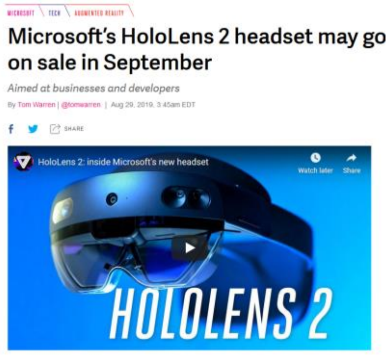
ARPRI

Meeting October 2019

Grant Objectives and Updates

- Changes to the team
- No substantial changes to the project objectives
- No HoloLens 2 available
  - Revision of budged to build in sustainability
  - Includes purchase of robot



MICROSOFT \ TECH \ AUGMENTED REALITY

Microsoft's HoloLens 2 headset may go on sale in September

Aimed at businesses and developers

By Tom Warren | @tomwarren | Aug 29, 2019, 3:45am EDT

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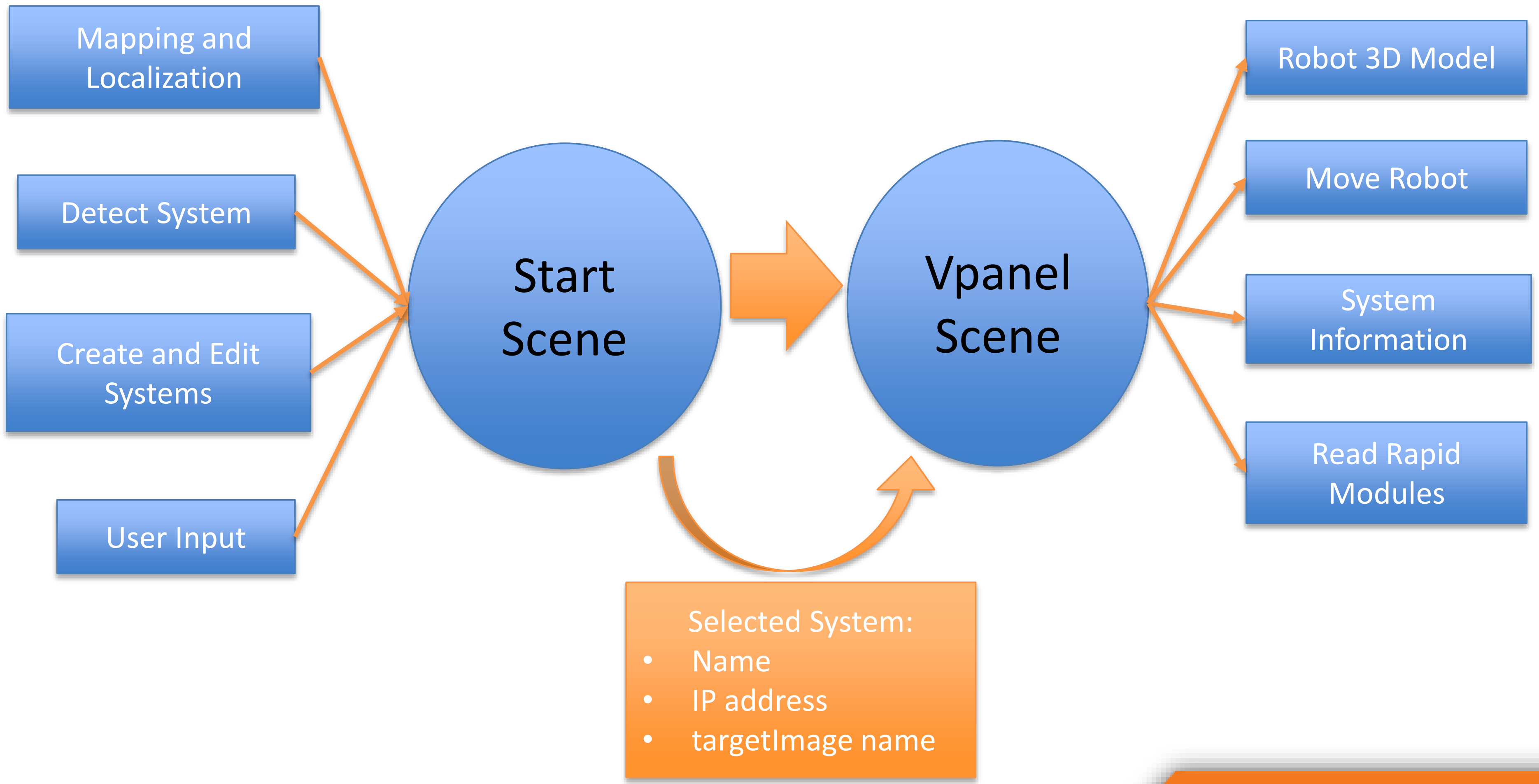
HoloLens 2: inside Microsoft's new headset

