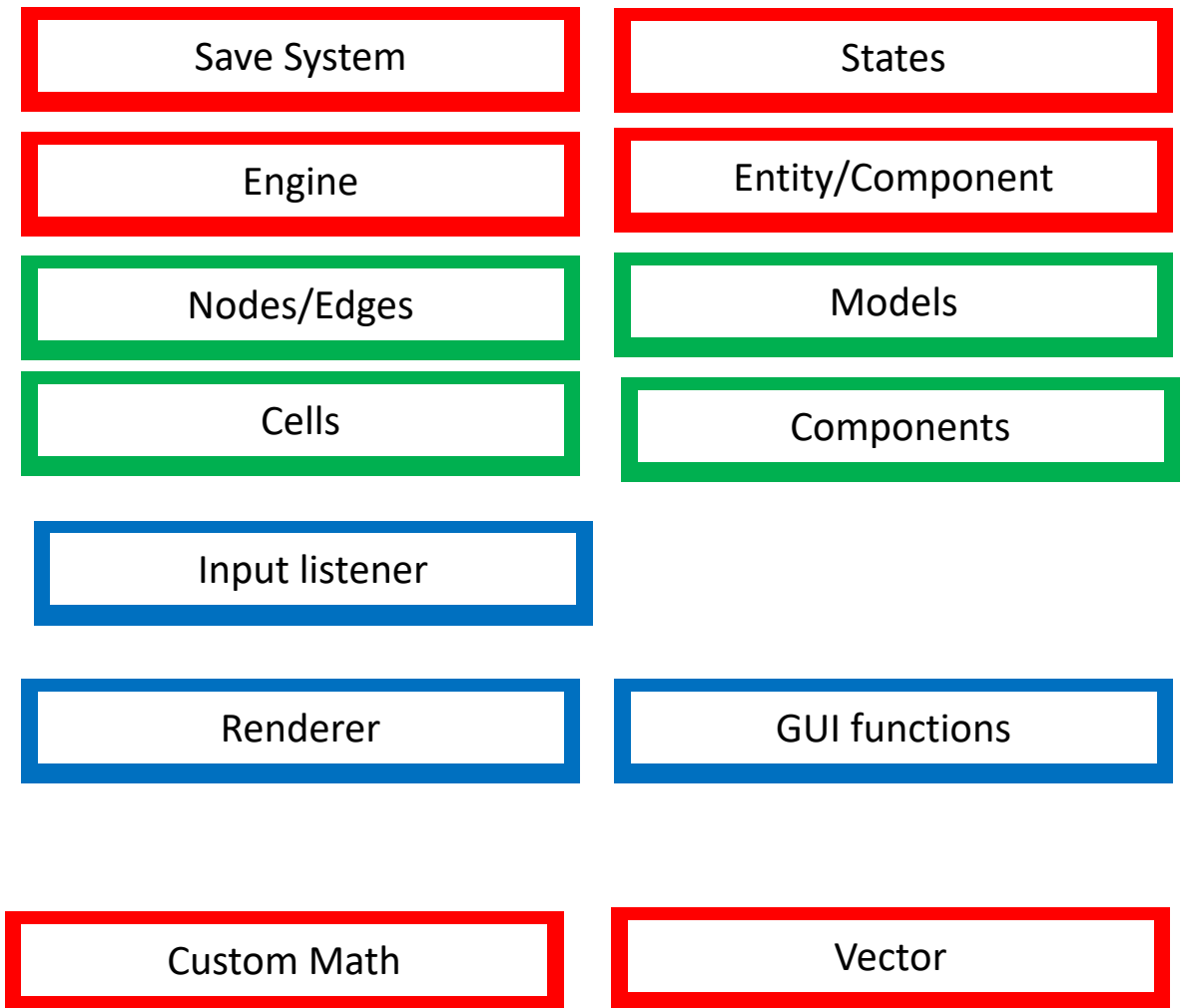
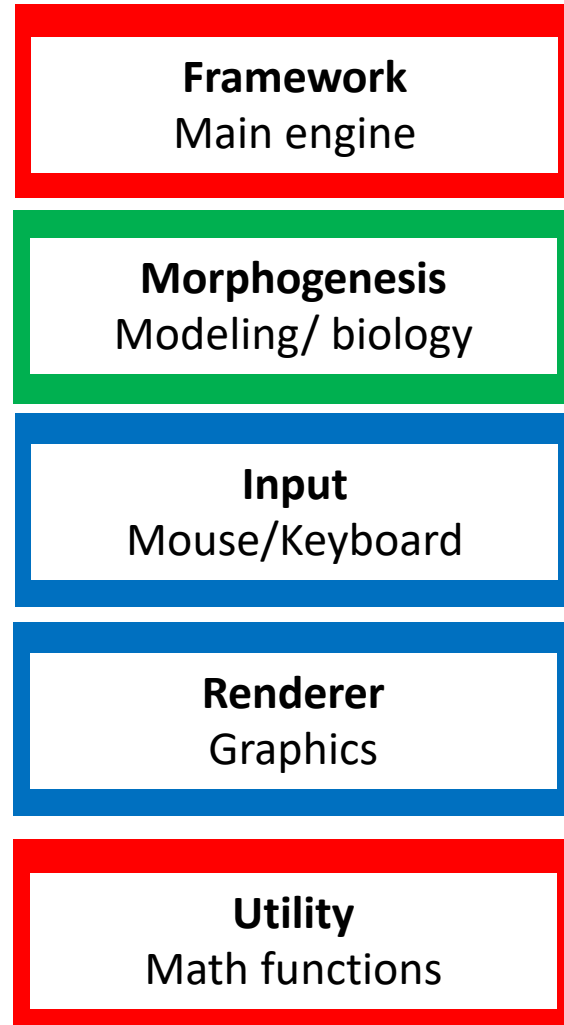


