PION

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WHAT IS WEBRTC?

1

Browser APIs

E2E Secure Connection between Peers

Multiple Audio/Video Tracks

Binary Data

- Can be lossy
- Can be unordered
- Multiple distinct DataChannels

2

What we need to solve

Connectivity
- Multiple Possible Routes
  - Not in the same network!
  - UDP?

Security
- E2E Secure

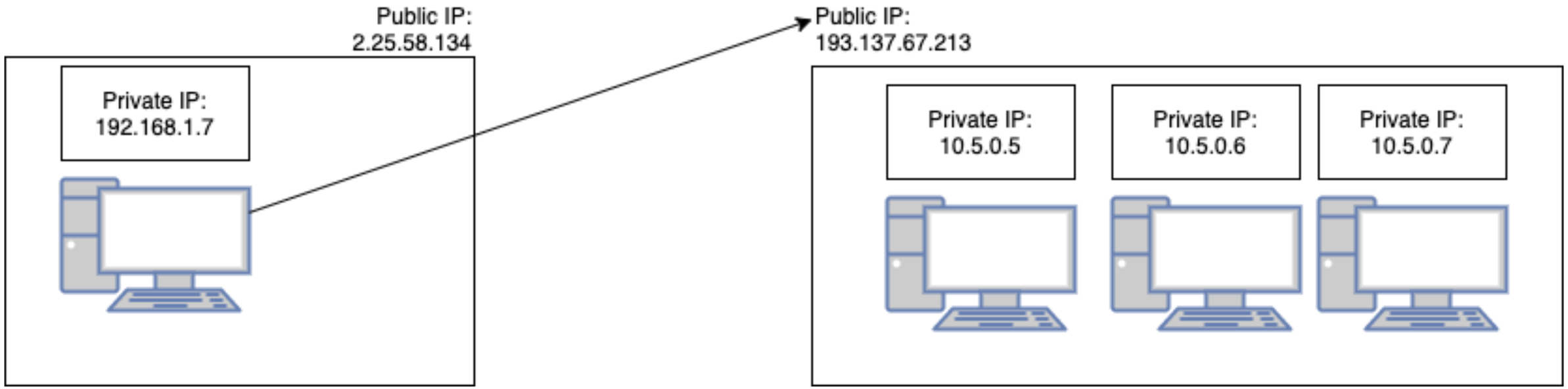
Latency
- 400 milliseconds max
- Unreliable Transport (UDP)