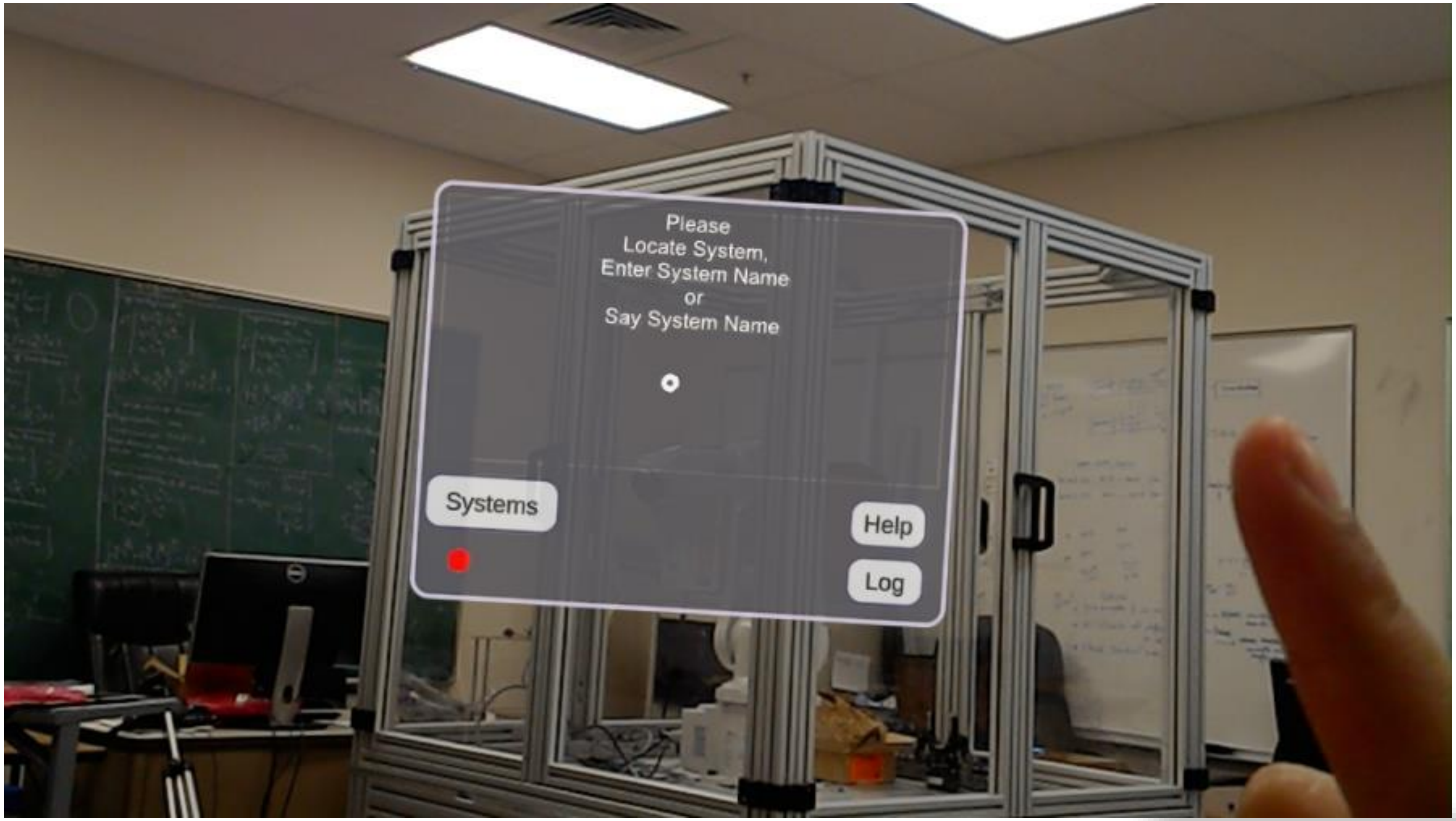
- NSF: *Planning Grant: Engineering Research Center for Human Interactive Technologies (HIT)* – California State University Fullerton, Texas A&M University, and Idaho State University's MCERC

Software Structure



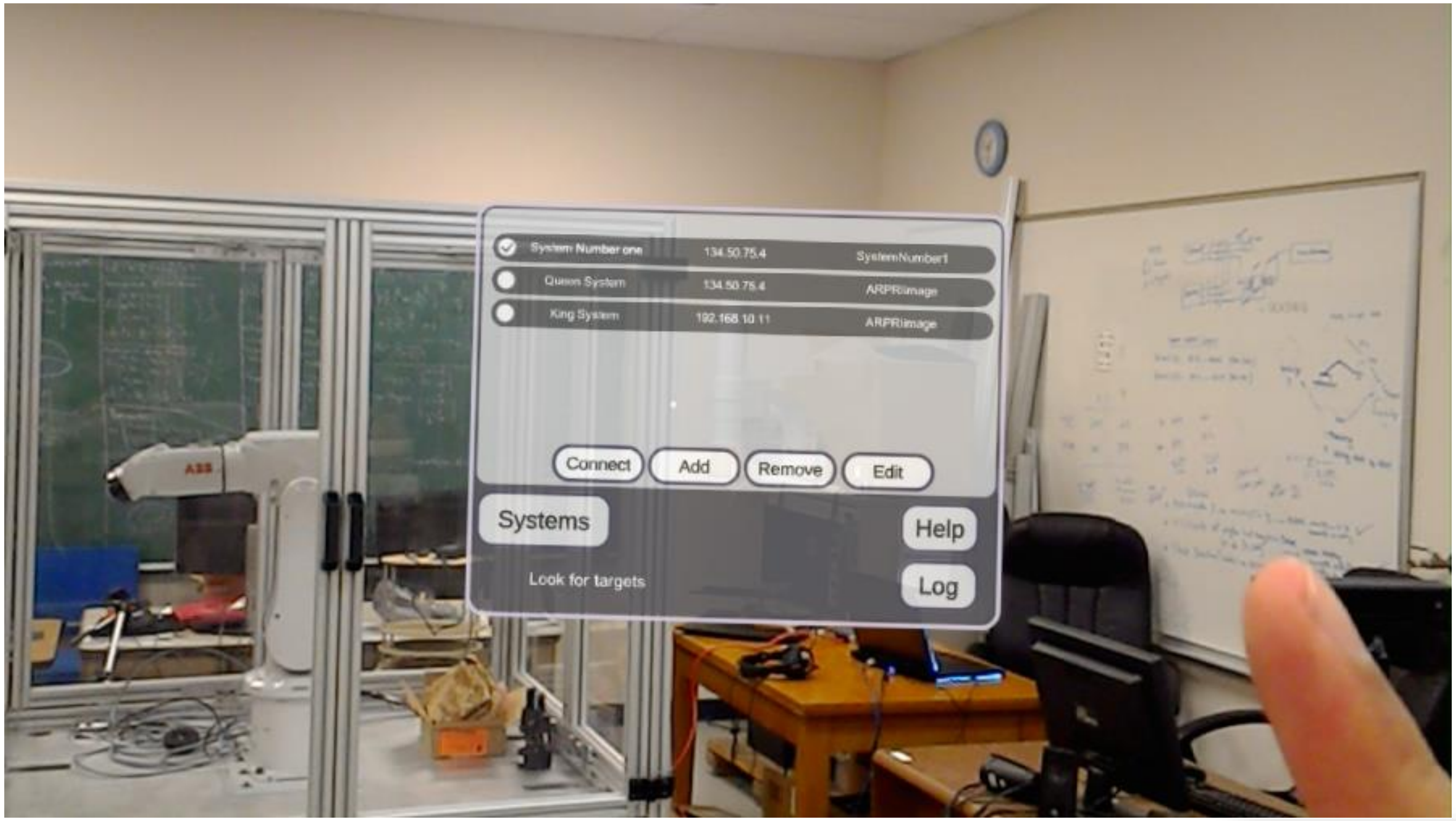
Start Scene

- Different appearance for buttons and menus
- Removed the animation in the beginning for performance issues



