# Introduction to SysML

# Part 6.0: Activities and Activity Diagrams

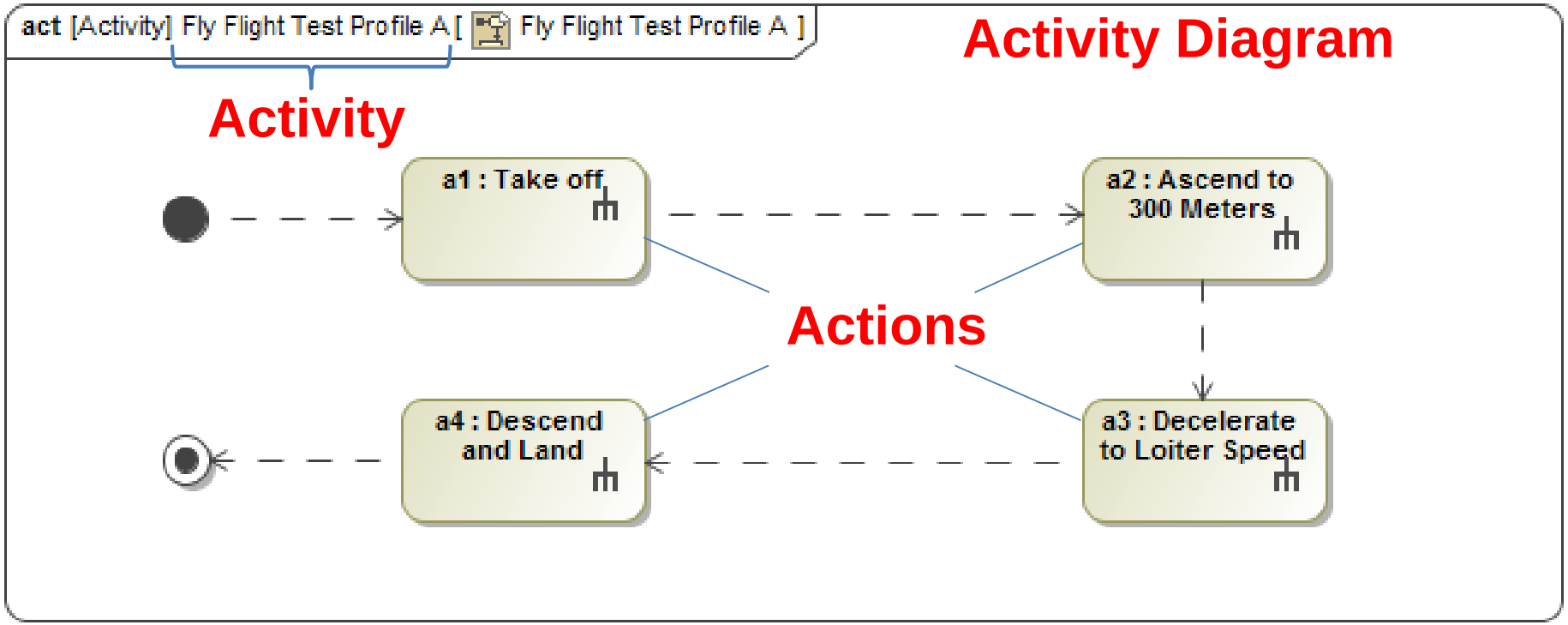
With tutorial exercises using MagicDraw

# Learning Objectives

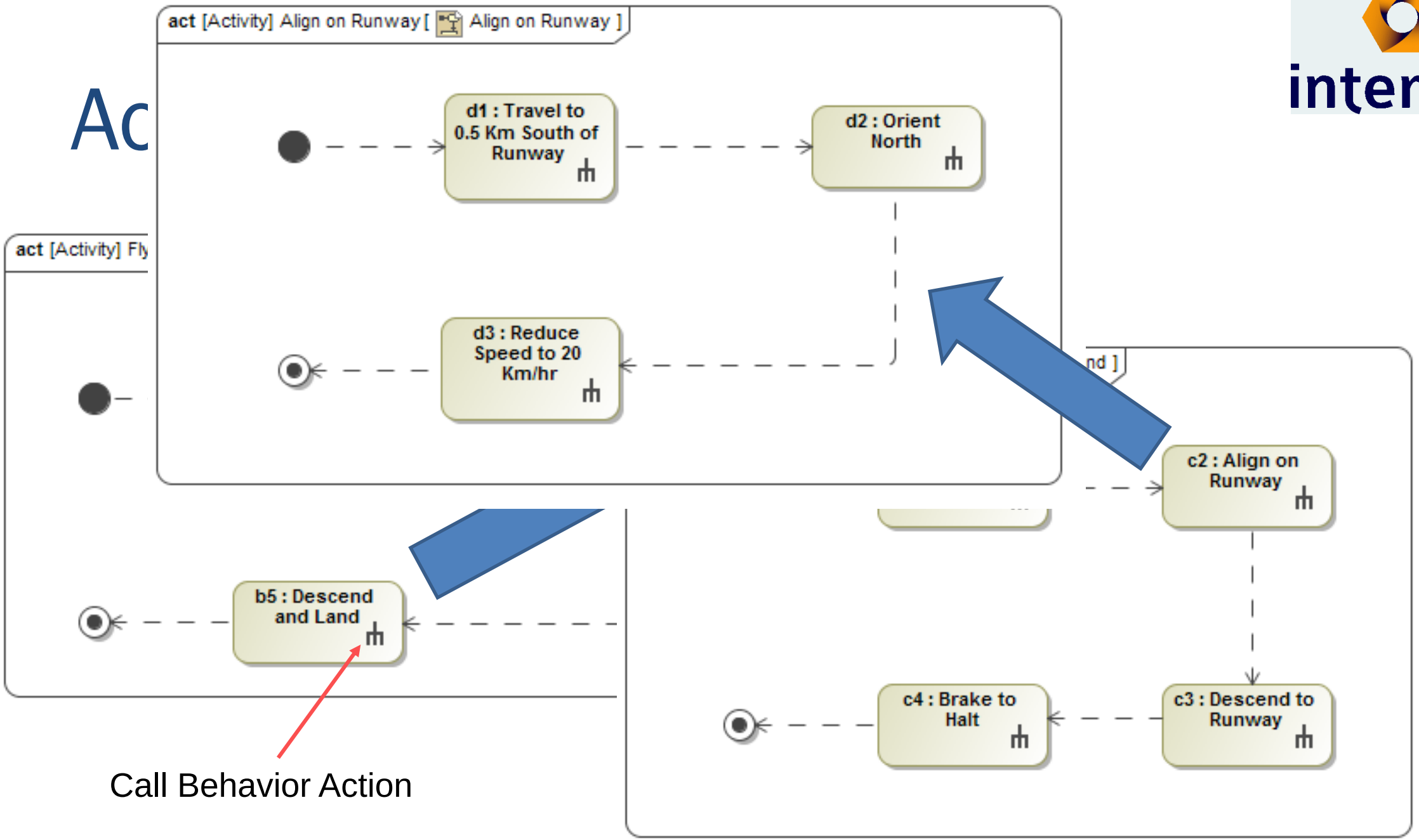
- Activities, Actions, and Activity Diagrams
- Control Flows and Object Flows
- First Exercise, creating an activity diagram with actions, object flows and swimlanes
- Token Semantics, Routing Nodes, Send Signal and Accept Event Actions
- Second Exercise, creating an activity diagram with routing nodes and control flows