Morphogenesis Simulator Design Framework

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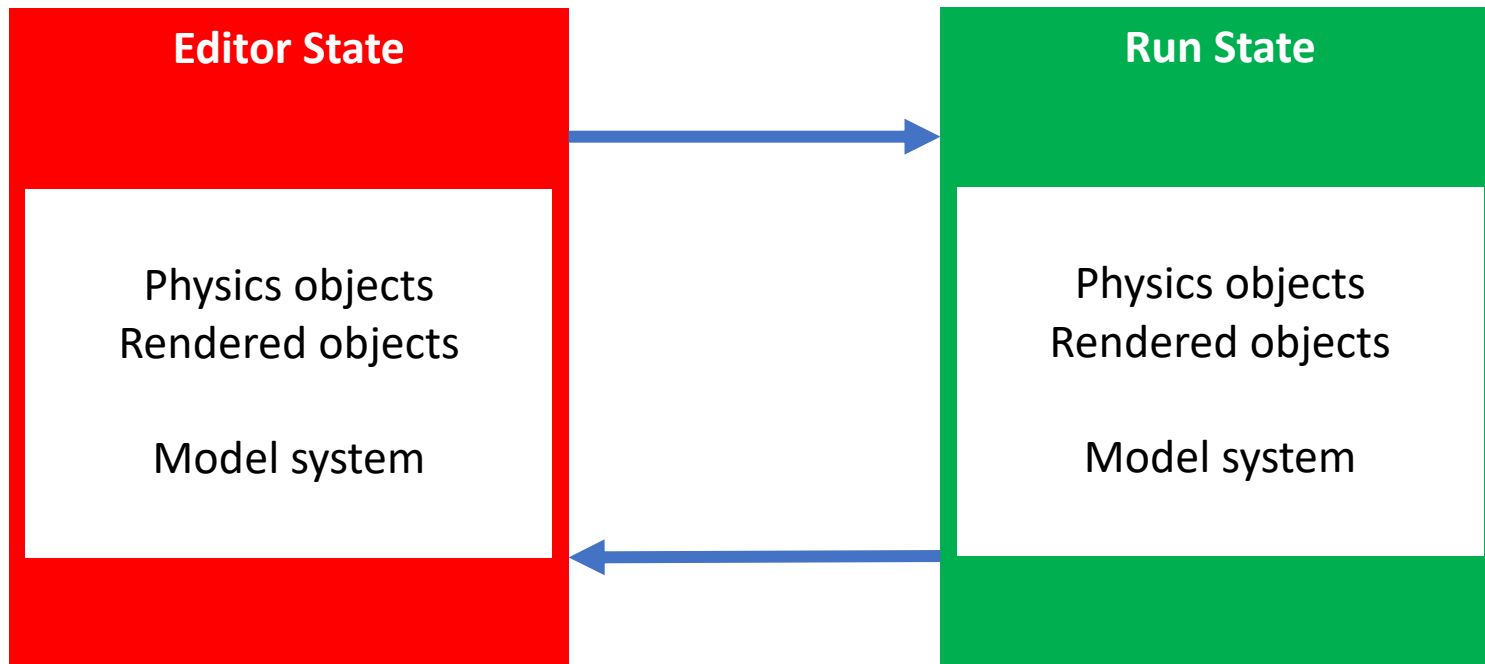
Project Structure



Simulation loop - States

- States are the main building block of the system.
- States are used to move from an editor/idle state (where one can adjust parameters of the simulation) to a run state (where the simulation is acting)
- Each state has a list of physics objects as well as a list of rendered graphics objects which will be updated either in the physics loop or render loop respectively.
- When the state is changed, these lists are passed back and forth between the states.

