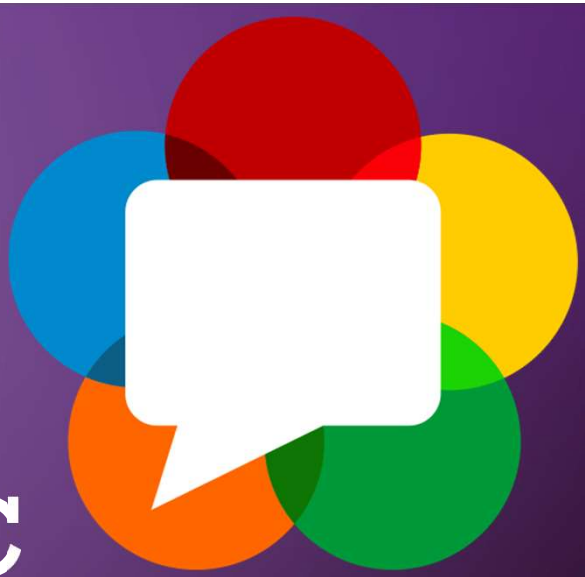

SECURING WEBRTC

LED BY: **DENNIS MCMEEKAN**

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ABSTRACT

- Real-Time Video Communication
- No Added Plugins or Installs
- Relatively New
- Security Concerns

INTRODUCTION

- Immense Growth of Media Communication
- Security Vulnerabilities
  - Confidentiality Violations
  - IP Leaks
- Two Prototypes
  - Unsecure
  - Secure

BACKGROUND

Evolving Technology Culture	• Powerful Real-Time Communication
Motivation	• New, Exciting, and Lasting Impact
Knowledge Development	• Use Teachers as Growth, Create New Horizons
Confinement Problem	• Limitations of Executions outside Base Program

PROBLEM STATEMENT

- "WebRTC has the foundation to allow for a secure and simple connection to be made by two users without installing native apps or plugins."

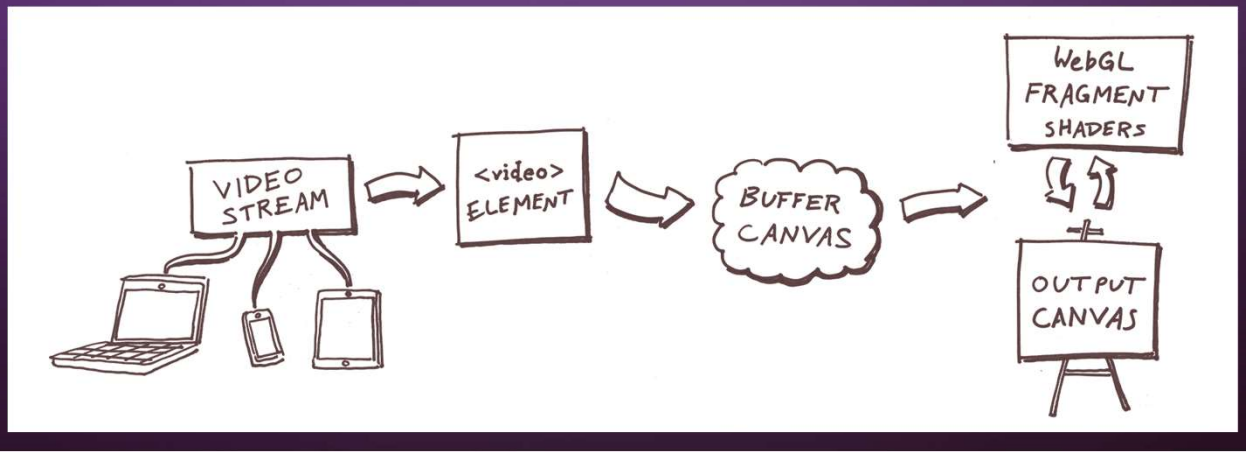
- Security Vulnerabilities do Exist

CONFIDENTIALITY VIOLATIONS

- Peer-To-Peer Connection -> Real-Time Data
- Altering WebRTC API
- Great for Development, Concerning with Hackers/Exploits