# Activities

- An Activity is composed of Actions
- An Activity Diagram is a view of the Actions composing that Activity

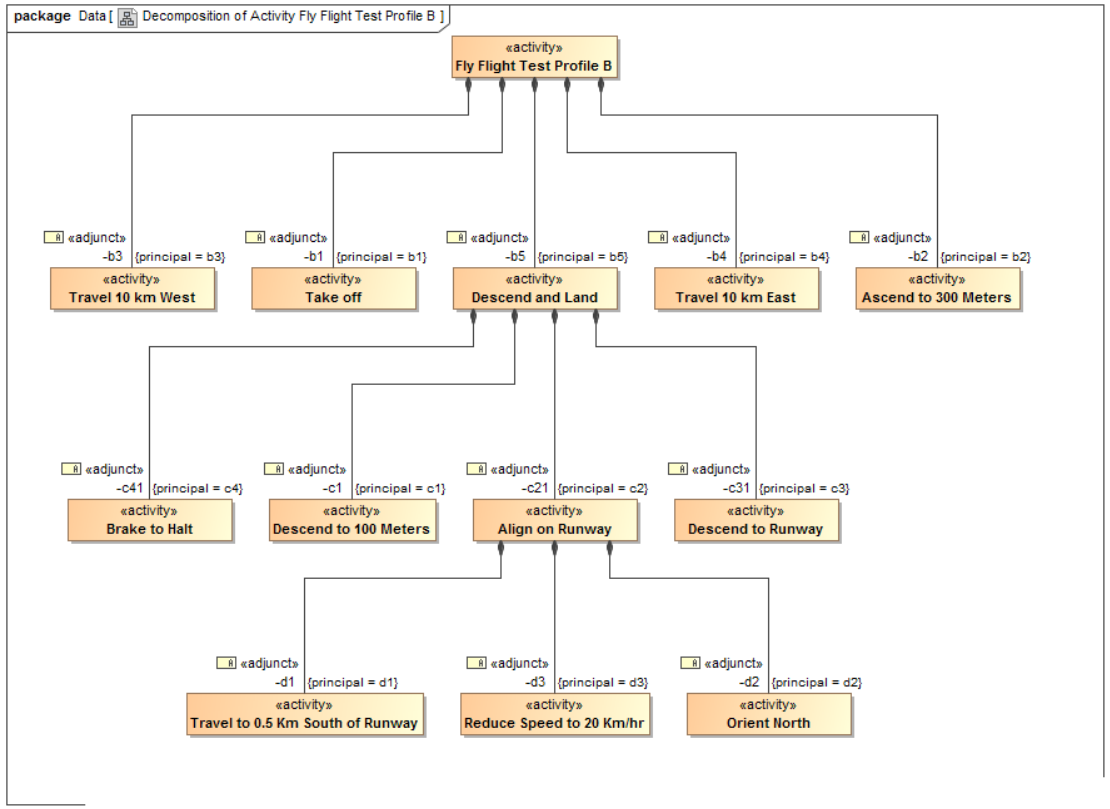


# Ac

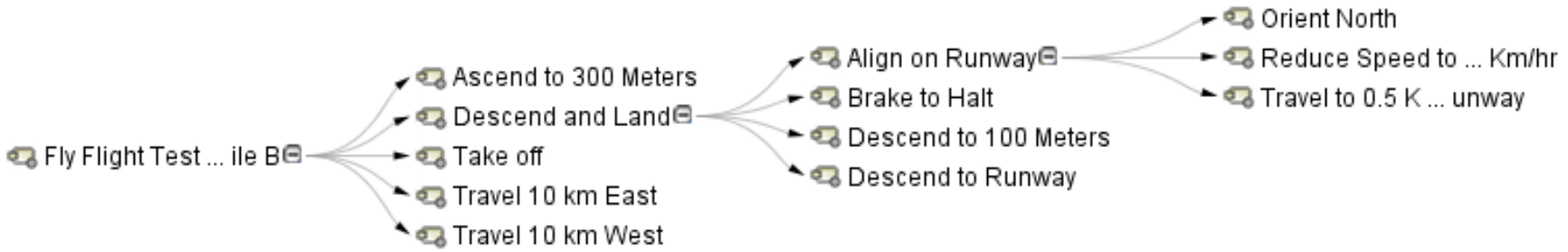



Call Behavior Action

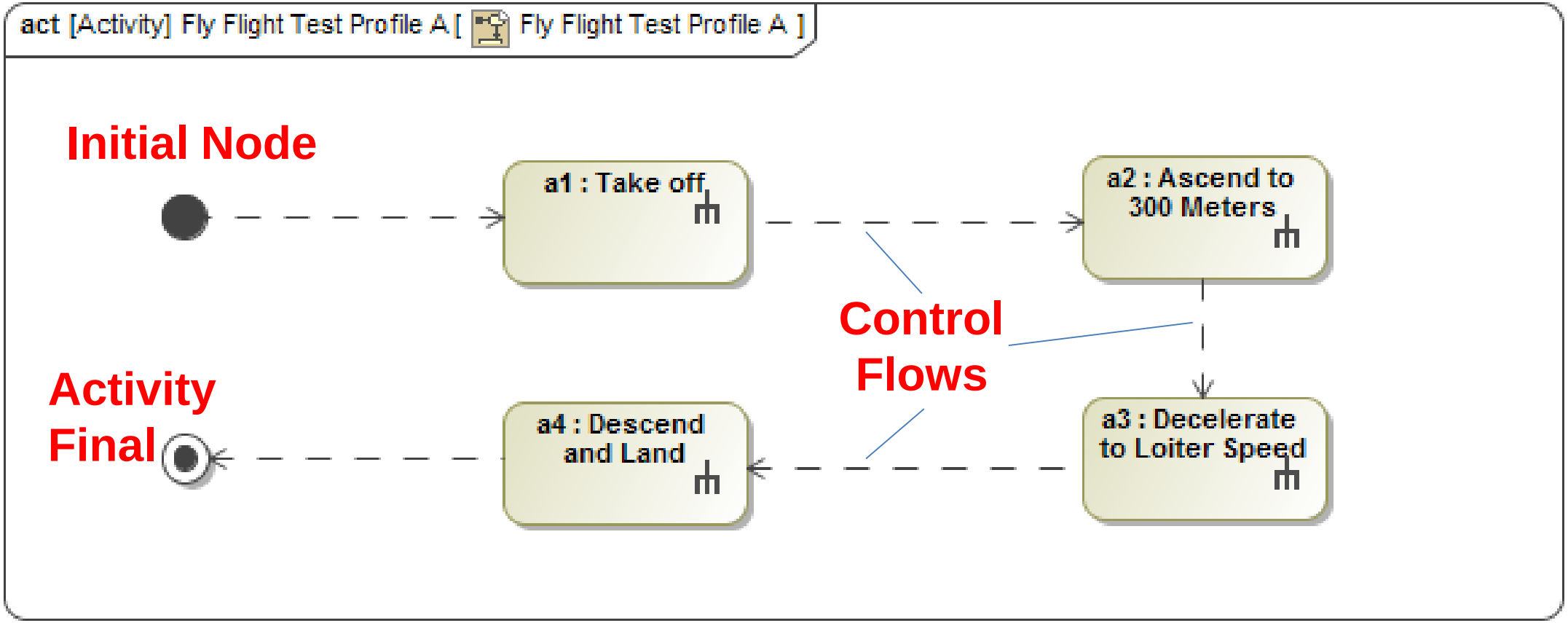