Start Scene

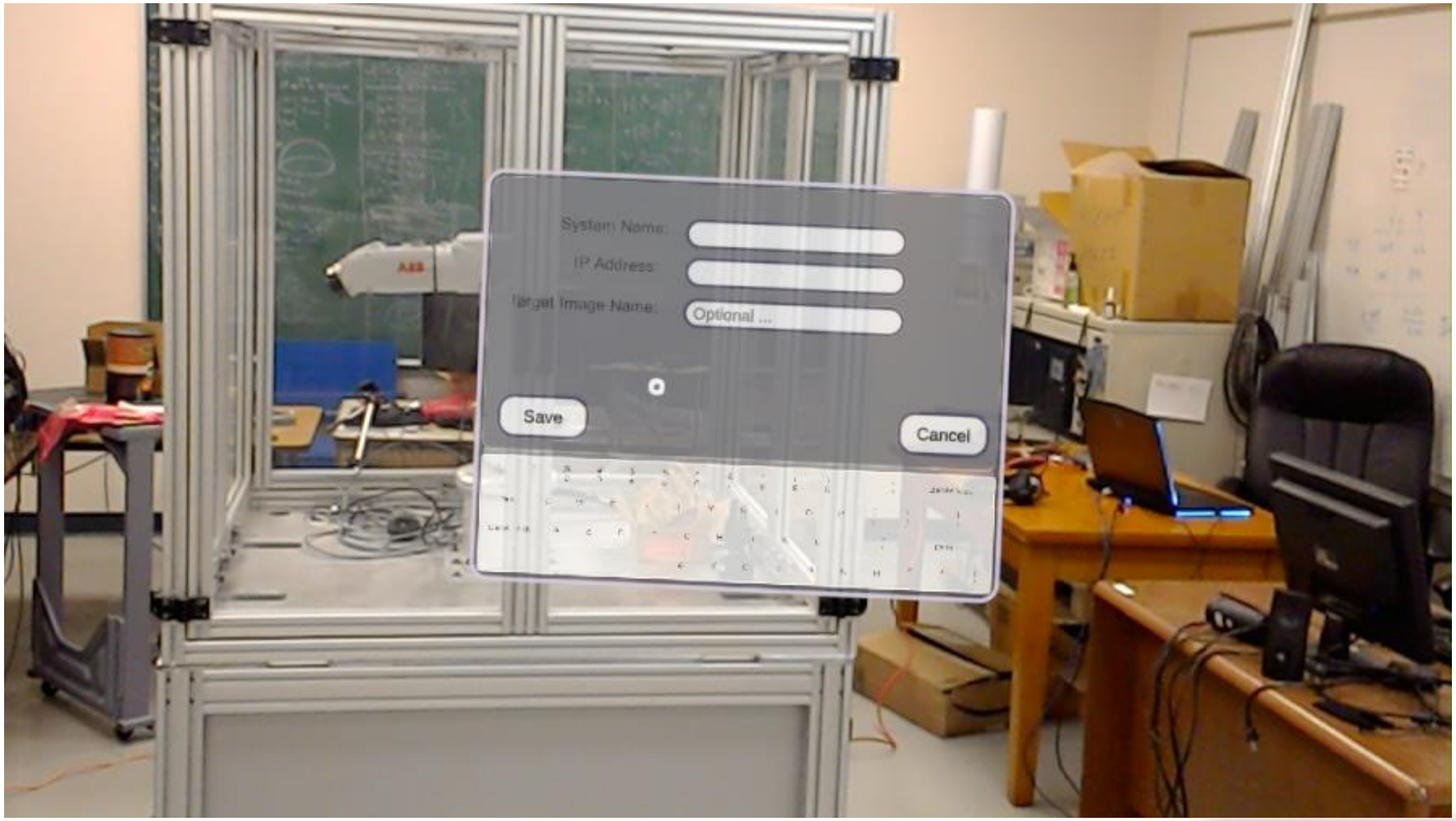
- A database in xml format holding the name, IP and target name of each system
- An interface to add, remove, edit and connect to any system



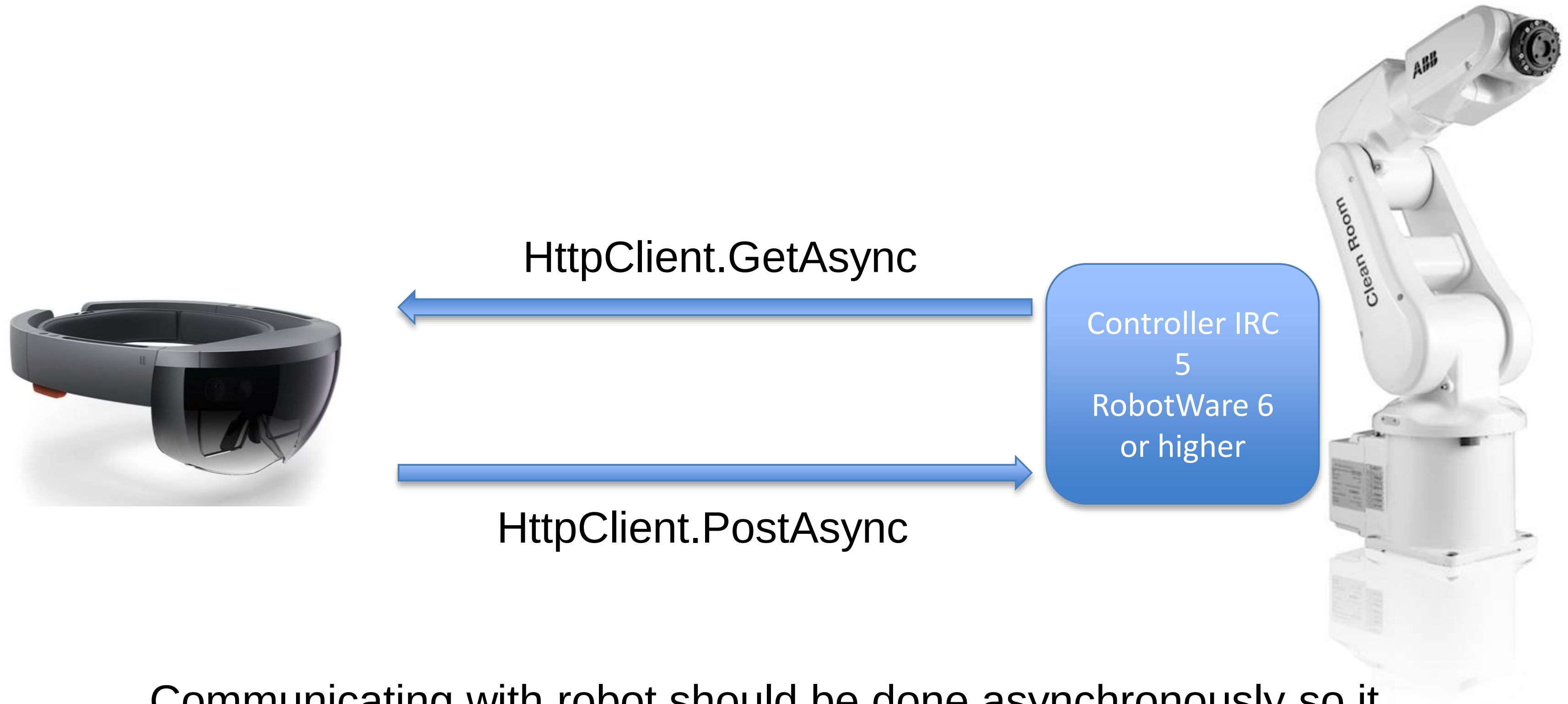
✓	System Number one	134.50.75.4	SystemNumber1
○	Queen System	134.50.75.4	ARPRimage
○	King System	192.168.10.11	ARPRimage

