Preparing the infrastructure

This section contains all the information about the server and client machine specifications and explanations as to why.

Server Spec

The server is a virtual machine in the secure defense cloud of Microsoft Azure.

Operating System (OS)	Windows Server 2019
GPU	NVIDIA P100
Driver Version	451.48
CPU	Intel Xeon E5-2690 v9
Memory	112 GiB
Location	Europe West (Amsterdam)
Azure VM Series	NC6s v2

Why Windows Server 2019: For some reason there is an issue with Windows 10, where performance degrades, even though the driver version and everything else is the same. I am not sure why this occurs, but as Windows Server is able to run steam and games we are just going to use that.

Why this GPU/VM Series: The NVIDIA CloudXR software requires a GPU of the Pascal or later Architecture. The P100 was the only card that I could find that fulfilled this requirement. The configuration also has the minimum requirements in terms of GPU, CPU and Memory power.

Location: Deploy the VM as close to the client/target location as possible to minimize Latency. The servers of the Europe West group are stationed near Amsterdam.

IP Address: Make sure the IP address is static, so that you do not have to worry about it changing.

Client Spec

Operating System (OS)	Windows 10
GPU	Any NVIDIA Graphics card with Pascal or later architecture (I used GeForce RTX 2080 Ti)
Driver Version	432.00
CPU	Intel I7-7820X or similar
Memory	>= 64 GiB (recommended)
VR Headset	HTC Vive, HTC Vive Pro or Valve Index

The client machine is the PC the VR headset is connected to. It will also have the client CloudXR software installed, but more to that in the next section. The most imporant thing again is to have a

NVIDIA GPU of **Pascal or later architecture.** Apart from that the computer has to have enough power to comfortably run VR games, so make sure to install a good CPU, enough RAM and if possible a fast SSD.

Network Spec

According to the offical documentation the available network bandwidth on both machines should be minumum 50 Mbps, preferably 60 Mbps.

Installing the software

This section details what software has to be installed on each machine.

Server Software

CloudXR Server: Install the CloudXR software and select the server part + redistributables when prompted. Also install the following requirement: Microsoft June 2010 DirectX SDK: https://www.microsoft.com/en-us/download/details.aspx?id=8109

Steam + SteamVR: Install Steam and then SteamVR. Make sure to have the latest patch.

The CloudXR software ties into SteamVR to simulate a connected headset for the server machine. For the games started on the server it is as if the VR headset was connected to the server physically. Also download the game/application you want to use. Any OpenVR application is possible.

GPU Driver: This one is a bit tricky. The P100 GPU is not a gaming card and as such only comes with compute drivers. This is what I believe to have caused the performance issues. The solution was to install NVIDIA's GRID software, which has a compatible vGPU driver. First update the GPU driver to the latest version. Then download the following vGPU software (accessed 19.10.2020):

Platform	Microsoft Windows Hyper-V
Platform Version	2019
Product Version	8.5
Description	NVIDIA vGPU for Windows

Install the software on the server, this also requires you to install a licensing server. All the relevant documentation is available on the website. Jeroen has the login data for the website.

VNC Server: The official guide explicitly advises against using Microsoft Remote Desktop, as it is known to lead to crashes. Instead install a VNC server on the server machine and configure it to start on boot. I used TightVNC as my VNC server.

Client Software

CloudXR Client: Install the CloudXR software and select the client part + redistributables. Also install the DirectX SDK from above.

Steam + SteamVR: As before Steam and SteamVR has to be installed. Make sure to have updated to the latest SteamVR version.

VNC Client: Install a VNC client to connect to the server. I used TightVNC's viewer software.

Using the prototype

After installing all the required software all that is left is to establish a connection, select an application and start playing. The steps to establish a connection are as follows:

1. Start the server VM and connect to it via VNC once it booted up.
2. Start SteamVR on the server.
3. Start the client machine and start SteamVR. (Make sure the headset is connected)
4. Open a command window and navigate to the install directory of your CloudXR installation. Normally that is "C:/Program Files/NVIDIA Corporation/CloudXR/Client/CloudXRClient.exe"
5. To connect to the server execute the following command: "CloudXRClient.exe -s **Your server IP** "
6. The software should then connect to the server. Once the connection is established you should see a VR headset symbol in the SteamVR window of the server machine.
7. Start the OpenVR application of your choice on the server and start playing.