COLLABORATIVE WORK WITH AUGMENTED AND VIRTUAL REALITY - A SECURE NETWORK CONNECTION IN UNITY

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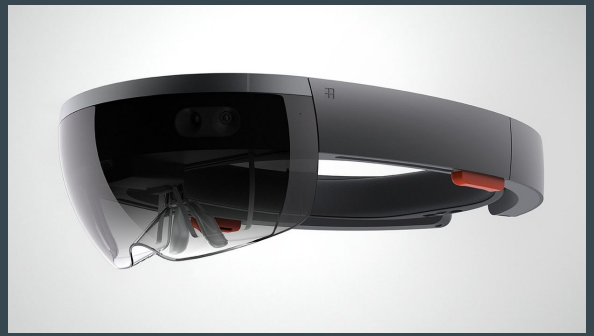
Developing a system to host collaborative remote “visits” using augmented reality and virtual reality

Companies may send sensitive data over this connection

A secure connection is required!



Microsoft Hololens

Oculus Rift

UNITY

2D/3D cross platform game engine
C++, C#
Focused on easy development

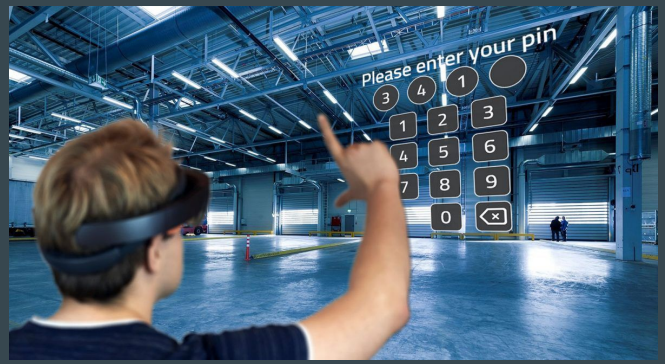
Latency > Security

UNET is deprecated. Successor not released yet

Mirror: Open source, Third party multiplayer library

THE PLAN

- Authenticate the user using AR/VR (Pin or pattern)
- Use TLS to establish a secure websocket connection between a server and a client in Unity
- Create a secure and “playable” client server setup



RESEARCH QUESTION

What is the performance of a TLS websocket connection in Unity compared to a standard insecure connection?

METHODOLOGY

Step 1: Implement a test scenario that uses a websocket over TLS

Step 2: Create my own certificate authority (CA) and make it trusted by the server and the remote client

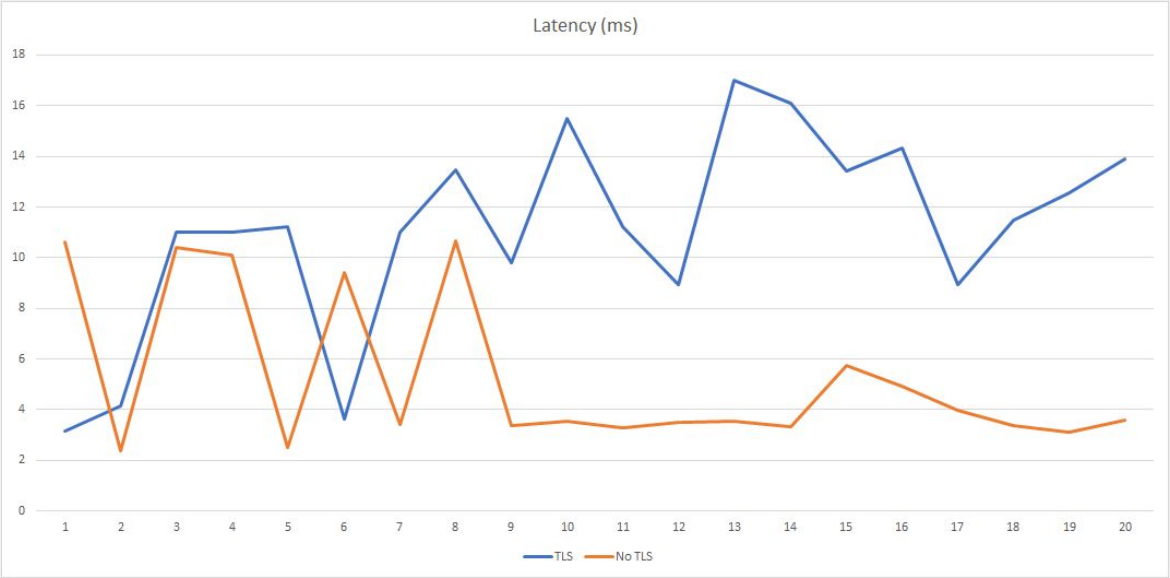
Step 3: Take measurements of the latency in the test scenario with TLS

Step 4: Take measurements of the latency in the test scenario without TLS

Step 5: Compile results and draw conclusions

RESULT

	Min(ms)	Max(ms)	Average(ms)
TLS	3.14	16.9	11.09
No TLS	2.49	10.65	5.24



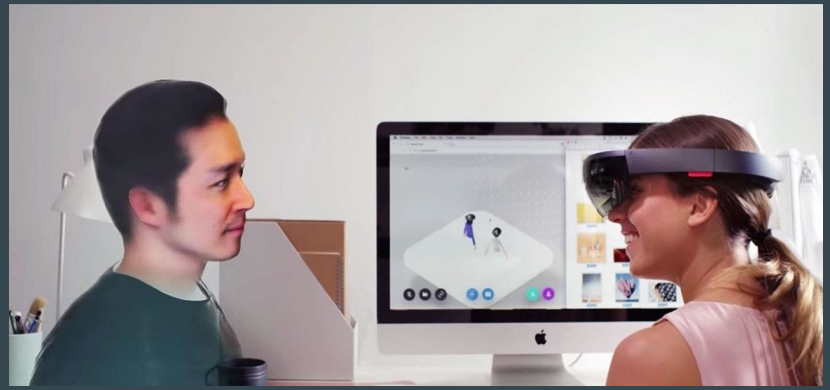
CONCLUSION

Is this method suitable for secure gaming connections? -> Yes!

Secure: 1000ms / 11.09ms = 90 updates per second

Insecure: 100ms / 5.24ms = 190 updates per second

Is this the only implementation possible? -> No



FUTURE WORK

- Test the scenario on AR/VR glasses
  - They have less processing power then my testing machines
  - Modern CPU'S are optimized for AES

- Implement different cipher suites
  - I used: TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA

- Unet successor may be a good alternative in the future

- Implement an authentication system
  - A user should proof it is him before being able to establish a connection
  - There needs to be a way to login (e.g. PIN or Pattern)