Start Scene

- Keyboard where the user can enter different information
- Target image name is optional as we have stopped using Vuforia



Communication



Communicating with robot should be done asynchronously so it does not create any lag or delay in updating each frame.

Voice commands

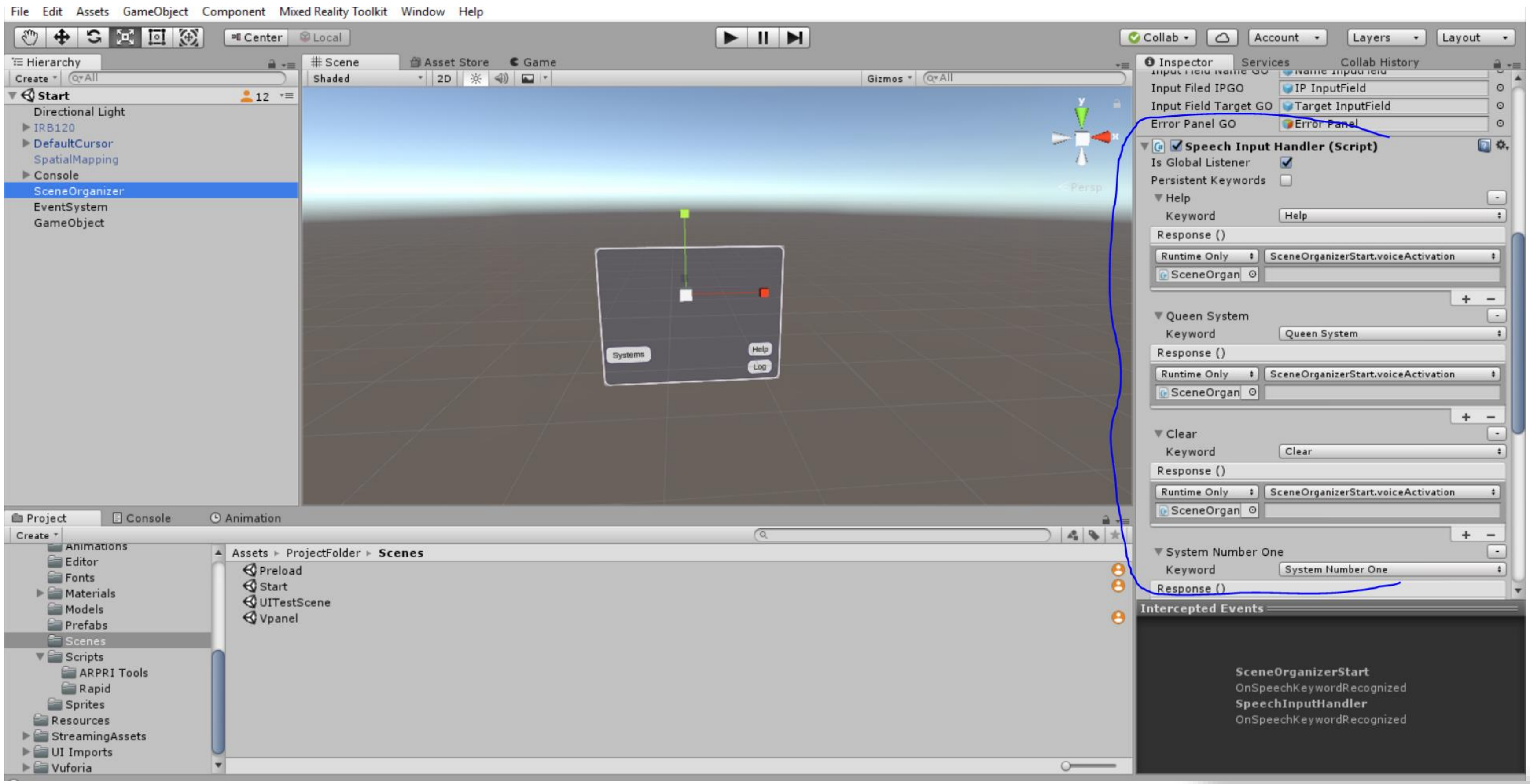
- System can be detected with voice command.
- Select some of the menu buttons with voice.
- Run and stop module from app through voice.

Method of Voice input

- Using Windows mixed reality toolkit for voice input.
  - Using speech input source and speech input handler.
- Speech convert into text and does the task assigned with the associated speech through coding.
- Robot web services used for running and stopping module.

Procedure of Voice Recognition

- A database of all robots with IP addresses and one specific name for each system.
- When we say any system name, it will search all database for finding the IP address and other specification of that robot



Hierarchy:
- Start
  - Directional Light
  - IRB120
  - DefaultCursor
  - SpatialMapping
  - Console
  - SceneOrganizer
  - EventSystem
  - GameObject

Project:
- Animations
- Editor
- Fonts
- Materials
- Models
- Prefabs
- Scenes
- Scripts
  - ARPRI Tools
  - Rapid
- Sprites
- Resources
- StreamingAssets
- UI Imports
- Vuforia

Assets ▸ ProjectFolder ▸ **Scenes**
- Preload
- Start
- UITestScene
- Vpanel

Inspector:

Input Filed IPGO	IP InputField
Input Field Target GO	Target InputField
Error Panel GO	Error Panel

Speech Input Handler (Script)

Is Global Listener	✓
Persistent Keywords	

Help
- Keyword: Help
- Response ()
- Runtime Only — SceneOrganizerStart.voiceActivation
- SceneOrgan

