Design

Task 1 document

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1.1 FUNCTIONAL REQUIREMENTS

4.1 The Falcon Rockets:

- Rocket (interface for all the Rocket and to be decorated with Engine class)
  Types of rockets
  - Falcon 9
    - The first stage: single Falcon9 cores and 9 Merlin engines
    - The second stage: a single Vacuum Merlin Engine.
  - Falcon Heavy
    - The first stage: 3 Falcon9 cores and 27Merlin engines
    - The second stage: single Vacuum Merlin Engine

4.2 The Dragon Spacecraft:

- SpaceCraft (interface for all SpaceCraft)
  - Dragon
    - The Dragon is responsible for only sending and not returning Cargo to the International Space Station.
  - CrewDragon
    - The Crew Dragon sends and safely returns Humans and Cargo to and from the International Space station.

4.3 Starlink Satellites

The Starlink Satellites are launched on a Falcon 9 and are responsible for communication in two ways once in Orbit.

- Inter-satellite communication by using lasers
- Communication with users on the ground by using radio signals.

4.4 Launch Simulator

The Launch Simulator provides an interface for simulations as all rockets should be tested before launch. (Static fire)

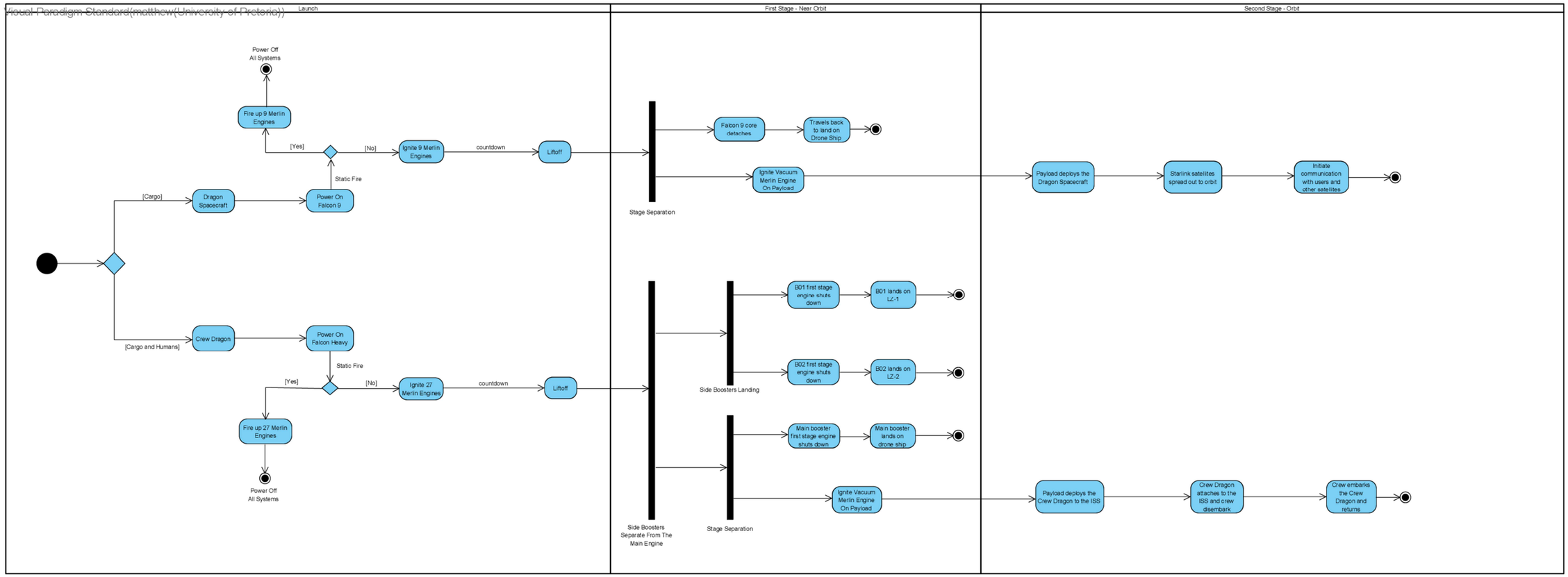
- The Launch Simulator can run simulations in test mode while building the simulation. Test mode simulations can be interrupted, tweaked, and then allowed to continue.
- Actual launch simulations are setup and run, additionally, they can be stored and run-in batches.

4.5 Miscellaneous Requirements

- Engines (interface for all the engines)
  Engine functionality:
  - Staticfire (a function that returns a boolean indicating whether the engine fired up)

  types of Engines
  - MerlinEngine
  - VacuumMerlinEngine
- Core (interface for all cores)
  types of Cores:
  - Falcon9core

1.2 ACTIVITY DIAGRAMS



High resolution copy in '/diagram/ActivityDiagram.pdf'

1.3 PATTERNS

Number	Pattern	Use
1	Template Method	Rocket: • Falcon 9 • Falcon Heavy Spacecraft: • Dragon - Sends but does not return Cargo • CrewDragon - Sends and safely returns Humans **and** Cargo
2	Strategy	Each launch has different payloads and different requirements, so the aim is to optimise the cost of each launch by choosing the best rocket **configuration** for the job,
3	Factory Method	Used where object creation will be needed.
4	Memento	RocketState
5	State	Falcon9: 1. The first stage has a single Falcon 9 core with 9 Merlin engines to get the second stage and the payload almost in orbit. 2. The second stage has a single Vacuum Merlin Engine to provide the last kick to get the payload in the desired orbit. FalconHeavy: 1. first stage has three Falcon 9 cores with a total of 27 Merlin engines to get to the second stage and the payload almost in orbit 2. The second stage has a single Vacuum Merlin Engine to provide the last kick to get the payload in the desired orbit
6	Iterator	Iterate through structure of StarLinkSatellites Iterate through structure of Cargo Iterate through structure of Humans
7	Prototype	• StarLinkSatellitePrototype • Falcon9CorePrototype • MerlinEnginePrototype • VacuumMerlinEnginePrototype
8	Decorator	Decorate a Dragon Spacecraft with a Rocket
9	Mediator	Communication between StarLink satellites

10	Observer	Communication to ground
11	Command	Simulations of Rocket lanches (Actual & test)
12	Chain of responsibility	To Simulate the Launch or To launch

1.5 CLASS DIAGRAM