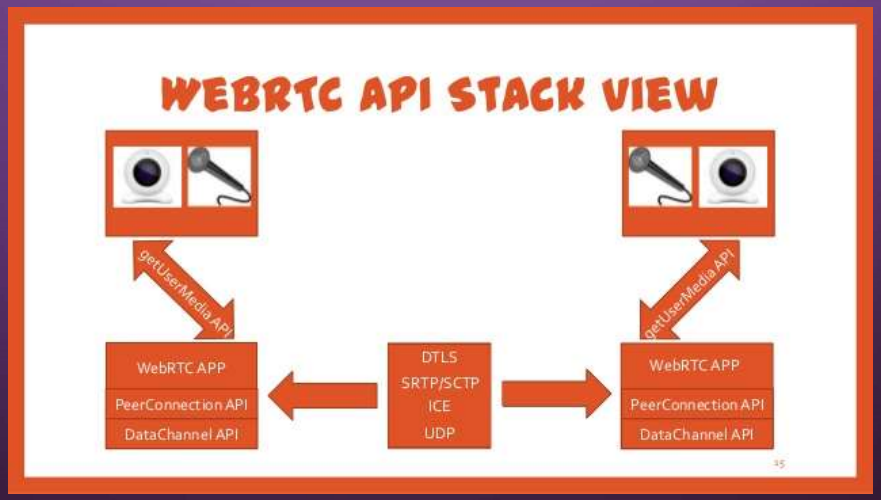
COVERT CHANNELS

- via Image Filtering
- Local -> Remote
  - Local -> Canvas -> Remote
- Delay Implemented Using Canvas Element



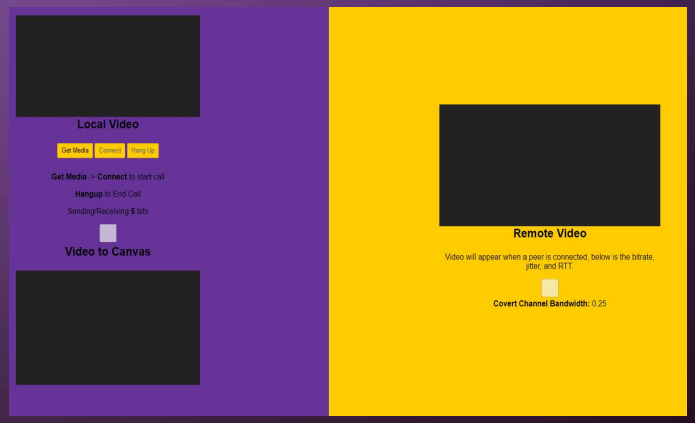
WEBRTC API

- Detailed & Resourceful
- Research -> Examples -> Prototype



UNSECURE PROTOTYPE

- Covert Channel -> Send & Receive a Bit
- Implement Delay, Sense the Delay, Receive Bit
  - Error Rate
  - Covert Channel Bandwidth
  - T or Input Rate