Queen System
- Keyword: Queen System
- Response ()
- Runtime Only — SceneOrganizerStart.voiceActivation
- SceneOrgan

Clear
- Keyword: Clear
- Response ()
- Runtime Only — SceneOrganizerStart.voiceActivation
- SceneOrgan

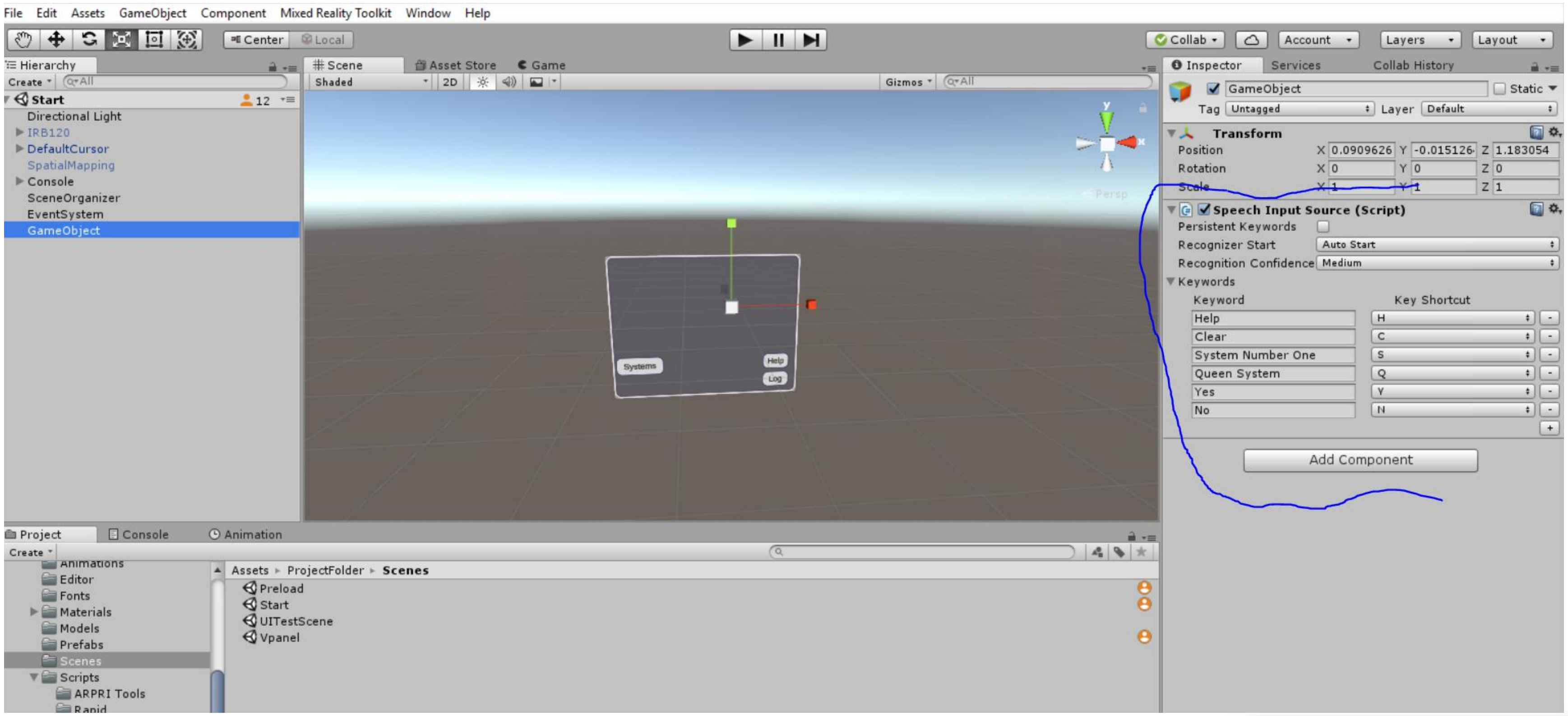
System Number One
- Keyword: System Number One
- Response ()

Intercepted Events

```
SceneOrganizerStart
OnSpeechKeywordRecognized
SpeechInputHandler
OnSpeechKeywordRecognized
```

Advantage of Voice Recognition

- Easier than gesture.
- User friendly.
- Don't need to go in front of robot.
- Detect from anywhere.



GameObject Static
Tag Untagged Layer Default

Transform

	X	Y	Z
Position	0.0909626	-0.015126	1.183054
Rotation	0	0	0
Scale	1	1	1

Speech Input Source (Script)

Persistent Keywords ☐
Recognizer Start: Auto Start
Recognition Confidence: Medium

Keywords

Keyword	Key Shortcut
Help	H
Clear	C
System Number One	S
Queen System	Q
Yes	Y
No	N

Module Running through Voice

- Run module from app through voice or button saying "Run"

Requirements:

1. Controller has to be in auto mode and motors have to be ON.
2. Module should be loaded in flex pendant.

Emergency Stop

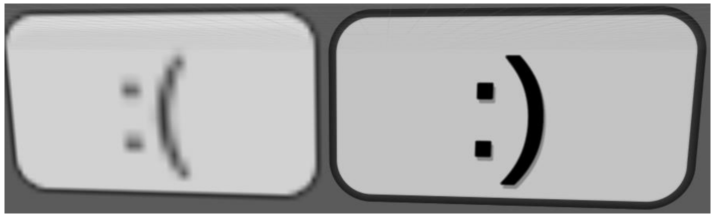
- In case of emergency, we can immediately stop executing module through voice command saying "STOP"

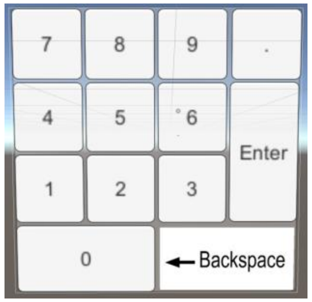
Benefits:

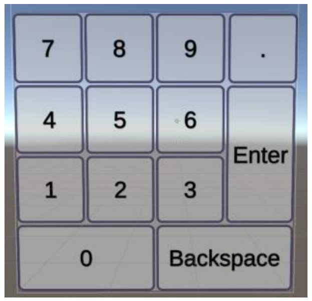
1. Fast execution
2. Easy to send command

