

Project Specs

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- Space X:
- Rockets:
    - Falcon 9
    - Falcon heavy
  - Spacecraft (Carry cargo)
    - Crew Dragon
    - Dragon
  - Need to optimise cost for the different payloads
    - Choose the best configuration for the job
- Starlink:
- Launched in clusters of 60 on a Falcon 9 rocket

- Design Patterns for Space X:
- Abstract Factory ( Creation of rockets and spacecraft )
  - Factory Method
  - Strategy ( Choosing which configuration depending on rocket )
  - Prototype (Creation of rockets and spacecraft )
  - Decorator (Decorate a rocket with which spacecraft)
  - Adapter (Rocket communicates with Spacecraft)
  - Command (Rocket release/lock spacecraft on rocket)
  - Adapter (using the rocket to ignite the spacecraft )

- Design Pattern for Starlink:
- Prototype ( create multiple satellites )
  - Composite ( can use prototypes to create a cluster of 60 )
  - Iterator ( Iterate through the Family of Satellites )

- What to think about:
- How to make the rockets:
    - F9 will have either Satellites or not
      - That depends on the state of the satellites - if already, F9 takes off without it, else with it
    - So Decorate the F9 with satellites if the satellites are ready, else launch it without satellites.
  - All Satellites must be the same
    - Prototyping for duplication of objects
    - They must be treated as a unit (clusters of 60), so the composite can handle that
      - Using prototype to create the tree
    - Iterator for going through the list of Satellites

- The Falcon Rockets
- Go through a testing state before launch (state)
  - Falcon 9:
    - Stage 1:
      - 9 Merlin engines to get in orbit
    - Stage 2:
      - 1 Vacuum Merlin Engine to get payload into orbit
  - Falcon Heavy:
    - Stage 1:
      - 3 falcon 9 cores
      - 27 Merlin engines to get into orbit
    - Stage 2:
      - 1 Vacuum Merlin Engine to get payload into orbit

- Dragon Spacecraft
- Crew Dragon:
    - Send and return humans from station
  - Dragon:
    - Sends only cargo to station

- Starlink Satellites
- Low Orbit
  - Clusters of 60
  - Falcon 9 Rocket
  - Communicate through lasers between each other
  - Radios from ground

- Launch Simulator
- Creation of rockets, satellites
  - Mounting of spacecrafts onto rockets
  - Testing state for rockets
  - Launch:
    - Rocket Launch successful
      - If not land in the ocean
    - Low orbit:
      - If F9 release the satellites
        - Check if the satellites have successfully been deployed
    - Higher orbit:
      - Switch to other engine
      - Release the payload
      - Spacecraft:
        - ◻ Crew:
          - There and back again
        - ◻ Dragon:
          - There

- For the Rockets:
- Two types of engines:
    - Merlin
    - Vacuum Merlin
    - Can use prototyping
  - Two types of Rockets:
    - Falcon 9:
      - Merlin Engines
      - Cargo
    - Falcon Heavy:
      - 3 Falcon Cores
      - 27 Merlin Engines
      - Cargo

Can use prototypes for the rockets, strategy depending of which rocket to make

State to monitor the state prelaunch and during launch (static fire test)

- Static fire test can be a template method
- Observer method to monitor low/high orbit to change engines
  - This will change rocket state (stage 1/2)

- For the spacecrafts:
- Two types:
    - Crew Dragon
      - More fuel for there and back
    - Dragon
      - Less fuel
  - Needs to be controlled from rocket, thus a command, adapter for communication
  - Maybe a chain of responsibility SpaceX -> rocket -> Spacecraft
  - Released from rocket:
    - a. State for successful release?

- Satellites:
- Cluster of 60:
    - So we could composite them using the prototype pattern as components
  - Means of communication:
    - Mediator: SpaceX -> rocket -> release
  - Iterator pattern to oversee cluster