UNSECURE PROTOTYPE - DEMO

RESULTS (UNSECURE) - BASELINE

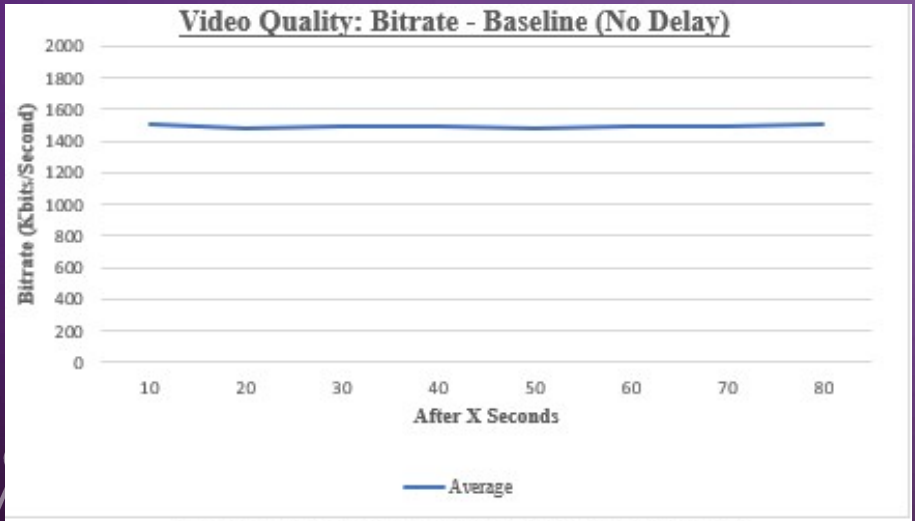


Figure 4.1 Video Quality: Bitrate – Baseline (No Delay)

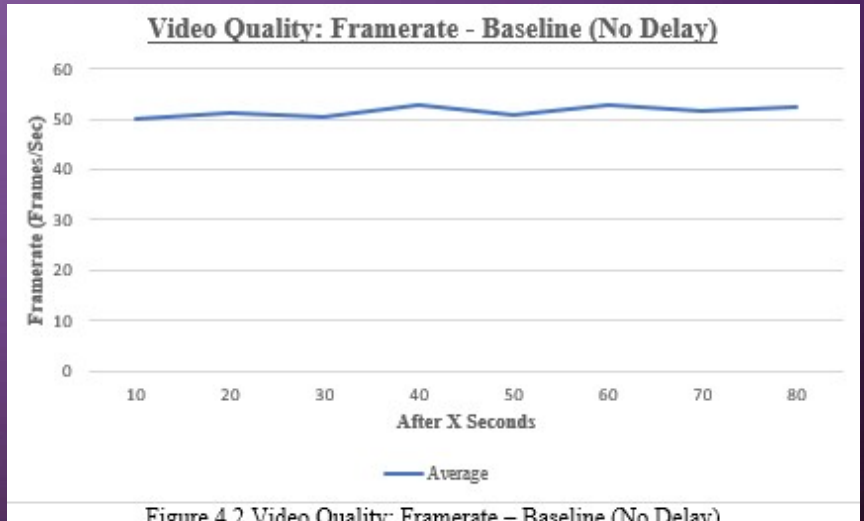


Figure 4.2 Video Quality: Framerate – Baseline (No Delay)

RESULTS (UNSECURE) – DELAY IMPLEMENTATION

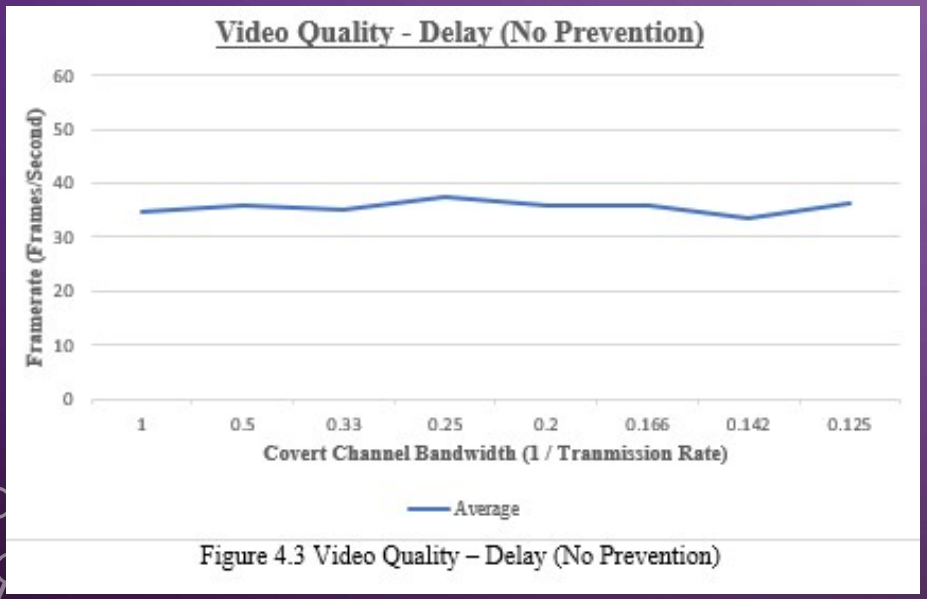


Figure 4.3 Video Quality – Delay (No Prevention)

