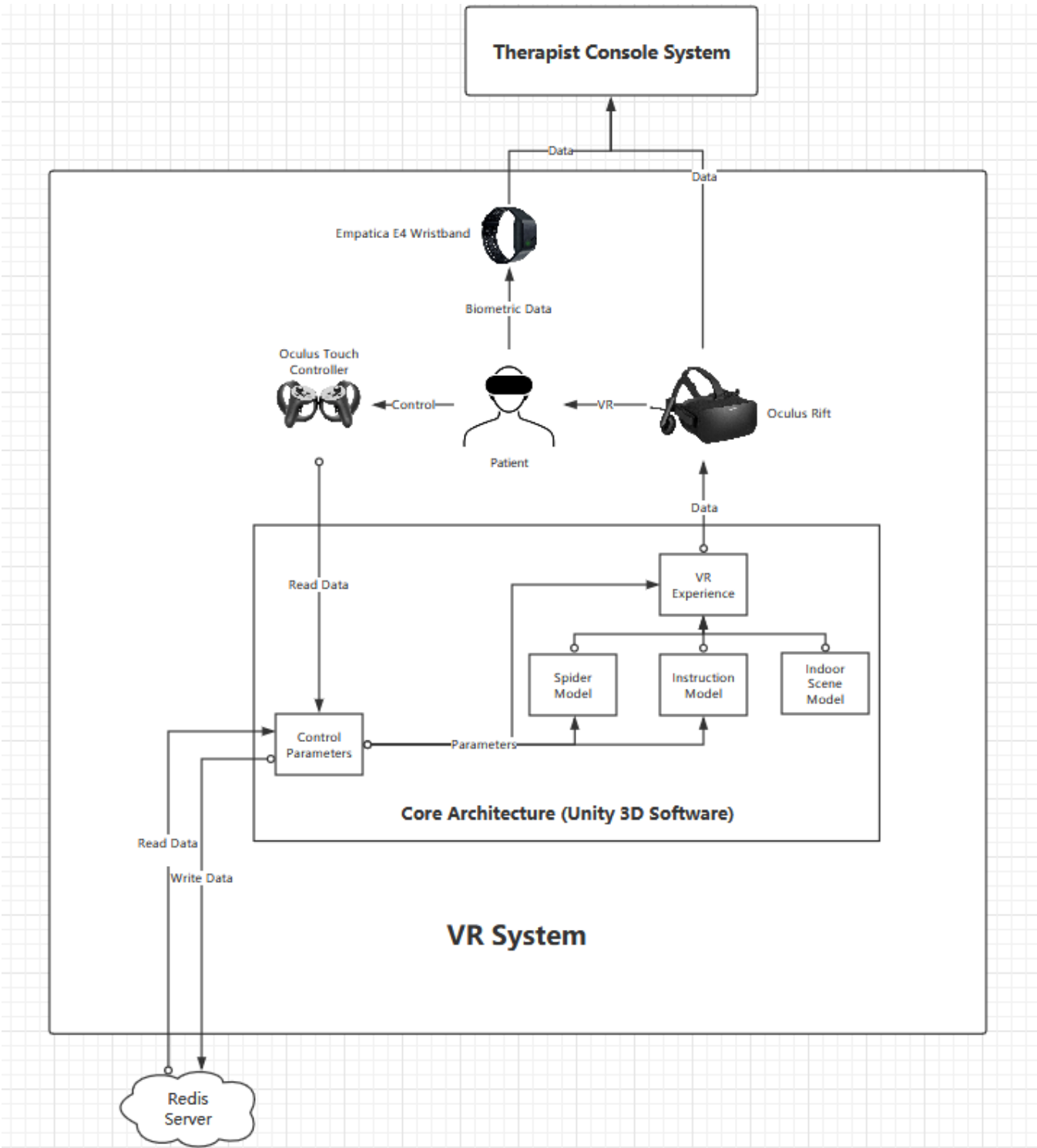# VR System Architecture

VR System Architecture Design

Design Concept:

In the VR System Architecture Design Graph above, we can find that the main I/O for the system is with the Therapist system and the Mid-tier Redis server.

For the Therapist system, the Empatica E4 wristband and the Oculus Rift devices in the VR system need to provide data to be shown in the UI. While for the

Mid-tier Redis server, all kinds of control parameters need to be transformed, which includes:

1. a signal to check the connection status between Therapist system and VR System;
2. various of spider control parameters: number, distance, and speed;
3. VR experience control parameters: start, pause, resume, and stop;
4. an instruction control parameter.

In the VR system, there also exists data transformation. When the VR experience started in the Oculus Rift device that patient wears, the patient may want to

control the VR experience for a pause, resume, or stop, which will also be transformed into the Unity 3D application to control the VR experience. At the same

time, the bio-metric data will be collected by the Empatica E4 wristband to record the patient's physical change continuously.