# Activity Decomposition Hierarchy



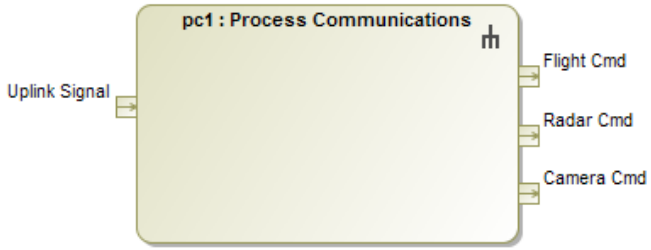

## Activity Decomposition Map

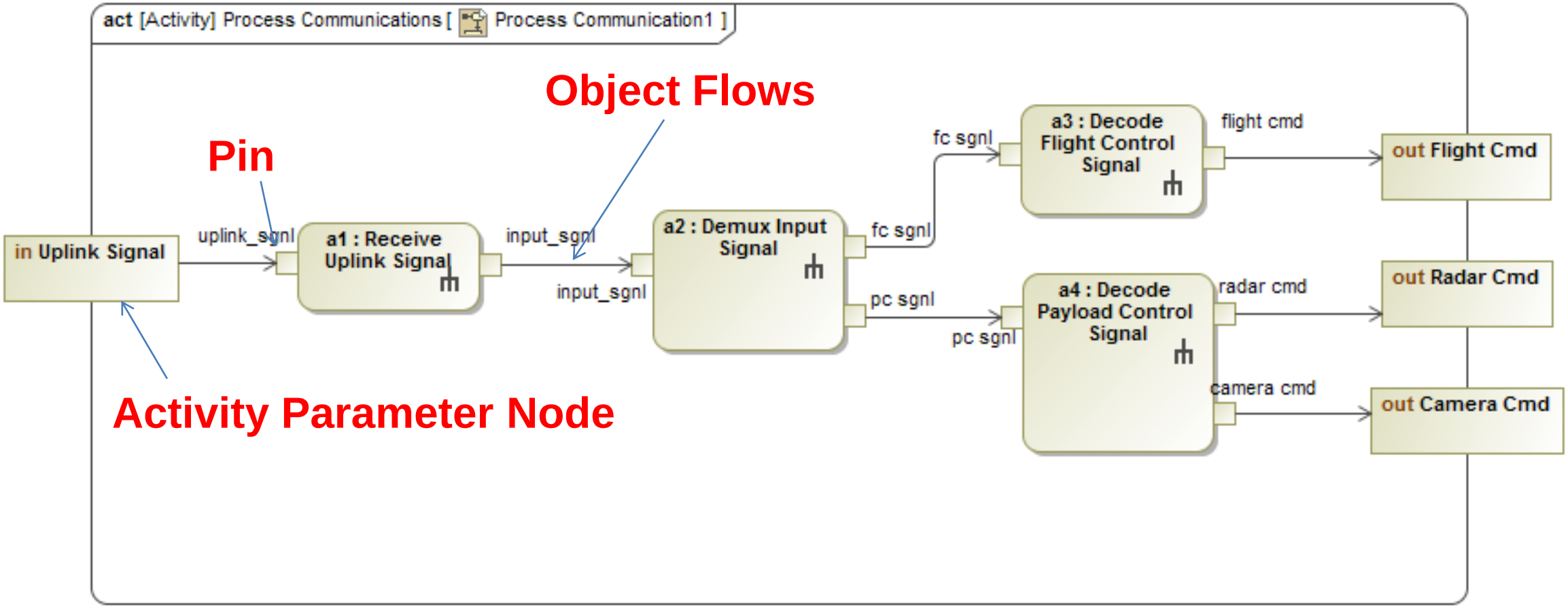


# Activities

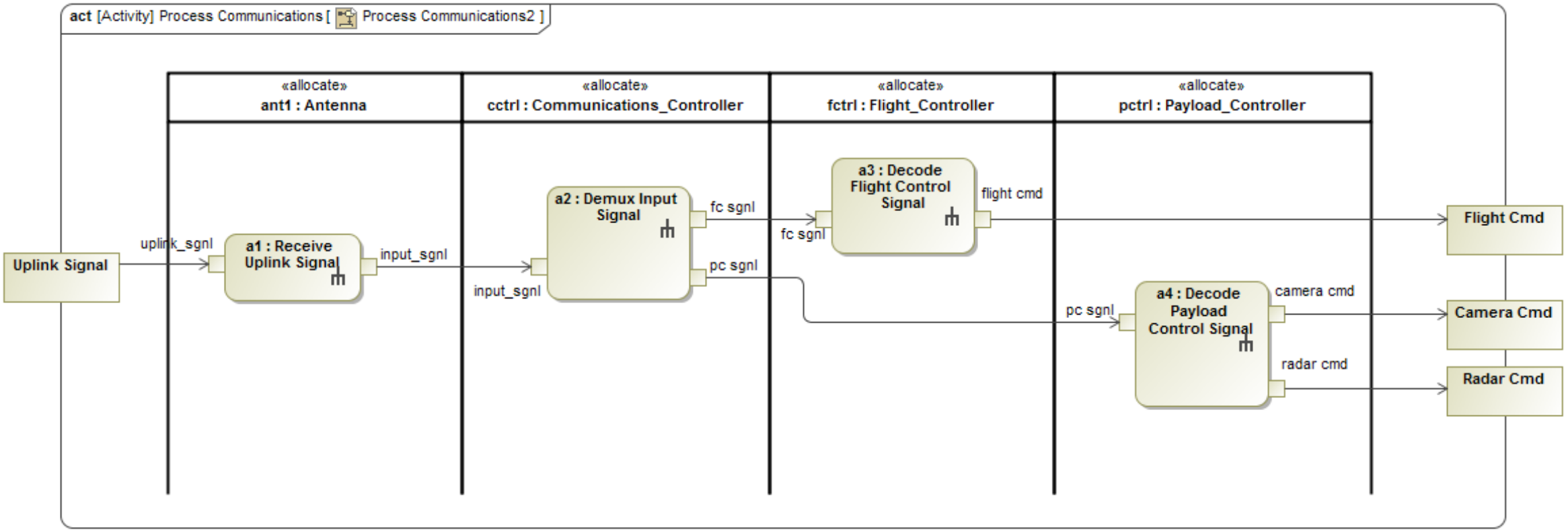


# Activities



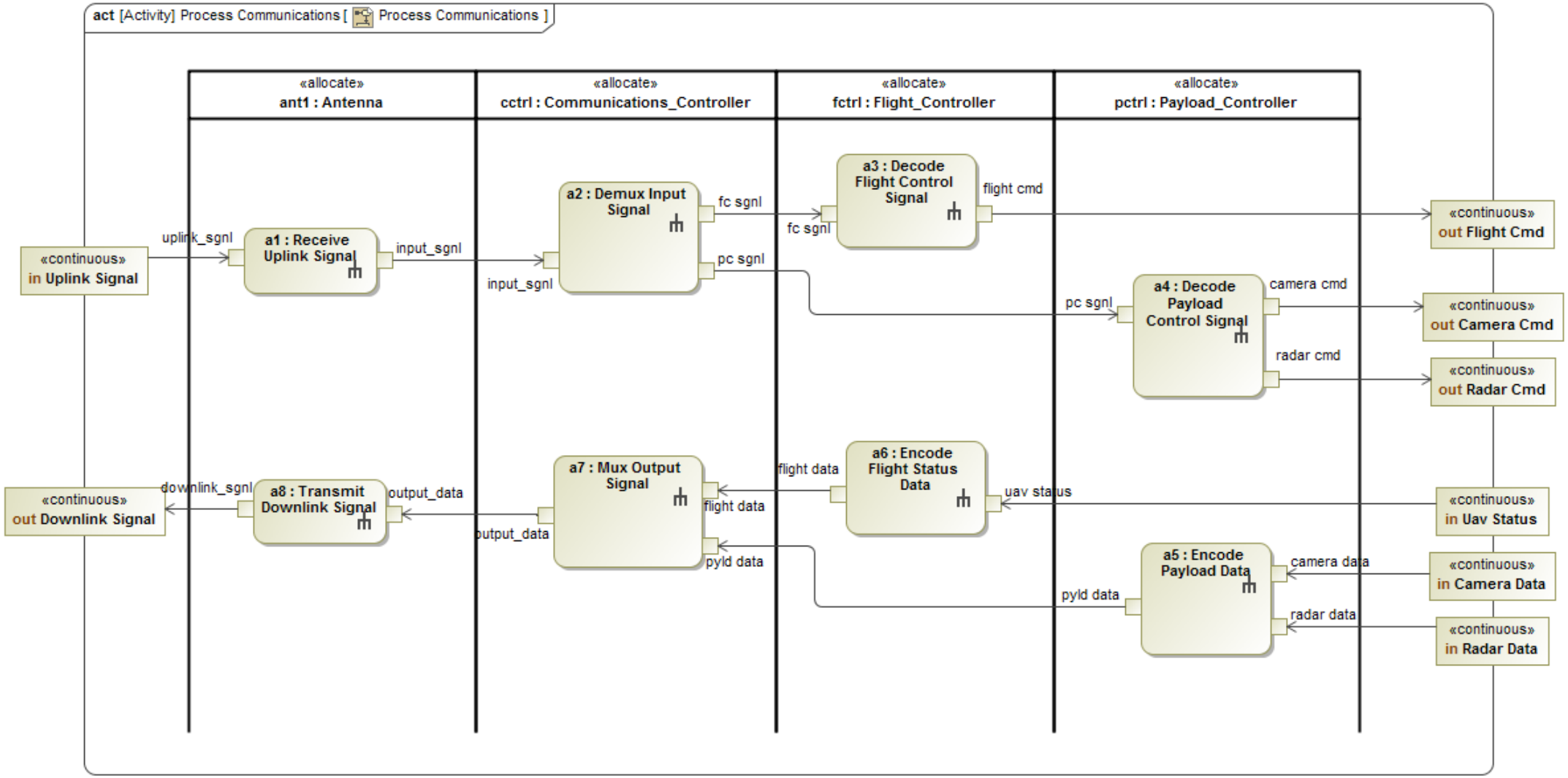