Ease of Use

WHAT DOES IT SOLVE

3

Problem: Connect two users with no Public IP



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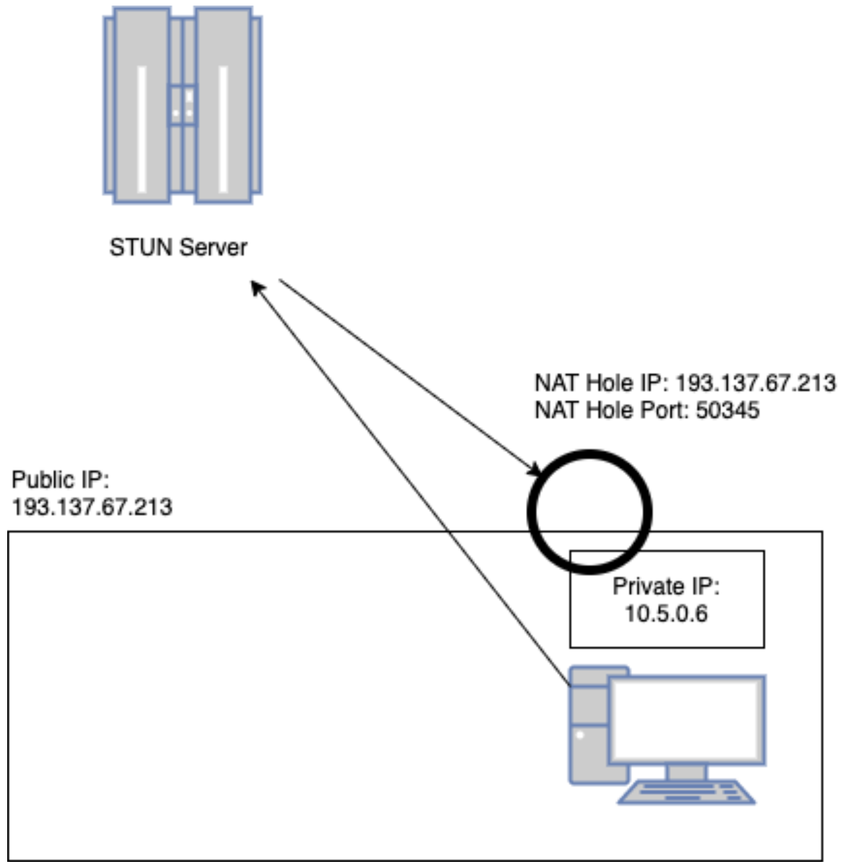
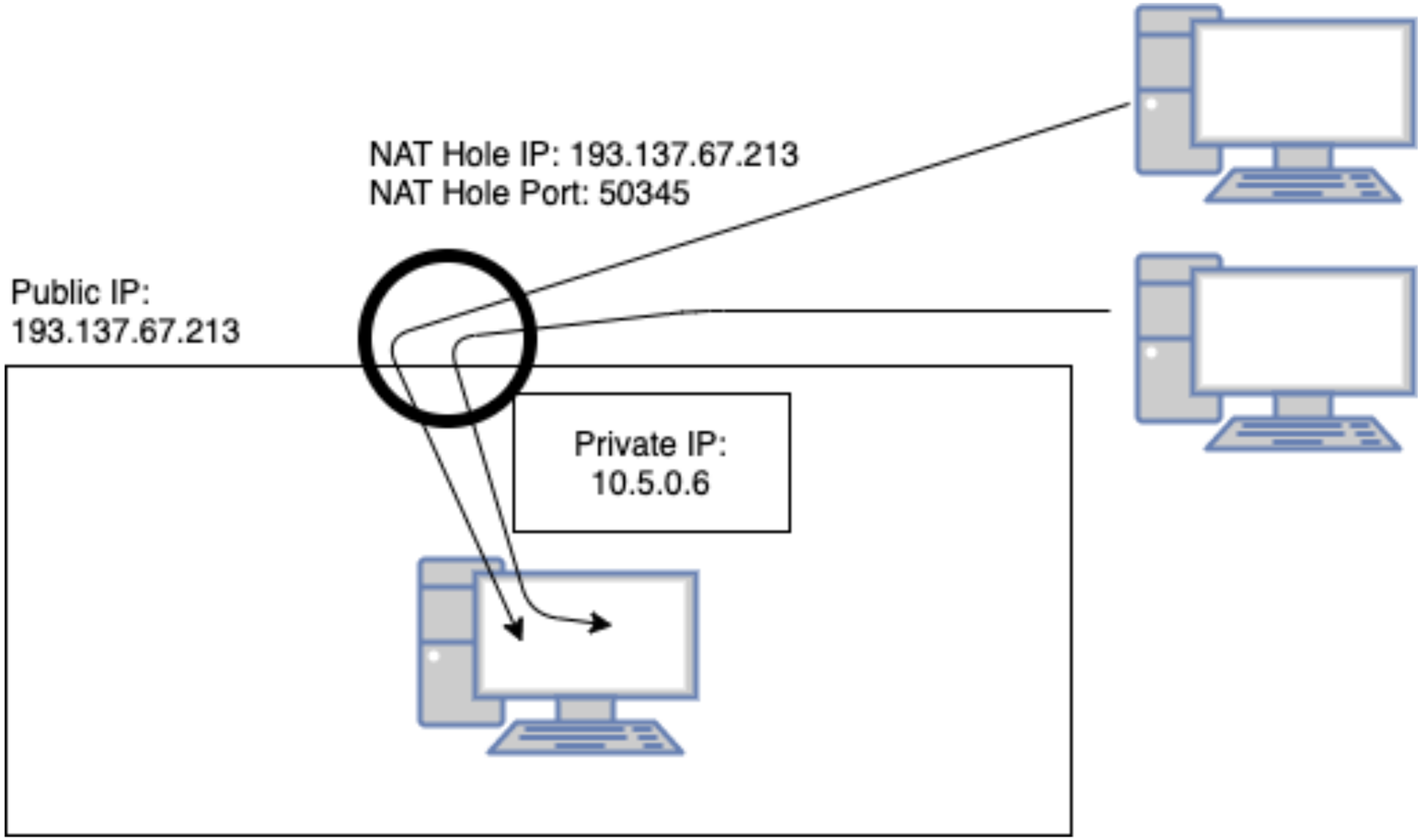
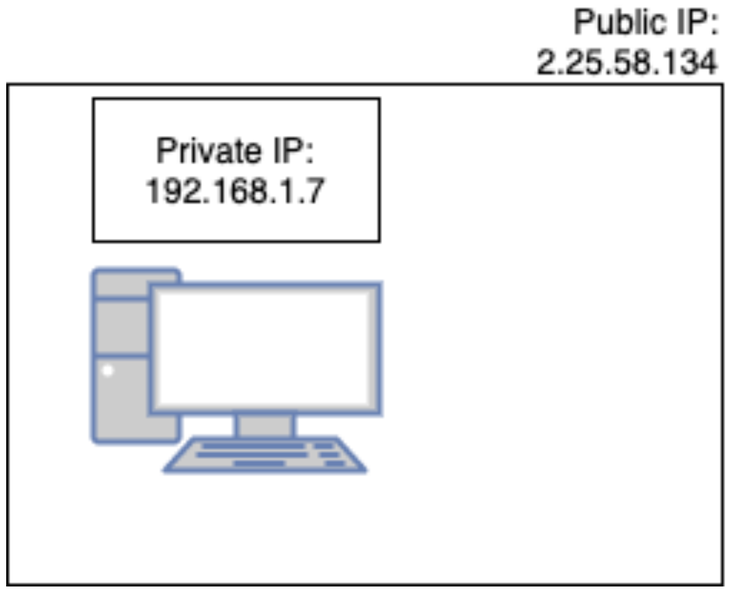
Solution: NAT Traversal