Simulation Loop - States



State and object behavior

- States control the actions of all objects in a scene
- Entities, which are the main objects and undergo physics computations, have several methods dependent on the state functions. These are mainly the methods in charge of setting up and deploying physics functions.
- Three major state functions:
 - Init() -> build objects in scene
 - Tick() -> physics loop
 - Render() -> update graphics
- A special group of objects called IRenders (objects that implement the IRender interface) render graphics during the render method. These are not necessarily entities as it is not needed for graphics components to be associated directly/indirectly with physics.

State and object behavior

STATE

Init()
Build/ initialize objects

Tick()
Perform physics
calculations

Render()
Update graphics

ENTITY

start()

earlyUpdate()

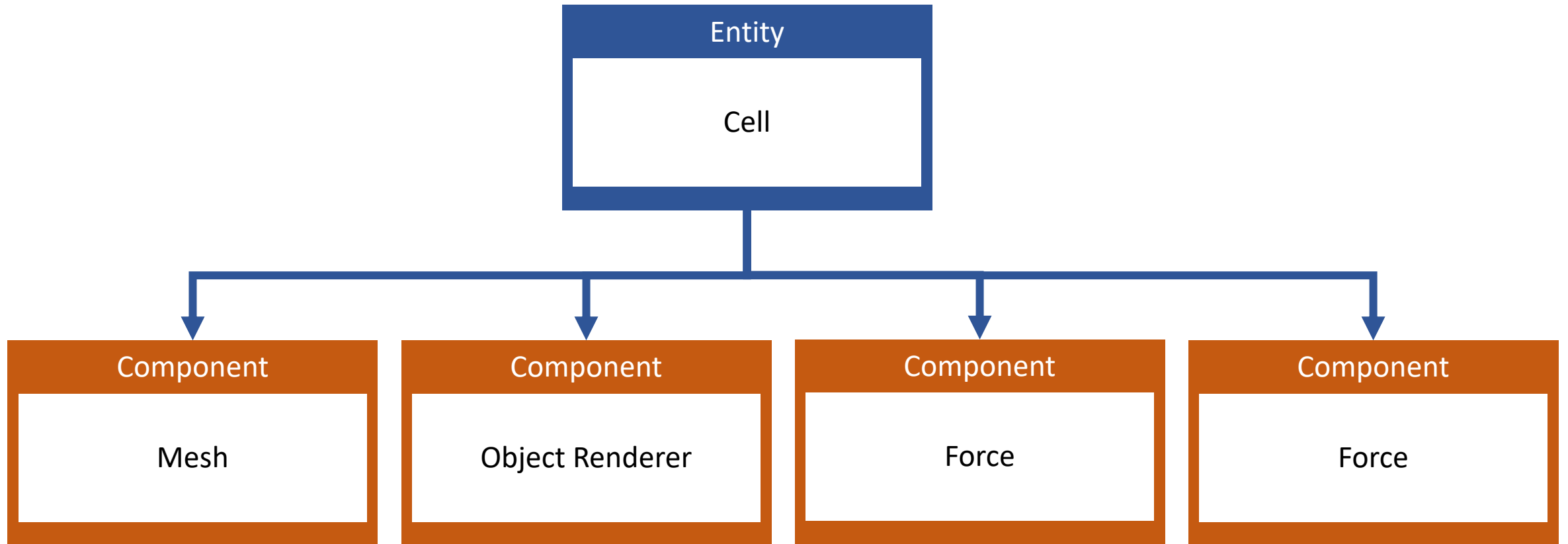
update()

lateUpdate()

IRENDER

render()

Entity - Component System



Whenever an entity uses the earlyUpdate, lateUpdate, and Update methods, each component updates

Entity – Component System

- Entity-Component systems are used to break up responsibilities of a class into multiple smaller segments which can be interchanged and switched out for each other.
- They also make saving data via json tools much easier via serialization.
- In this implementation, every time an entity updates, each component on that entity also updates.
- You can have more than one of the same type of component, for instance you can have more than 1 elastic force.