# Swimlanes



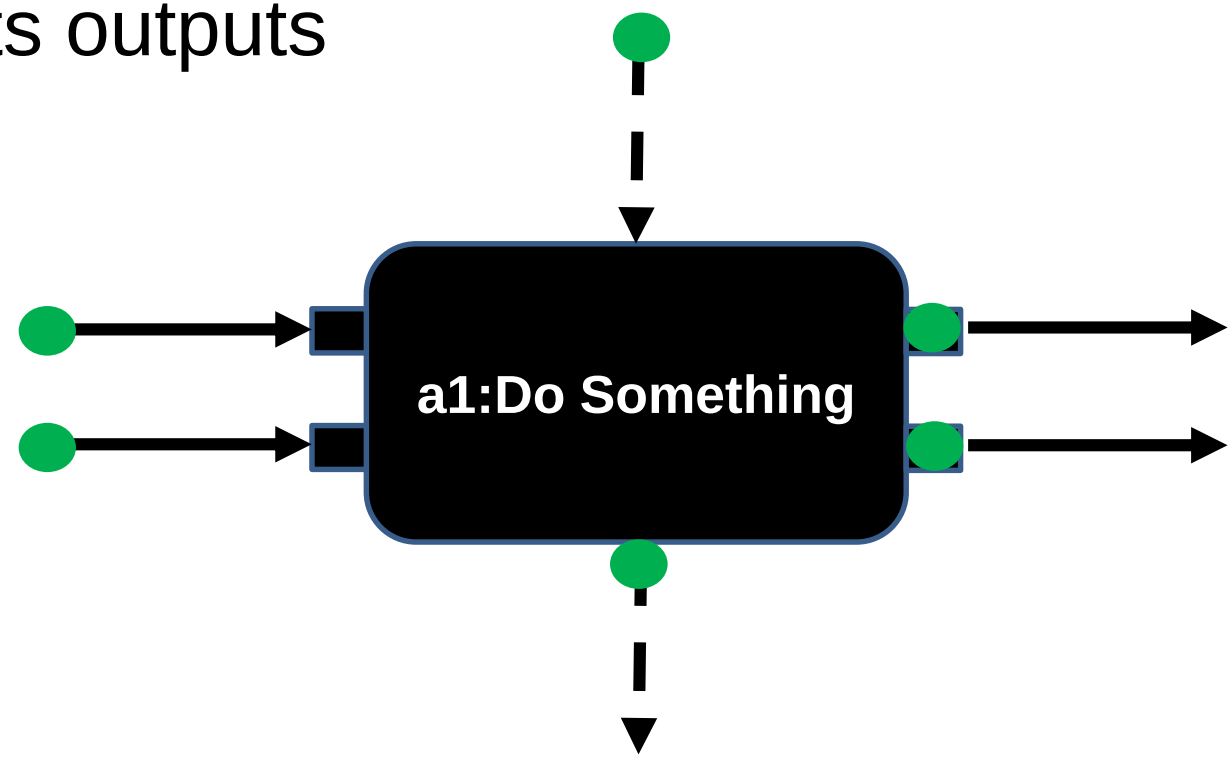

Swimlanes (Allocated Activity Partitions) allocate Behavior to Structure

# Exercise 6.1



# Token Semantics

- An action is triggered when tokens have arrived at all inputs
- After completion of its behavior, the action sends tokens on all its outputs