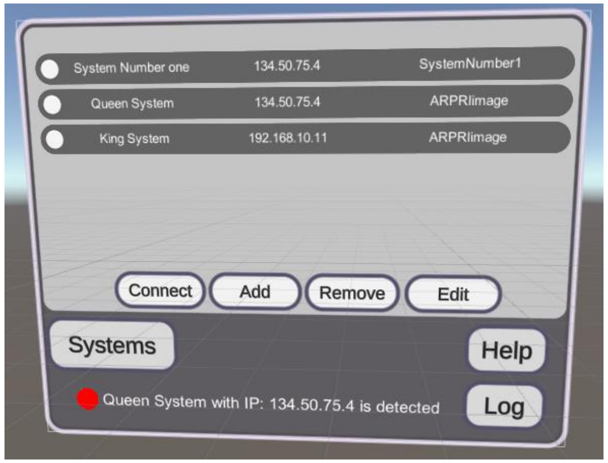
Front End

- Quality of user interface
- Look
  - TextMeshPro, ProceduralUIImage, GIMP
  - Scalability, flexibility
  - High resolution prototyping







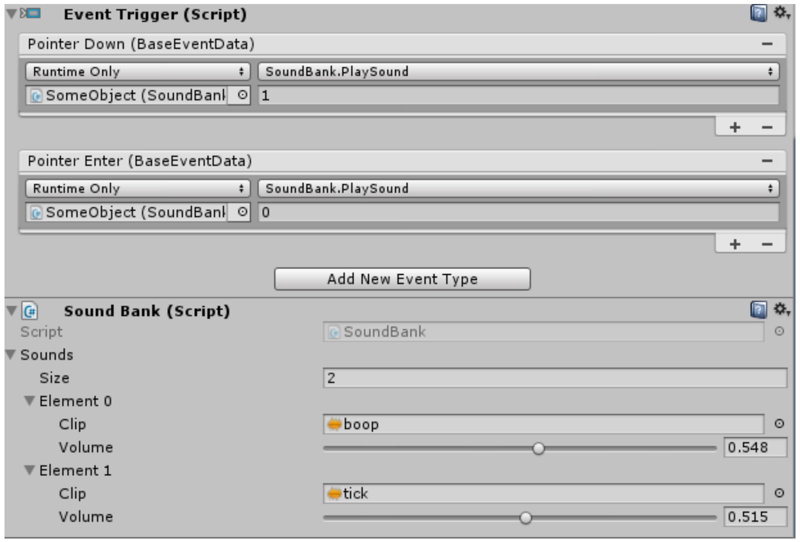


System Number one	134.50.75.4	SystemNumber1
Queen System	134.50.75.4	ARPRIimage
King System	192.168.10.11	ARPRIimage

Queen System with IP: 134.50.75.4 is detected

More Front End

- Sound
  - It's important!
- Feel
  - Action -> Feedback
  - Scripting vs. Animator
- Next steps…



Event Trigger (Script)

Pointer Down (BaseEventData)

Runtime Only | SoundBank.PlaySound

SomeObject (SoundBank | 1

Pointer Enter (BaseEventData)

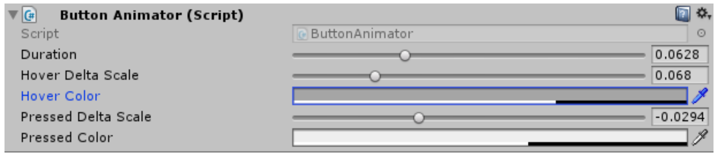
Runtime Only | SoundBank.PlaySound

SomeObject (SoundBank | 0

Add New Event Type

Sound Bank (Script)

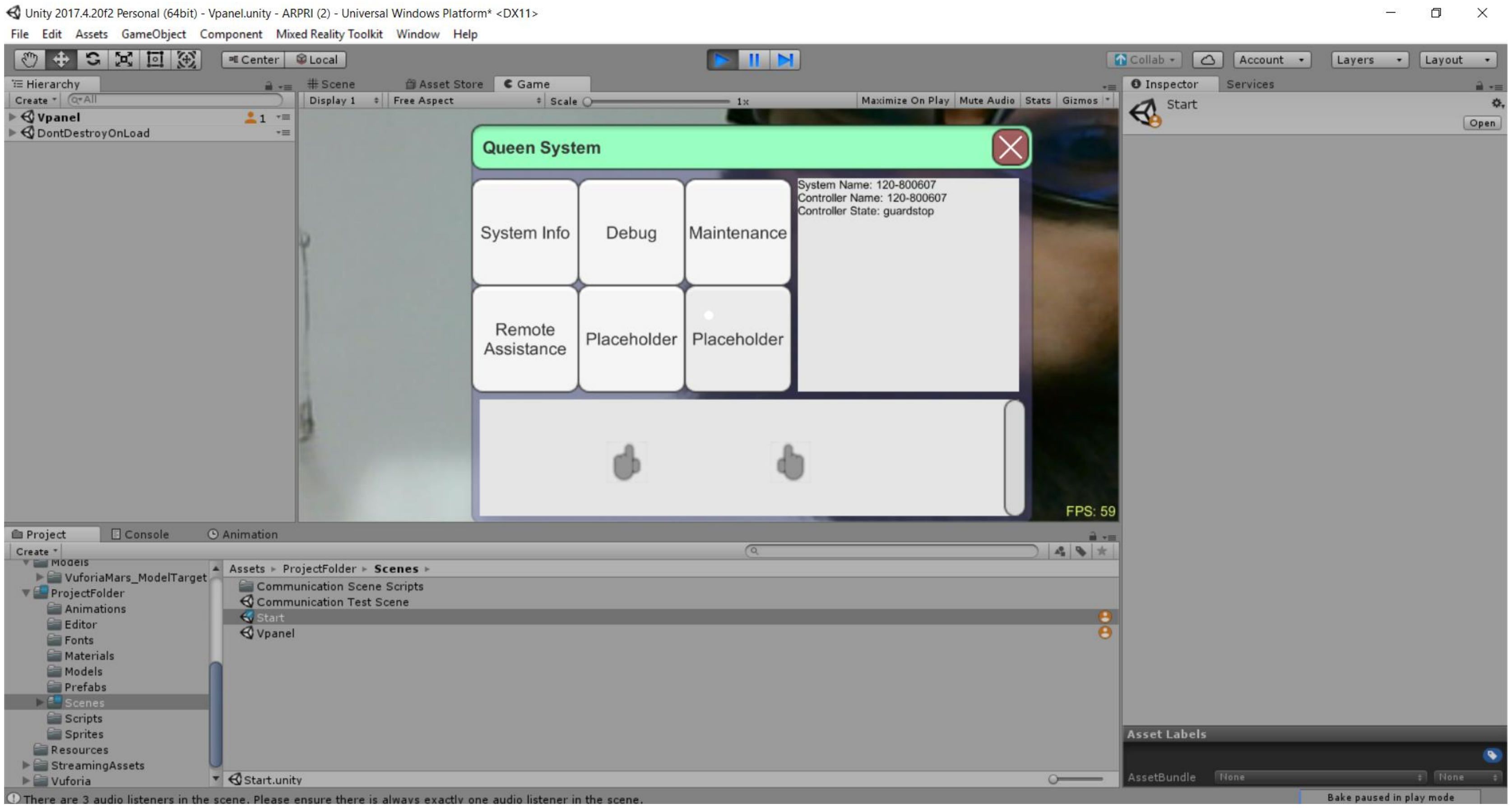
Script	SoundBank
Sounds	
Size	2
Element 0	
Clip	boop
Volume	0.548
Element 1	
Clip	tick
Volume	0.515