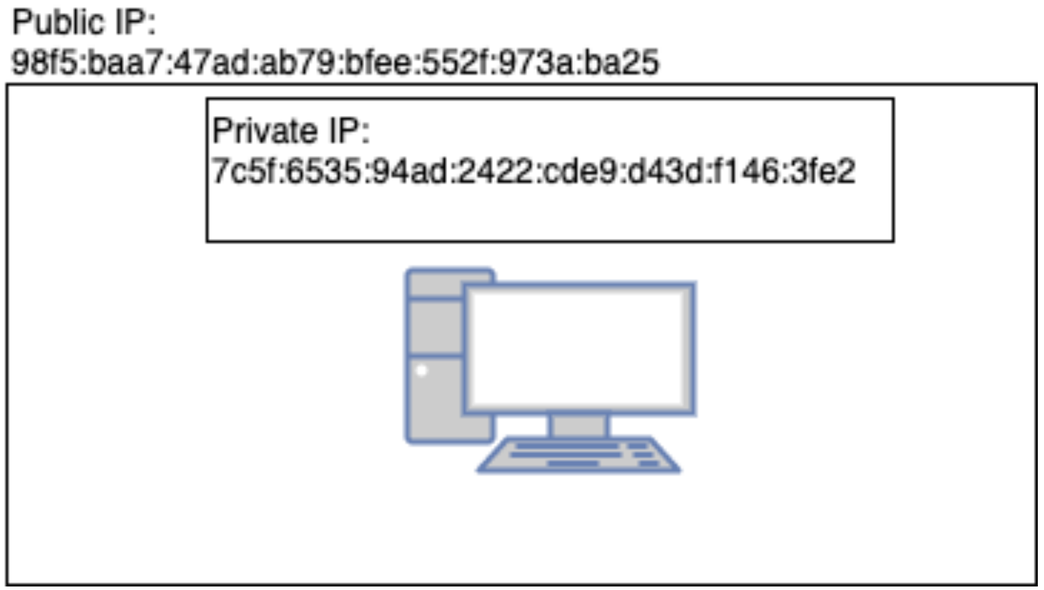


Solution: NAT Traversal

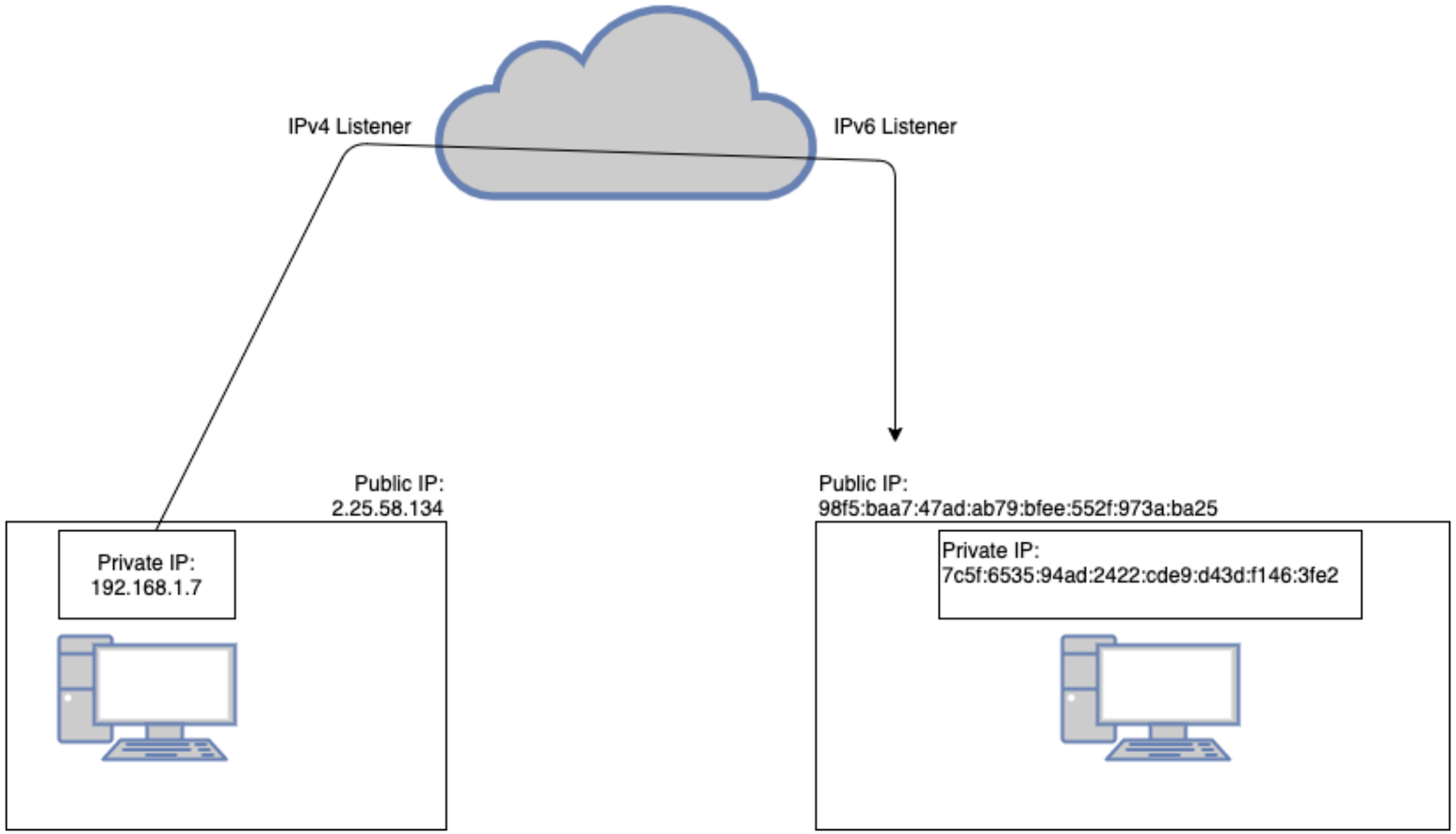


Problem: One is IPv4, One is IPv6