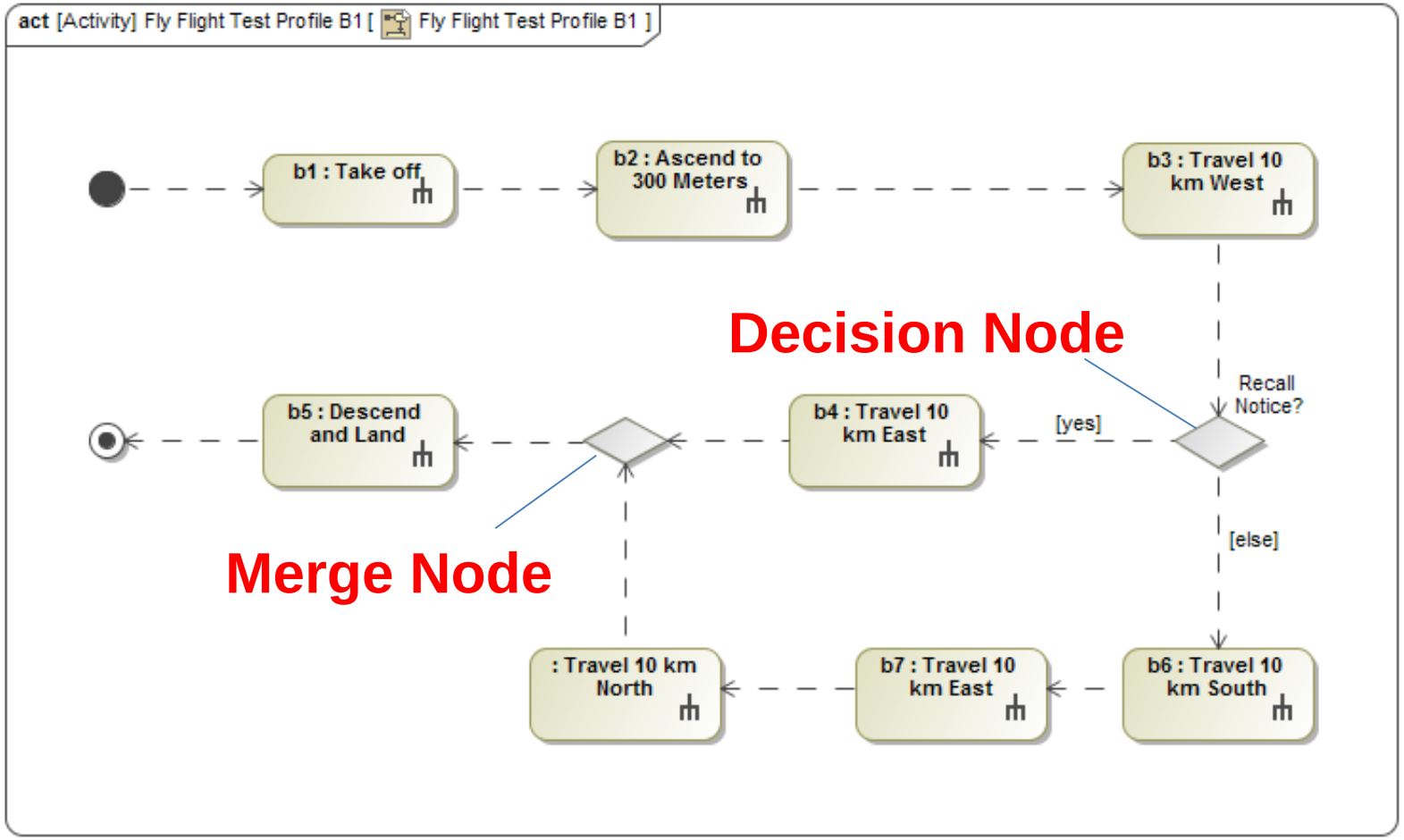


# Activity Simulation

- SysML Modeling Tools typically require add-on tools to simulate behaviors like activities, testing the logic of the activity model.

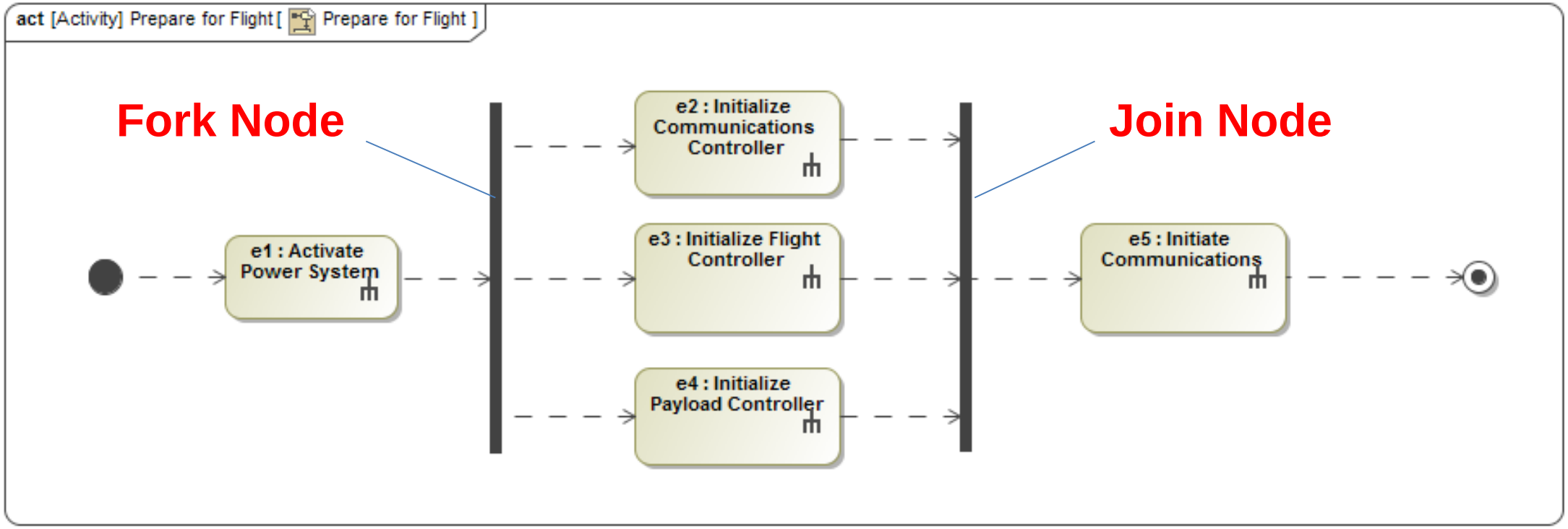
# Decision and Merge Nodes

- At a Decision Node, a token at the input triggers a token at one of the outputs, determined by the guard condition
- At a Merge Node, a token at any of the inputs triggers a token at the outputs



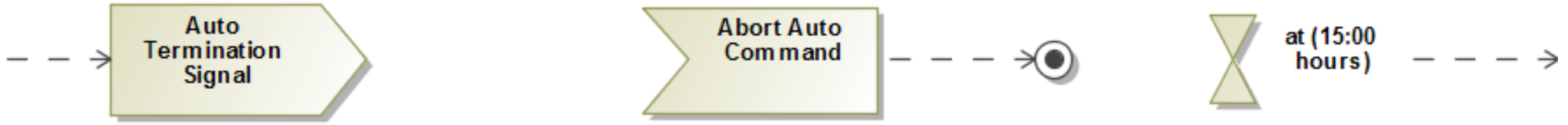
# Fork and Join Nodes

- At a Fork Node, a token at the input triggers a token at all of the outputs
- At a Join Node, a token at all of the inputs triggers a token at the outputs