Button Animator (Script)

Script	ButtonAnimator
Duration	0.0628
Hover Delta Scale	0.068
Hover Color	
Pressed Delta Scale	-0.0294
Pressed Color	

Vpanel Scene

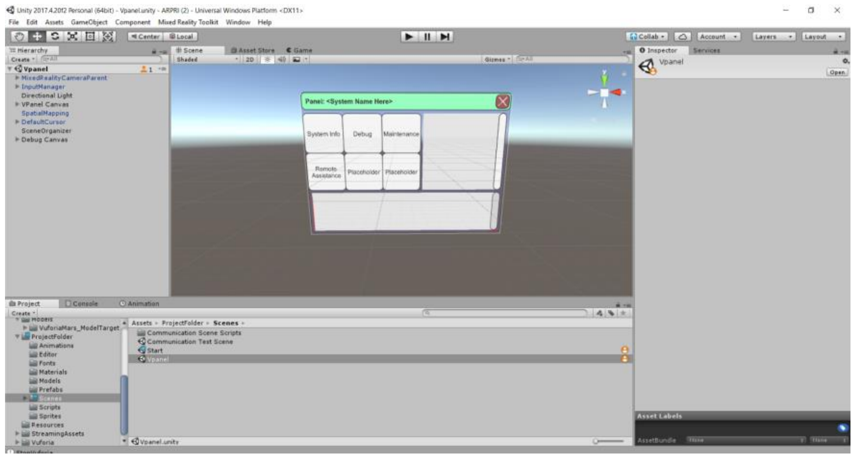


System Name: 120-800607
Controller Name: 120-800607
Controller State: guardstop

There are 3 audio listeners in the scene. Please ensure there is always exactly one audio listener in the scene.

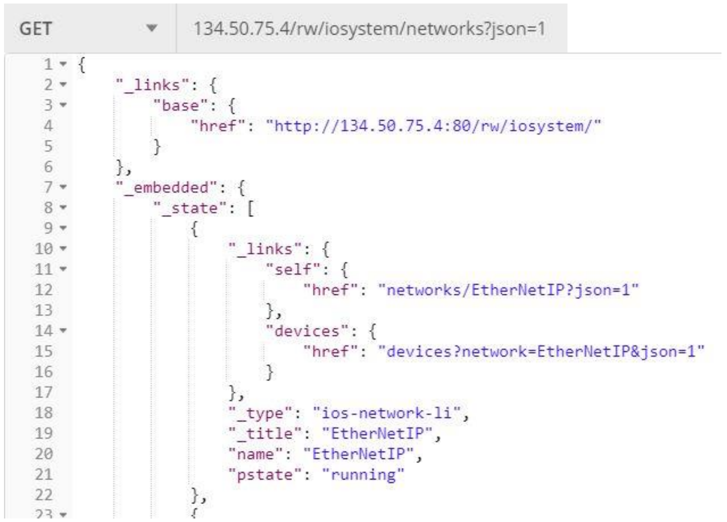
Vpanel Scene

- This scene is used to interact with the target system.
- The panel displays information about the connected system.
- The panel contains interaction buttons:
  - System info
  - Debug
  - Maintenance
  - Remote assistance
  - Placeholders



Interaction with Robot

- VPanel contains information of the system that the app is connected to.
- Information is received via HTTP “Get” requests to the system’s IP address.
- Specific values are then parsed out of received XML or JSON files.



GET 134.50.75.4/rw/iosystem/networks?json=1

```
{
    "_links": {
        "base": {
            "href": "http://134.50.75.4:80/rw/iosystem/"
        }
    },
    "_embedded": {
        "_state": [
            {
                "_links": {
                    "self": {
                        "href": "networks/EtherNetIP?json=1"
                    },
                    "devices": {
                        "href": "devices?network=EtherNetIP&json=1"
                    }
                },
                "_type": "ios-network-li",
                "_title": "EtherNetIP",
                "name": "EtherNetIP",
                "pstate": "running"
            },
            {
```

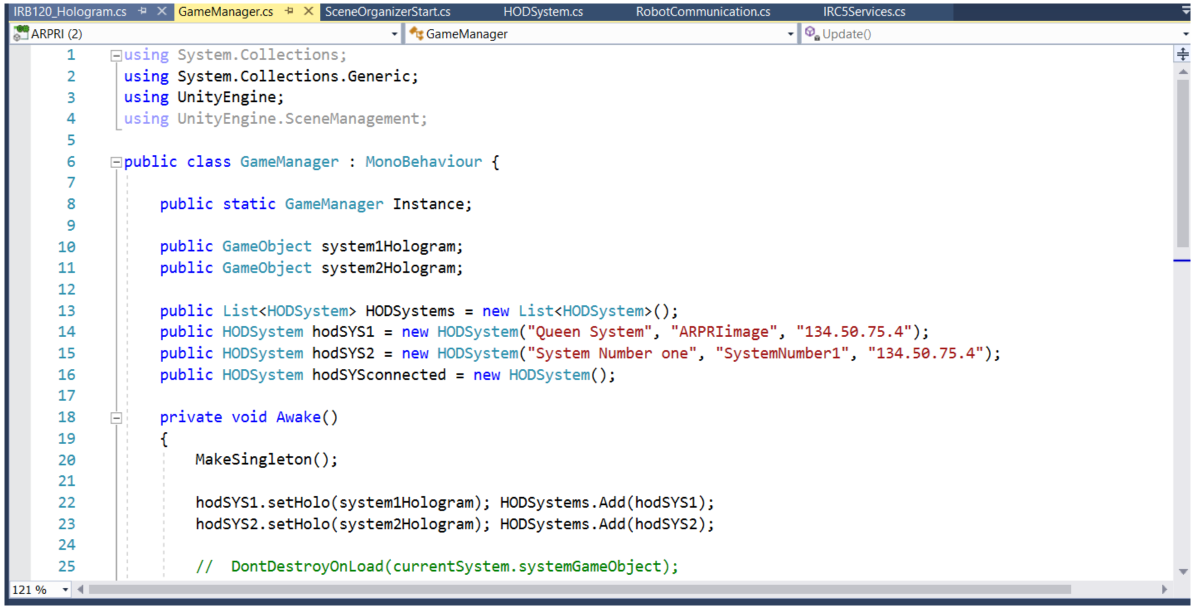
- Values here are sent to the active system object.