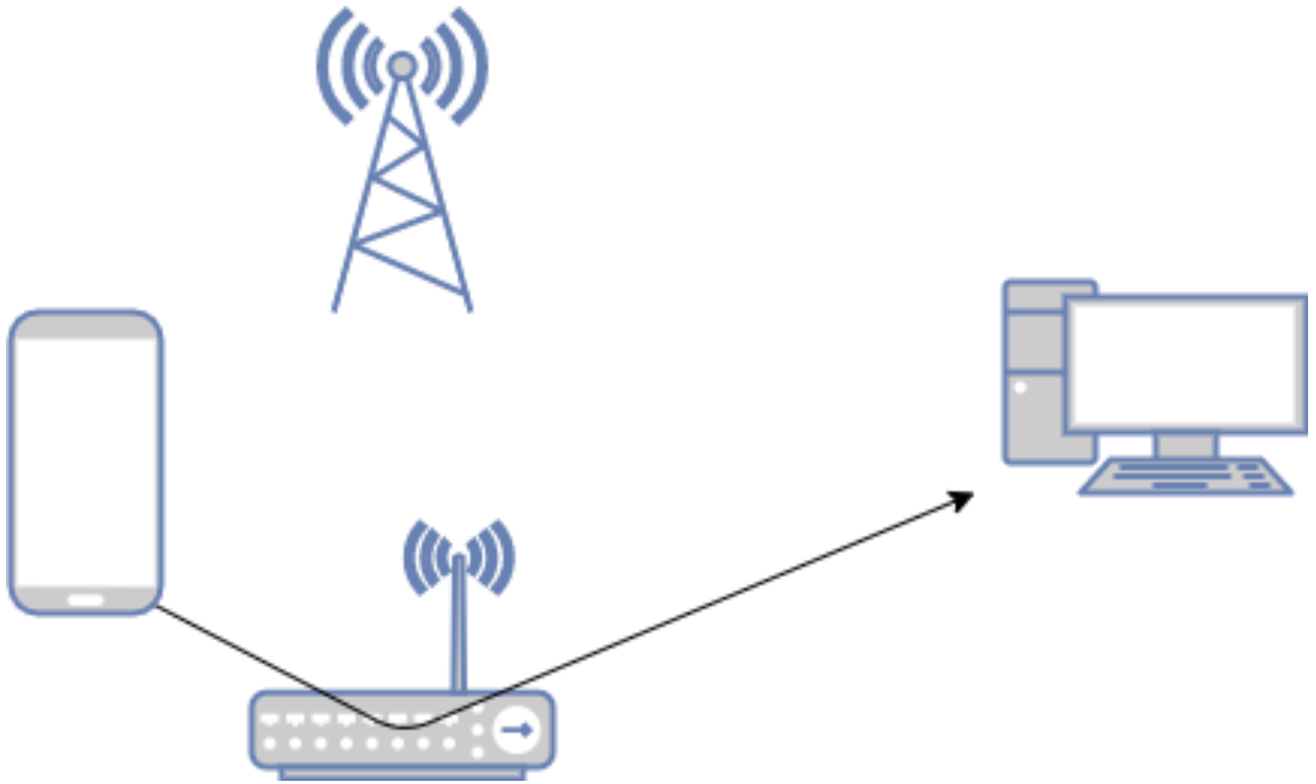




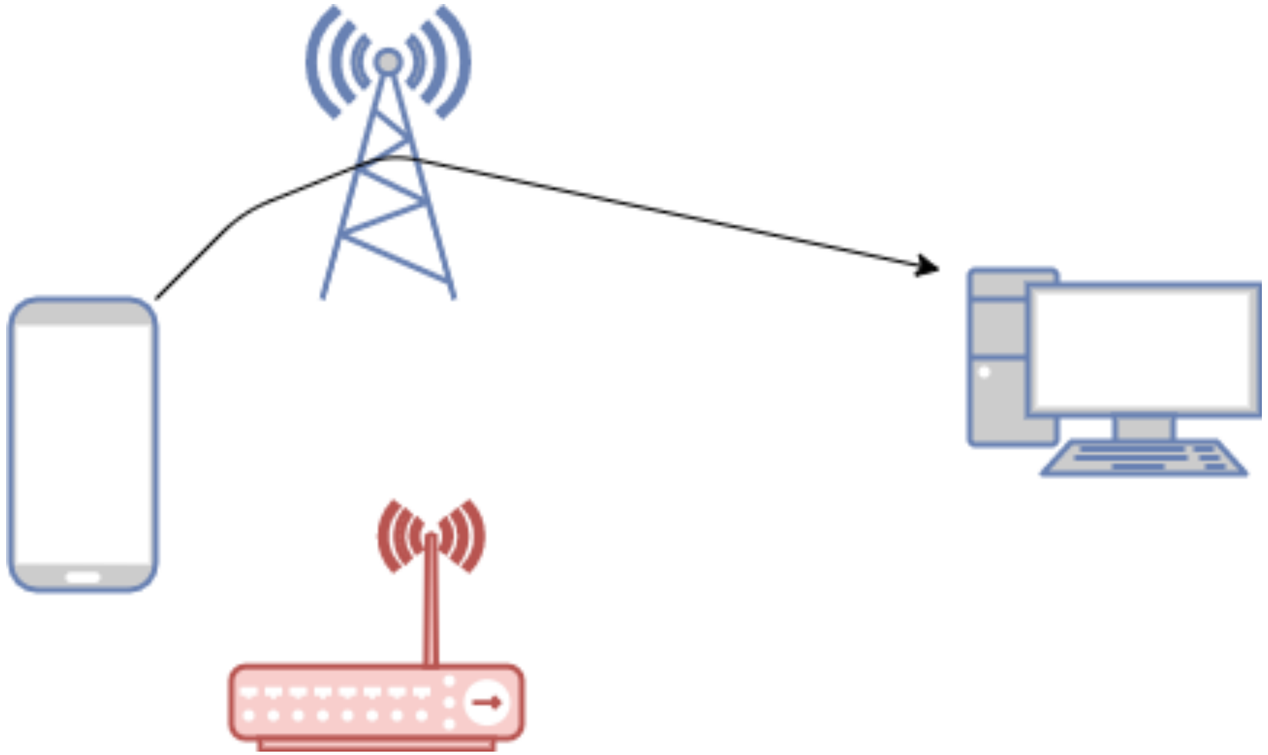
Solution: TURN



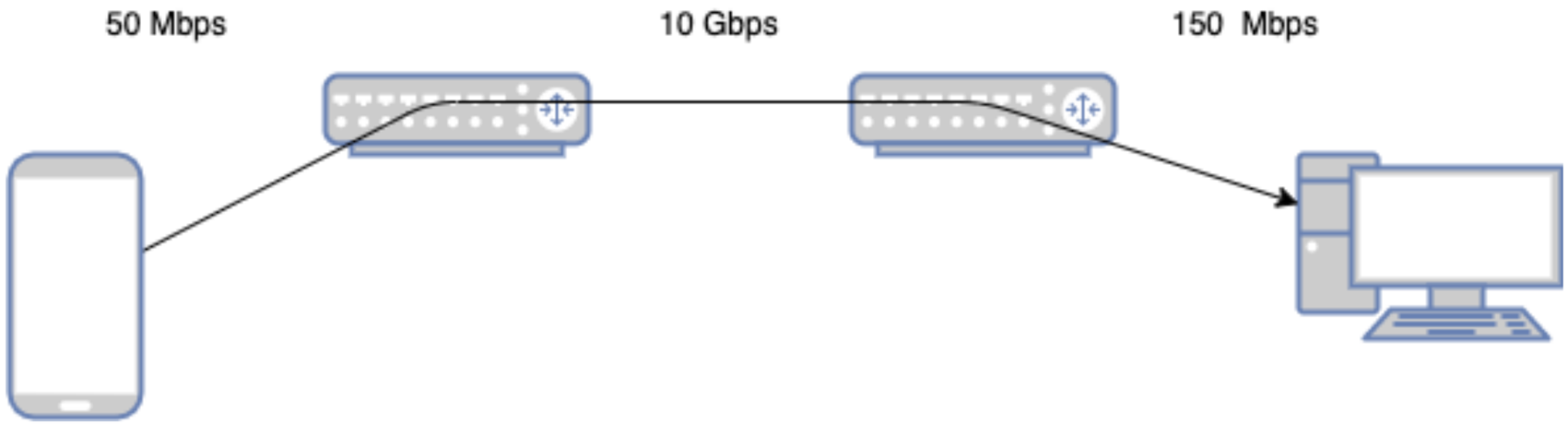
Problem: Wi-Fi on Fire