# Other Kinds of Actions

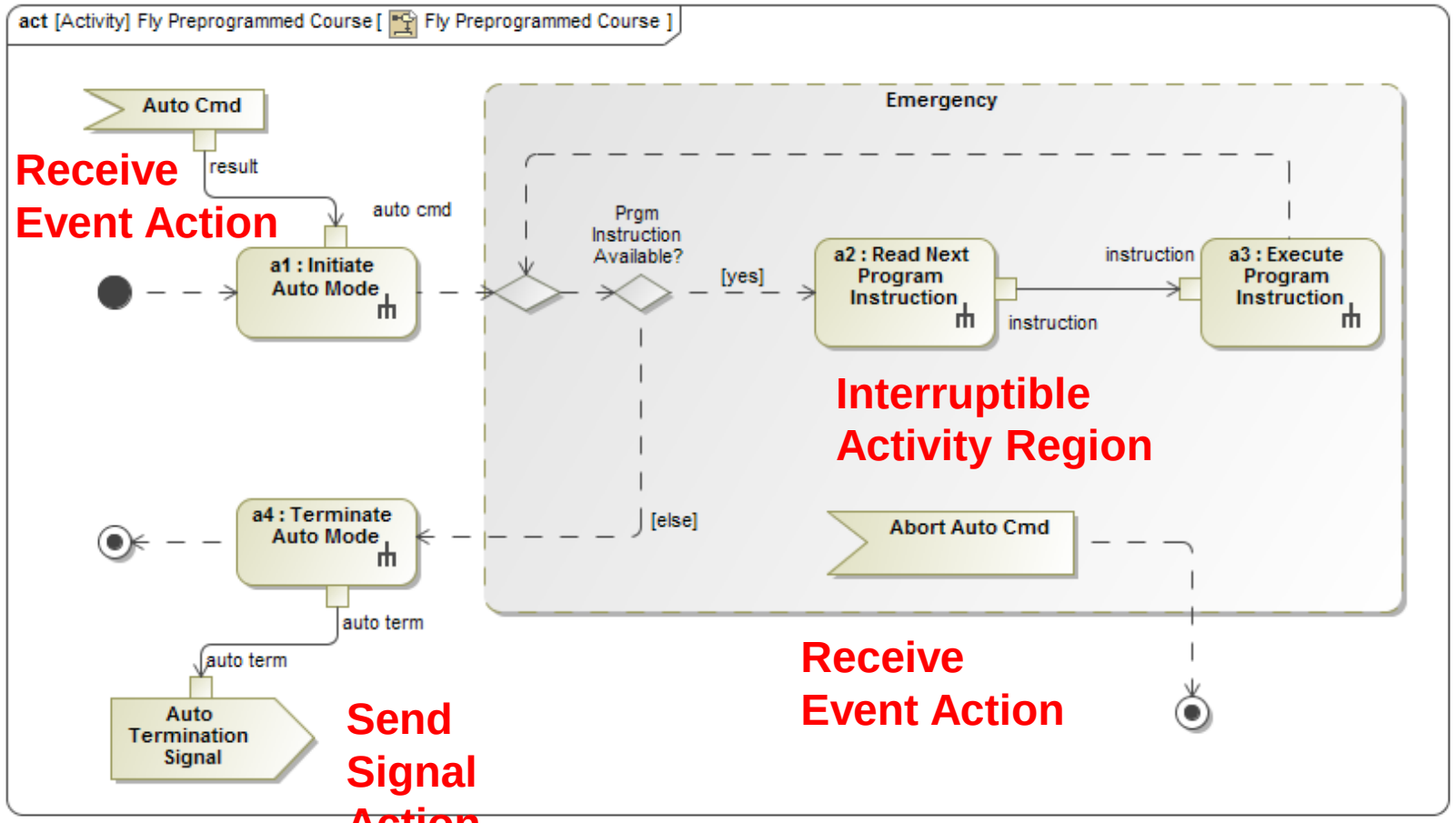
- Not all Actions are usages of Activities
- Actions may call other kinds of behaviors
- Some Actions do not call behaviors (do not appear as xxx:XXX)
  - Software Operations may be used as Actions
  - Some standard Actions are predefined