VR System Use Case Diagram Design
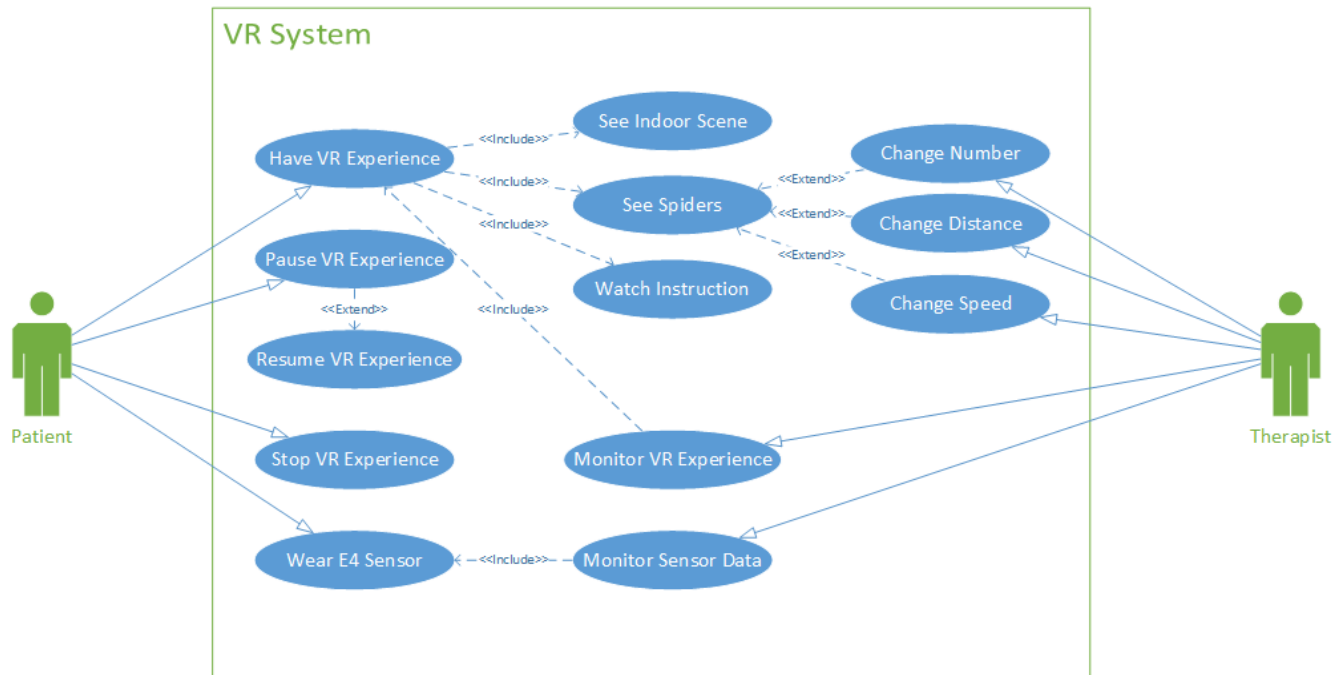
Main Functions:

According to the Use Case Diagram above, we can clearly see that, for patients, they have eight use cases. To discuss use cases in details with regards to the requirement User Stories:

1. Generally, patients can

- be exposed to a spider in a virtual environment according to the US_P_1.
- stop the system if feel uncomfortable by pressing the emergency button notify the therapist to stop according to the US_P_2.
- wear sensors to measure anxiety accurately according to the US_P_3.
- notify the therapist to resume the VR experience after a regular break according to the US_P_8.
- notify the therapist to resume the VR experience in a safer environment after a regular break according to the US_P_8_2.
- notify the therapist to resume the VR experience and have need another break soon after a regular break according to the US_P_8_3**.
- notify the therapist to pause the VR experience by taking off the headset according to the US_P_9.
- be in a smoothly running VR environment according to the US_P_10*.
- have a stop button and a continue button according to the US_P_12*.

2. For technically unfamiliar patients, they can

- know the instruction of how to use the VR equipment and how the VR experience execute according to the US_P_5.
- know the initial starting point of the spiders once the experience starts according to the US_P_5_1*.

3. For technically able patients, they can skip the instruction part of the VR experience according to the US_P_5_2.

4. For patients with high arachnophobia, they can notify therapist to make exposure escalate relatively slowly according to the US_P_6.

5. For patients with low arachnophobia, they can notify therapist to make exposure escalate relatively quickly according to the US_P_7.

Similarly, a therapist has five use cases related to the use cases of patients:

1. A therapist can manually escalate the experience by adjusting parameters, which refers to the first three use cases of changing parameters of spiders according to the US_T_3.

2. A therapist need to be sure that the VR equipment and all sensors are communicating with the system, which refers to the other two use cases for VR experience and sensor according to the US_T_4.