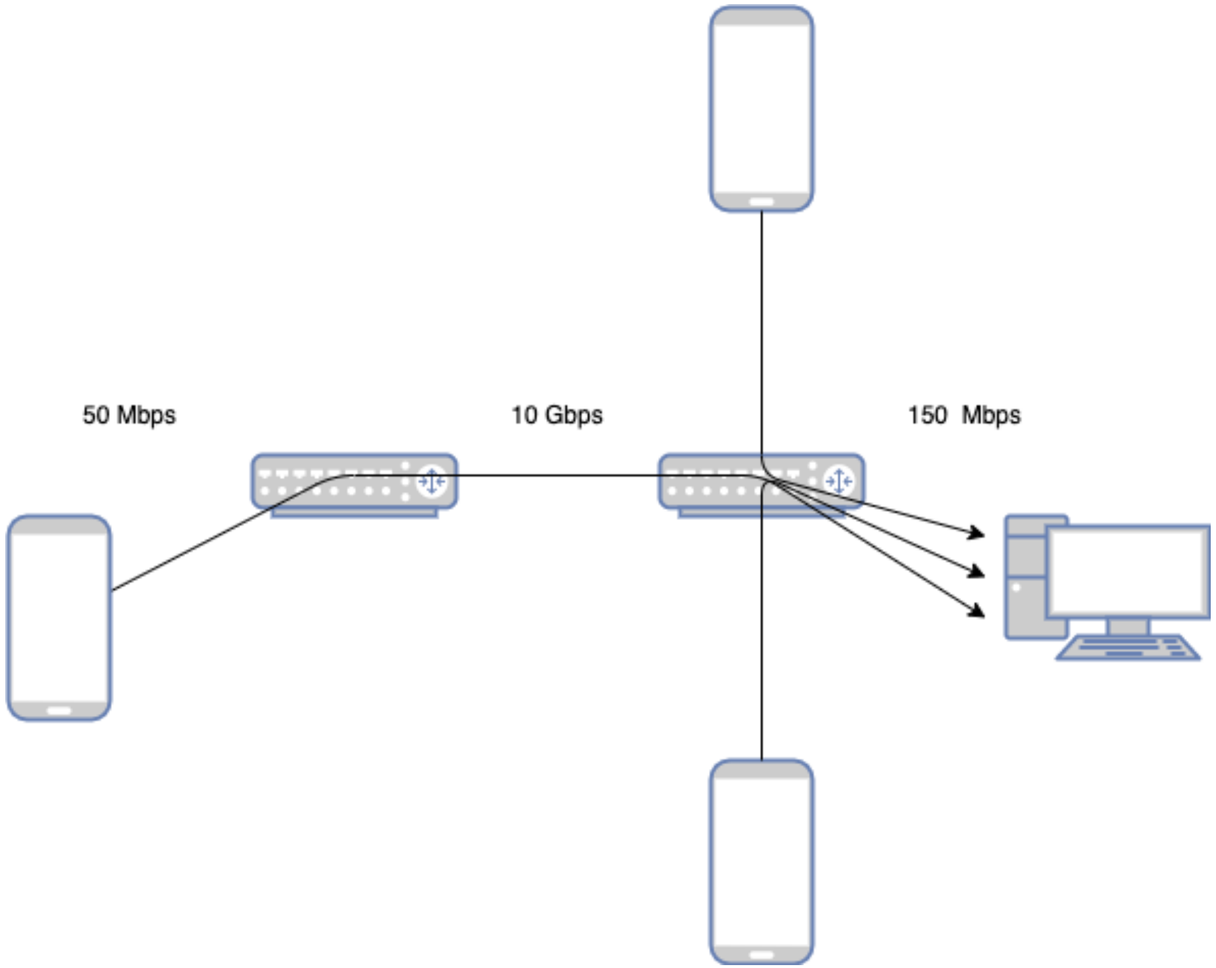
Solution: ICE Renomination



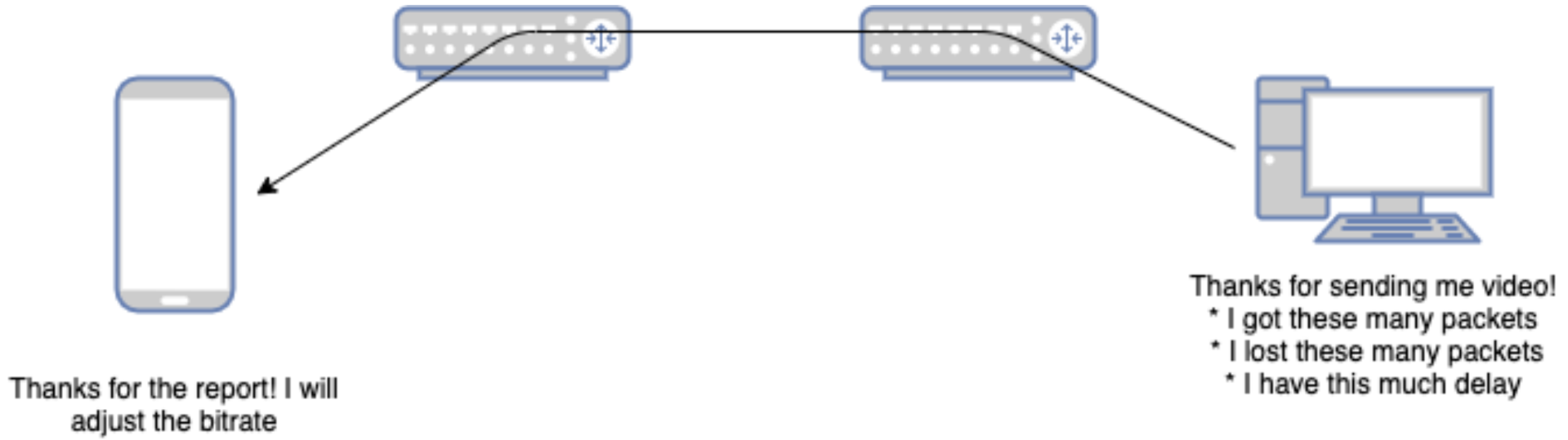
Problem: What bitrate do I upload?



Problem: What bitrate do I upload?