**Send Signal Action** **Receive Event Action** **Time Event Action**

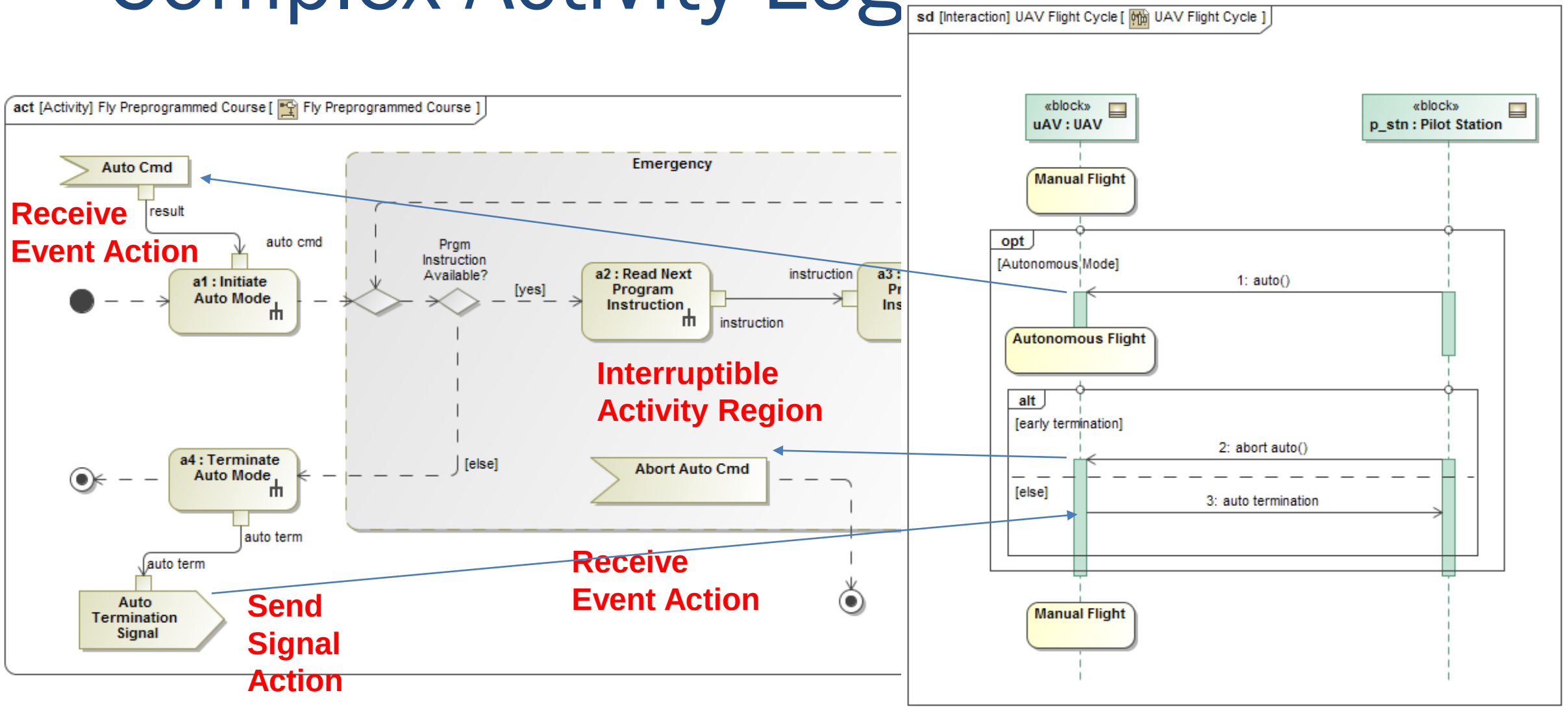
  - fUML – Foundational UML Library

# Complex Activity Logic

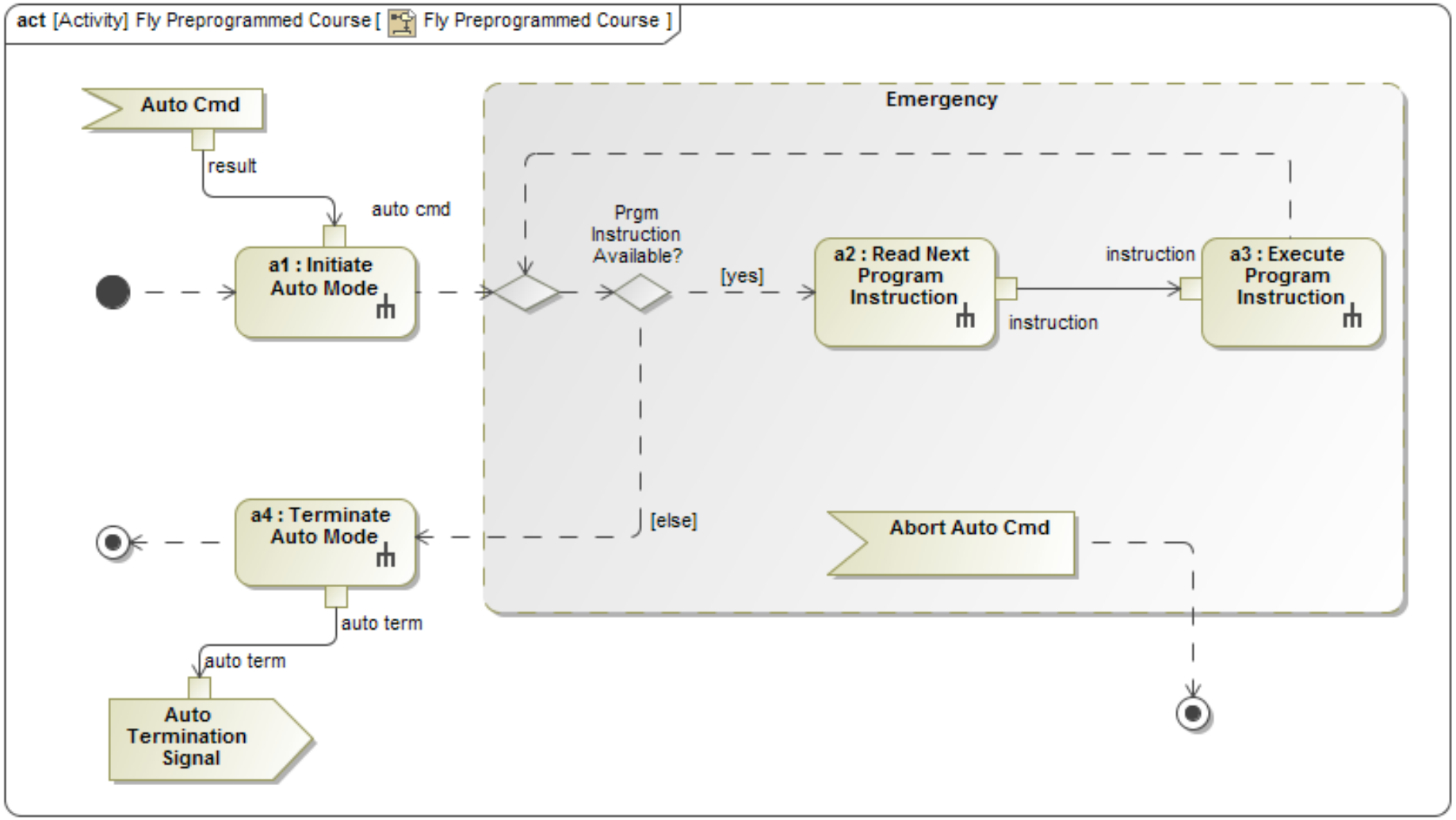



- Receive event and send signal actions provide links to other behaviors
- Interruptible regions show collection of actions that can be interrupted together

# Complex Activity Logic



# Exercise 6.2



# Recap

- At the end of the hands-on exercises, you should be able to
  - Explain the following terms: activity, action, control flow, object flow, swimlane, routing node
  - Create an activity diagram with actions, flows and swimlanes
  - Describe how send signal and receive event actions connect behaviors
  - Identify the principle purpose(s) of activity diagrams

# Questions?

**www.intercax.com**

**email info@intercax.com**

**blog www.intercax.com/blog**

**Twitter @intercax | LinkedIn intercax-llc**

## Disclosure

- This course material is developed by InterCAX LLC. All copyrights held by InterCAX LLC.
- Usage of this material is governed by the licensing agreement terms between user and InterCAX. Usage or distribution for educational or other purposes outside these terms is not permitted. No part of this material may be reproduced or repurposed without the written consent of InterCAX.
- The intent is to present vendor-independent concepts and examples in an objective educational way that the course participants will find helpful. References are made to commercial products by InterCAX for the purpose of making these concepts concrete. Course participants are responsible to evaluate these products and tools for themselves and to investigate similar products and tools by other organizations where applicable.