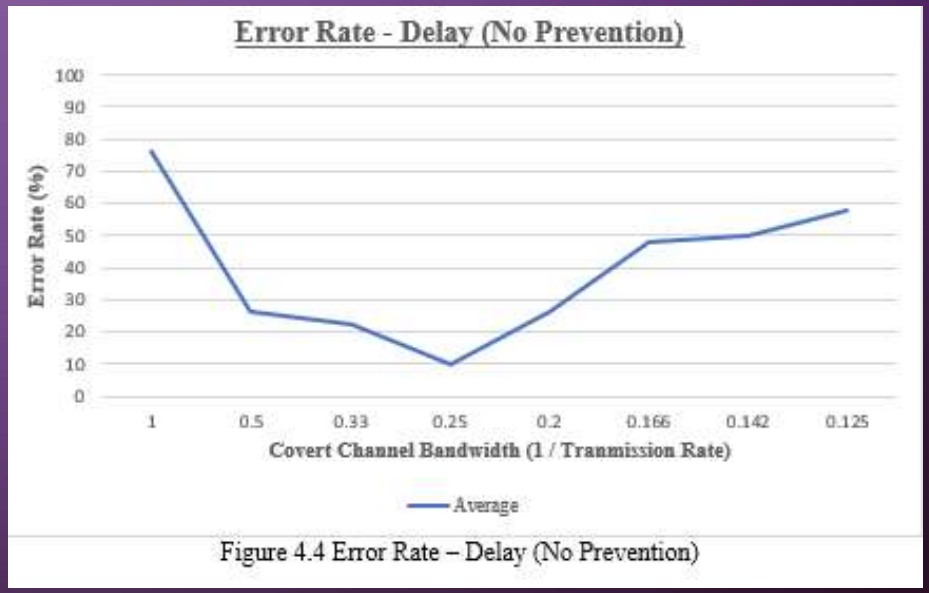


Figure 4.4 Error Rate – Delay (No Prevention)

SECURE PROTOTYPE

- Mitigate Covert Channels
  - Constant Delay
  - Random Delay
- Control by Admin
- Performance Concerns?
- Increase in Error Rate?

SECURE PROTOTYPE - DEMO

RESULTS (SECURE) – CONSTANT DELAY

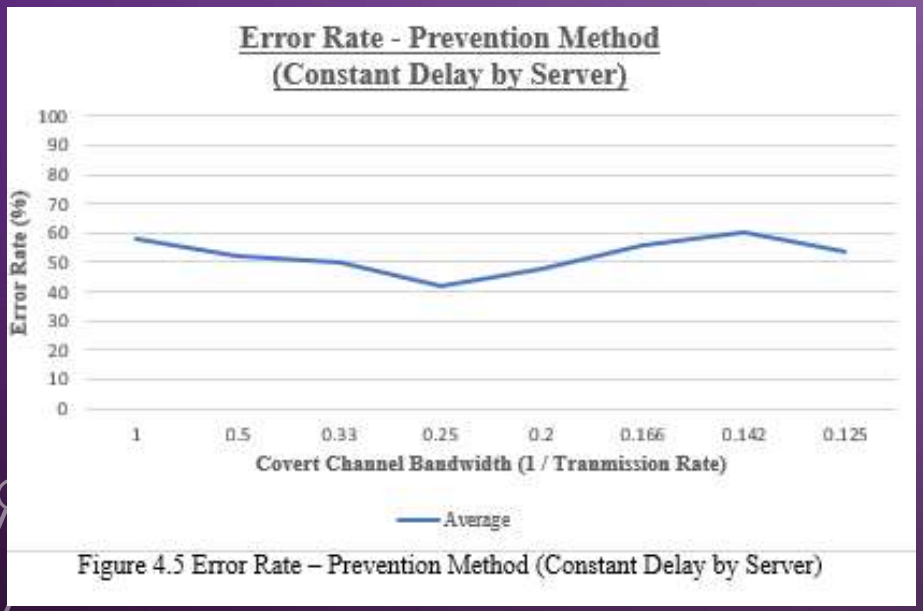


Figure 4.5 Error Rate – Prevention Method (Constant Delay by Server)