Solution: Congestion Control

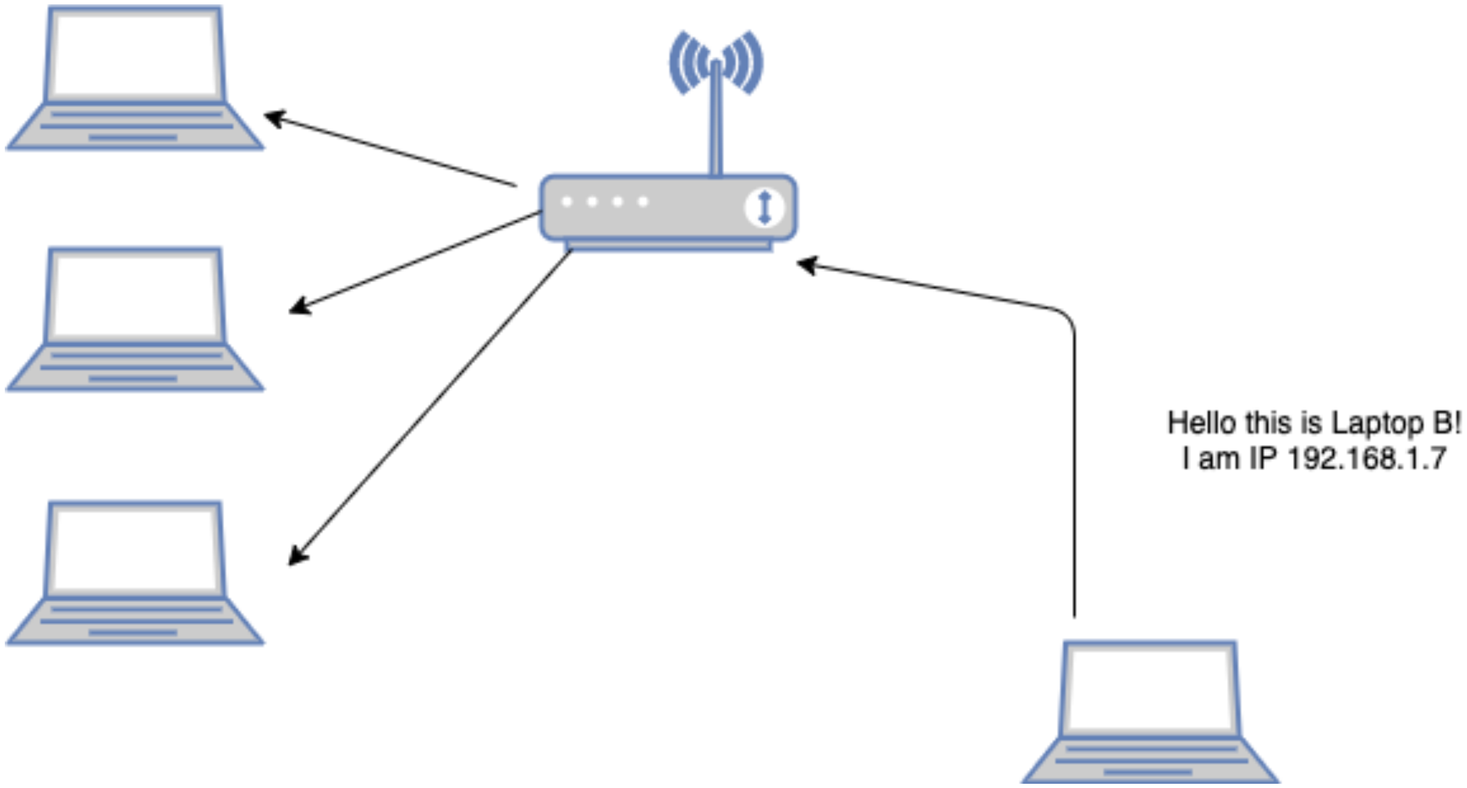


Problem: connect without knowing IP?

I want to connect to Laptop A

I want to connect to Laptop B

Solution: Multicast DNS



TIME TO BUILD

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Connecting (Signaling Offer/Answer)

```go
package main

import (
    "github.com/pion/webrtc/v2"
)

func main() {
    peerConnection, err := webrtc.NewPeerConnection(webrtc.Configuration{})
    if err != nil {
        panic(err)
    }

    offer, err := peerConnection.CreateOffer(nil)
    if err != nil {
        panic(err)
    }

    err = peerConnection.SetLocalDescription(offer)
    if err != nil {
        panic(err)
    }

    // send Offer to remote PeerConnection via any protocol
    // receive Answer from remote PeerConnectian
    answer := webrtc.SessionDescription{}
    err = peerConnection.SetRemoteDescription(answer)
    if err != nil {
        panic(err)
    }

    // You are connected
}
```

Sending Data (DataChannels)

```
    datachannel, err := peerConnection.CreateDataChannel("my-fun-channel", nil)
    if err != nil {
        panic(err)
    }

    datachannel.OnOpen(func() {
        err = datachannel.SendText("Hello World!")
        if err != nil {
            panic(err)
        }
    })
}
```

Receiving Data (DataChannels)

```
peerConnection.OnDataChannel(func(datachannel *webrtc.DataChannel) {
    datachannel.OnOpen(func() {
        fmt.Printf("New stream %s \n", datachannel.Label())
    })

    datachannel.OnMessage(func(msg webrtc.DataChannelMessage) {
        fmt.Printf("%s \n", msg.Data)