Buttons

- Add buttons and potential content on buttons (?)

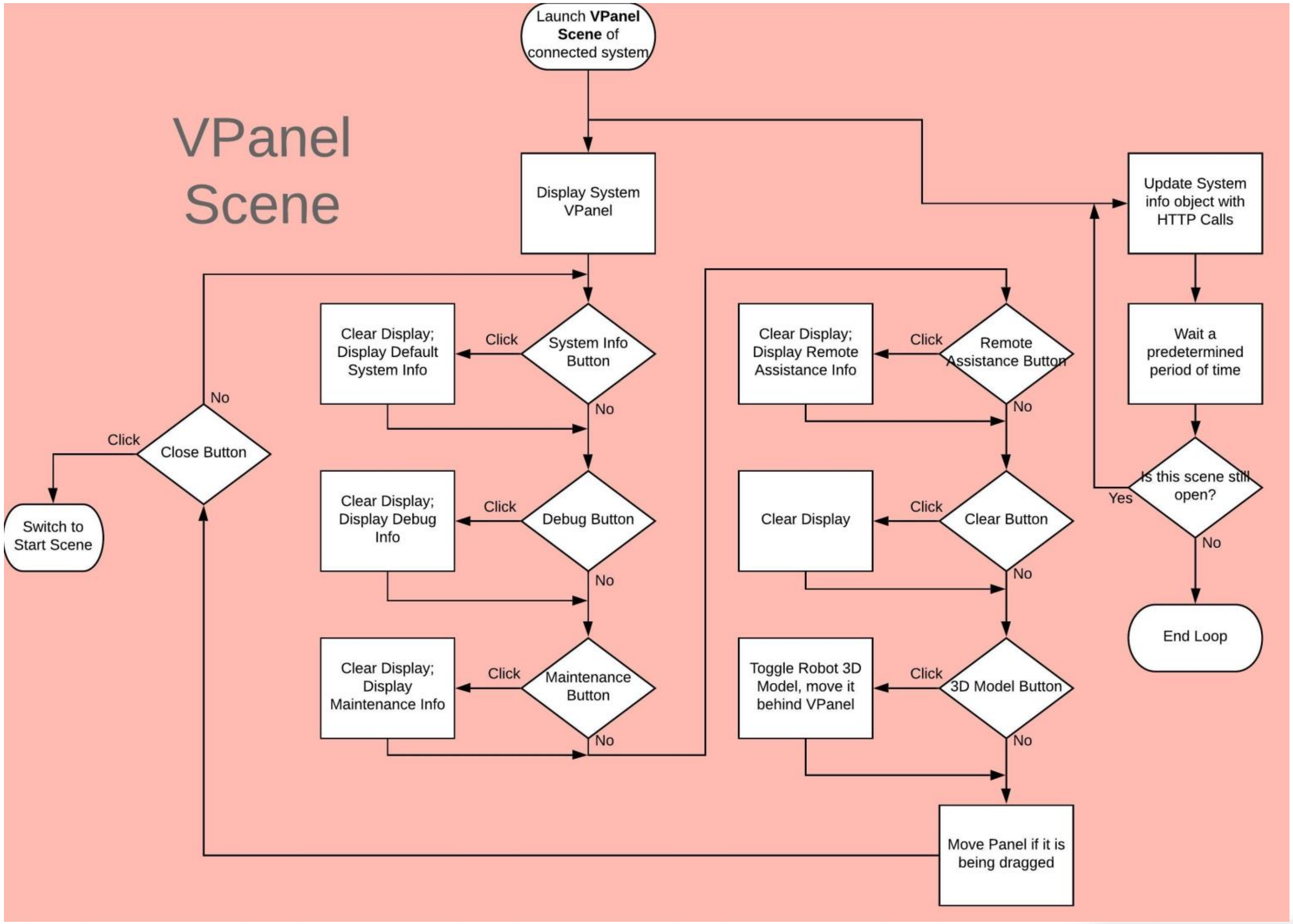
Vpanel: System database

- List in class GameManager
- More systems can be added
- Used by detection systems.



```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.SceneManagement;

public class GameManager : MonoBehaviour {

    public static GameManager Instance;

    public GameObject system1Hologram;
    public GameObject system2Hologram;

    public List<HODSystem> HODSystems = new List<HODSystem>();
    public HODSystem hodSYS1 = new HODSystem("Queen System", "ARPRIimage", "134.50.75.4");
    public HODSystem hodSYS2 = new HODSystem("System Number one", "SystemNumber1", "134.50.75.4");
    public HODSystem hodSYSconnected = new HODSystem();

    private void Awake()
    {
        MakeSingleton();

        hodSYS1.setHolo(system1Hologram); HODSystems.Add(hodSYS1);
        hodSYS2.setHolo(system2Hologram); HODSystems.Add(hodSYS2);

        //  DontDestroyOnLoad(currentSystem.systemGameObject);
```

Game structure


VPanel Scene
Launch VPanel Scene of connected system
Display System VPanel
Update System info object with HTTP Calls
Wait a predetermined period of time
Is this scene still open?
Yes
No
End Loop
System Info Button
Click
Clear Display; Display Default System Info
No
Debug Button
Click
Clear Display; Display Debug Info
No
Maintenance Button
Click
Clear Display; Display Maintenance Info
No
Remote Assistance Button
Click
Clear Display; Display Remote Assistance Info
No
Clear Button
Click
Clear Display
No
3D Model Button
Click
Toggle Robot 3D Model, move it behind VPanel
No
Move Panel if it is being dragged
Close Button
Click
Switch to Start Scene
No

Next capabilities

Completion Requirements

- Grant requirements: HoD needs to purchase Hololens???
- HoD usage potential (what are HoD's plans?)
- Final visit in December and transfer of product.
- Final project report to State.
- Continuation of project.

Questions?