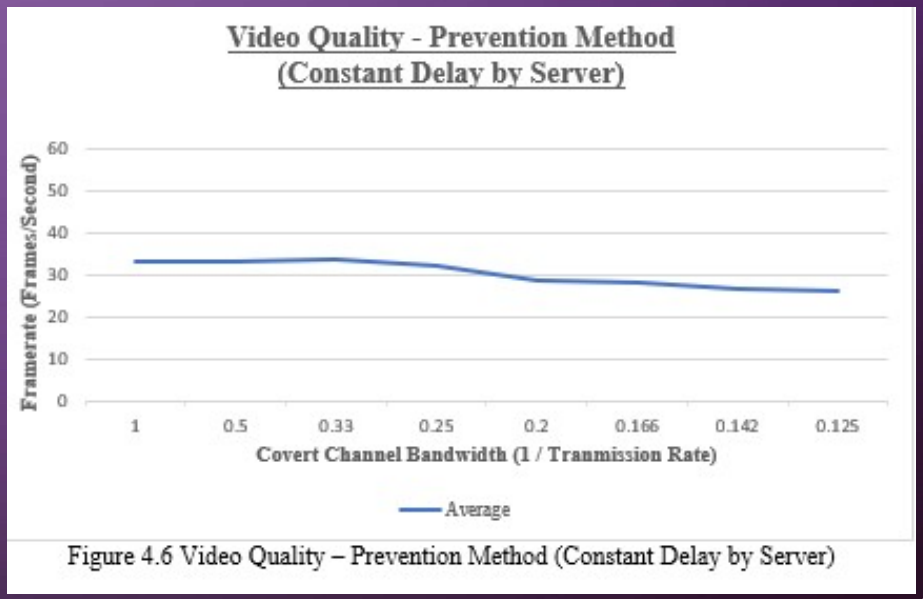


Figure 4.6 Video Quality – Prevention Method (Constant Delay by Server)

RESULTS (SECURE) – RANDOM DELAY

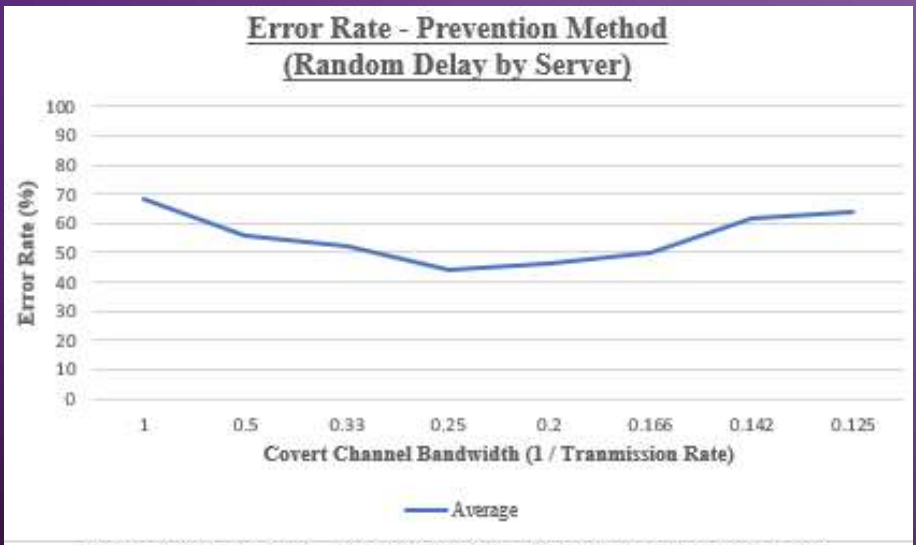


Figure 4.7 Error Rate – Prevention Method (Random Delay by Server)