    })
})
```

Deploy to the browser!

```
seaduboi@38f9d359441f:~/go/src/github.com/Sean-Der/kranky$ GOOS=js GOARCH=wasm go build -o main.wasm
seaduboi@38f9d359441f:~/go/src/github.com/Sean-Der/kranky$ cat index.html
<html>
        <head>
                <meta charset="utf-8"/>
                <script src="wasm_exec.js"></script>
                <script>
                        const go = new Go();
                        WebAssembly.instantiateStreaming(fetch("main.wasm"), go.importObject).then((result) => {
                                go.run(result.instance);
                        });
                </script>
        </head>
        <body></body>
</html>
```

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Send Video

```
videoTrack, err := peerConnection.NewTrack(webrtc.DefaultPayloadTypeVP8, 50000, "video", "pion")
if err != nil {
    panic(err)
}

_, err = peerConnection.AddTrack(videoTrack)
if err != nil {
    panic(err)
}

for {
    frame, _, err := ivf.ParseNextFrame()
    if err != nil {
        panic(err)
    }

    err = videoTrack.WriteSample(media.Sample{Data: frame, Samples: 90000})
    if err != nil {
        panic(err)
    }
}
```

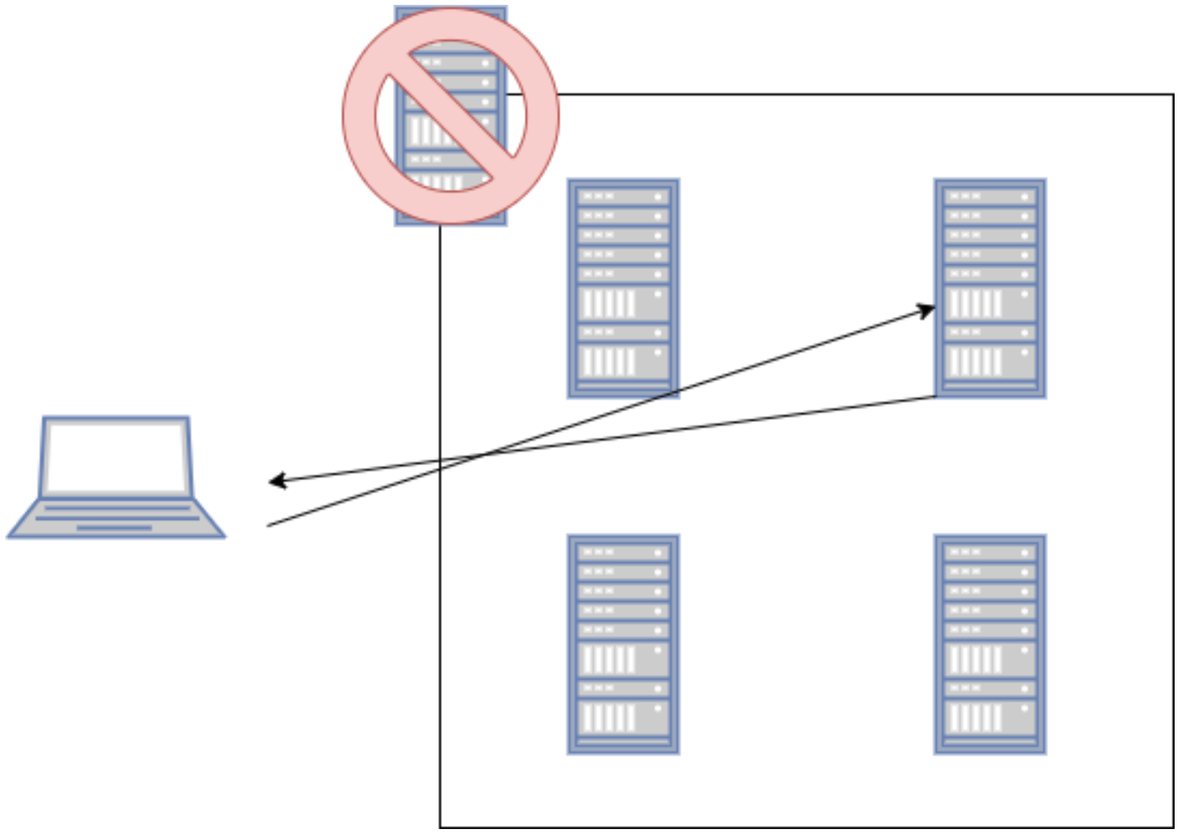
Receive Video

```
peerConnection.OnTrack(func(track *webrtc.Track, receiver *webrtc.RTPReceiver) {
    if track.Codec().Name == webrtc.Opus {
        for {
            packet, err = track.ReadRTP()
            if err != nil {
                panic(err)
            }
            // Playback using Media library of your choice
        }
    }
})
```