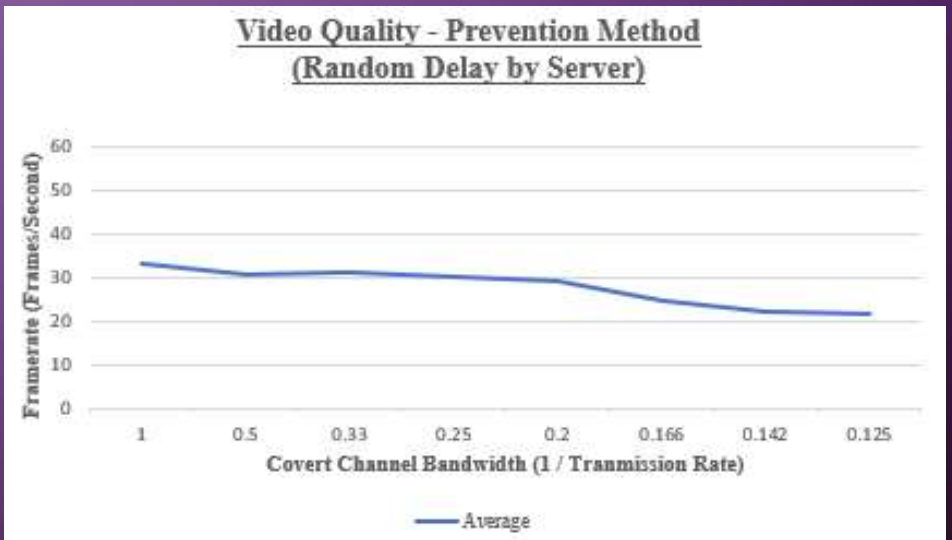


Figure 4.8 Video Quality – Prevention Method (Random Delay by Server)

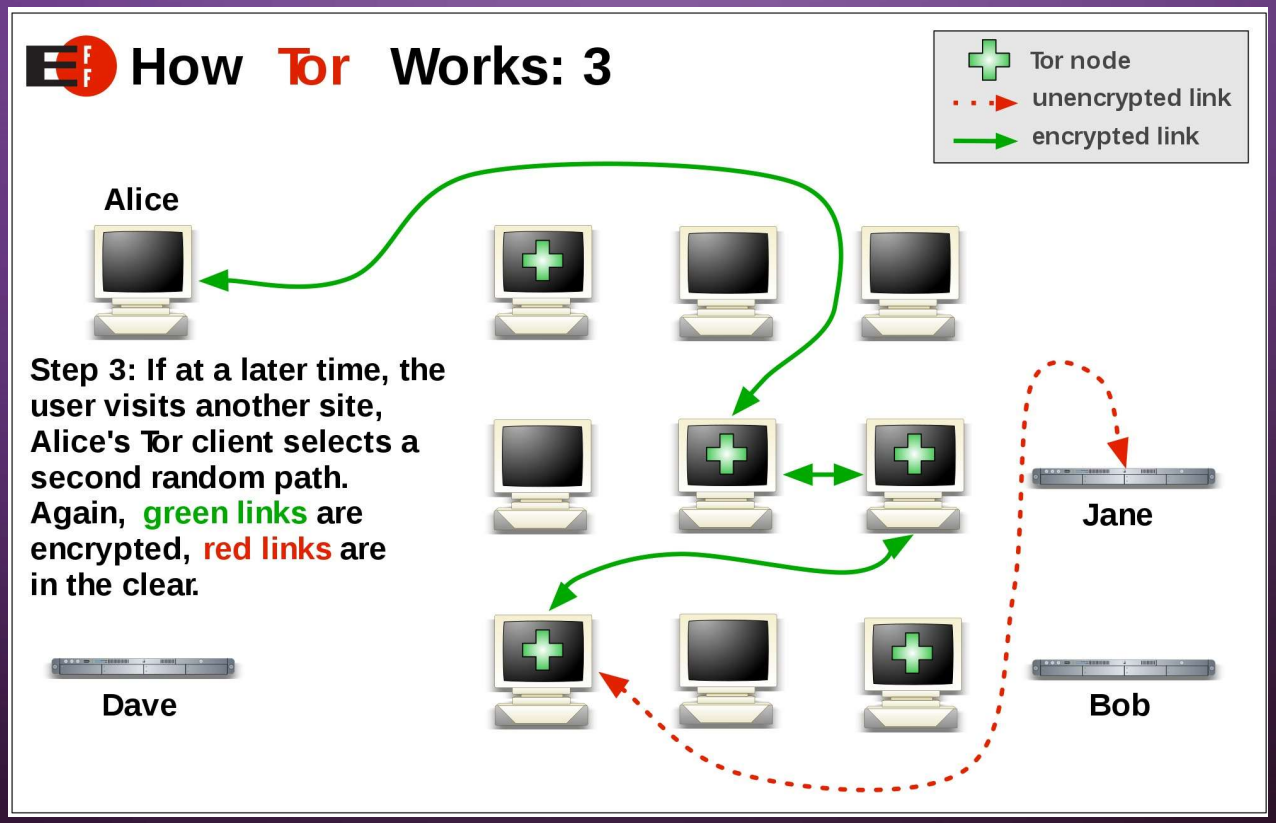
SECURE PROTOTYPE

- Expand Unsecure, Mitigate Covert Channels with Delays
- Constant Delay
- Random Delay

DISTRIBUTED HASH TABLE

- Mitigating IP Leaks
  - Current: STUN/TURN Protocol for Server Implementation
  - New: Distributed Hash Table Server
    - Seen with TOR

DHT IMPLEMENTATION

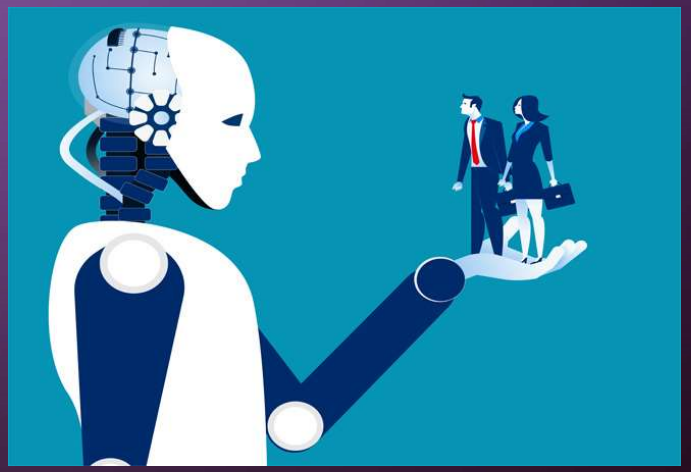


CONCLUSION

- WebRTC is susceptible to Covert Channels
  - Image Filtering allows Fluctuating Bitrates
    - Bit can be sent, and received
  - Mitigation Method of Delay Mechanisms
    - Constant
    - Random
- WebRTC is susceptible to IP Leaks
  - Distributed Hash Table Implementation

FUTURE WORK

- Network Concerns (Two Separated Clients)
- Audio Delay Matched with Video Delay
- Prototype Implementation of DHT
  - Development, Testing, & Analysis



Questions?

IMAGE SOURCES:

- WebRTC Transparent Logo: https://www.pnglib.com/wp-content/uploads/2020/01/webrtc-logo_5e2e9f5f06511.png
- WebRTC Overview: https://fameglob.com/wp-content/uploads/2017/08/web_rtc_wht_we_do_graphic.jpg
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- Image Filtering: https://sudo.isi.co/webrtc-real-time-image-filtering/flow-6807f3324c.png
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- Lock: https://img.pngio.com/lock-icon-this-is-a-graphic-representation-of-a-pad-lock-the-kind-of-png-50-px-lock-and-key-png-free-1600_1600.png
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