PION IN ACTION

ssh-p2p

github.com/nobonobo/ssh-p2p



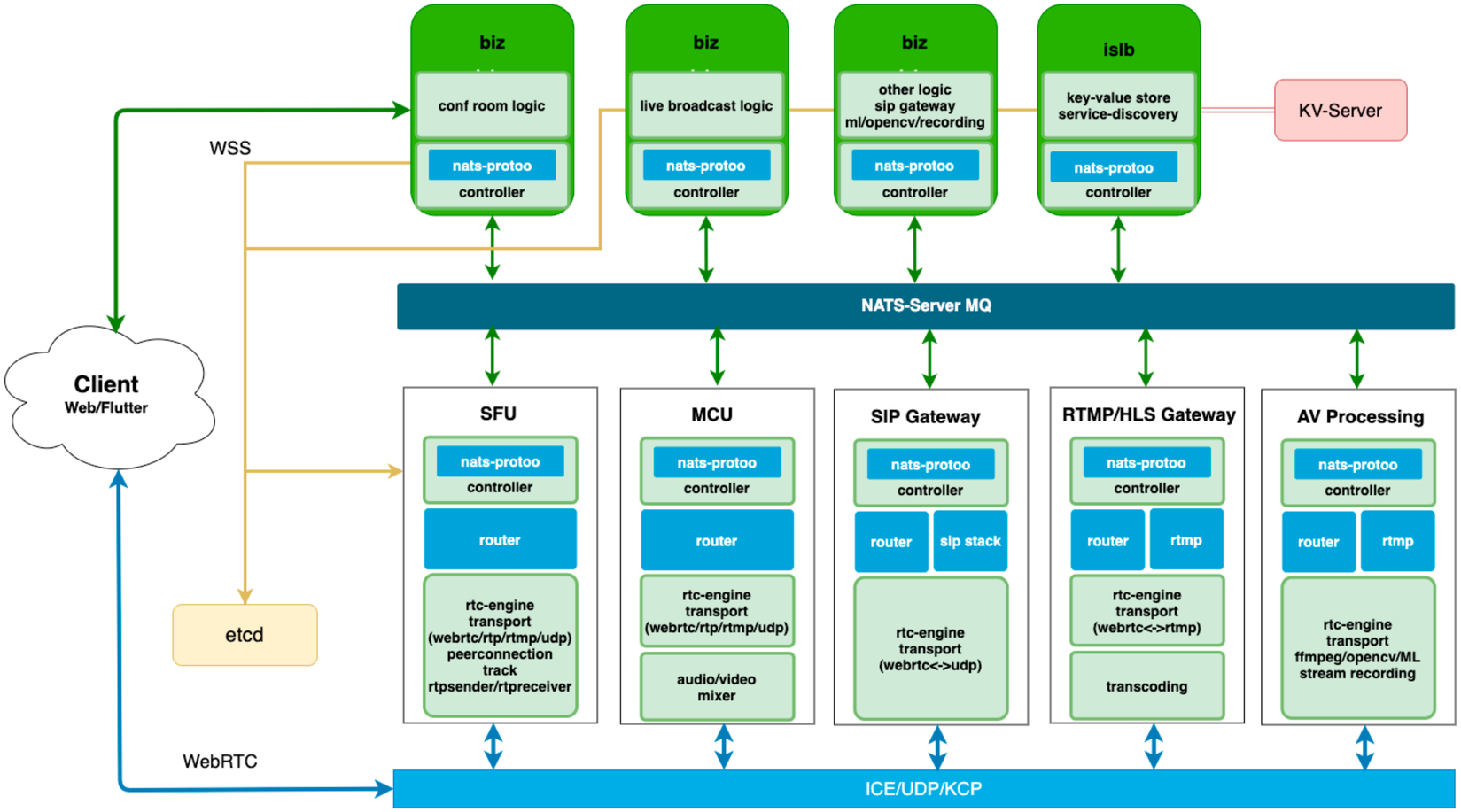
CloudRetro.io

RTCTunnel

github.com/rtctunnel

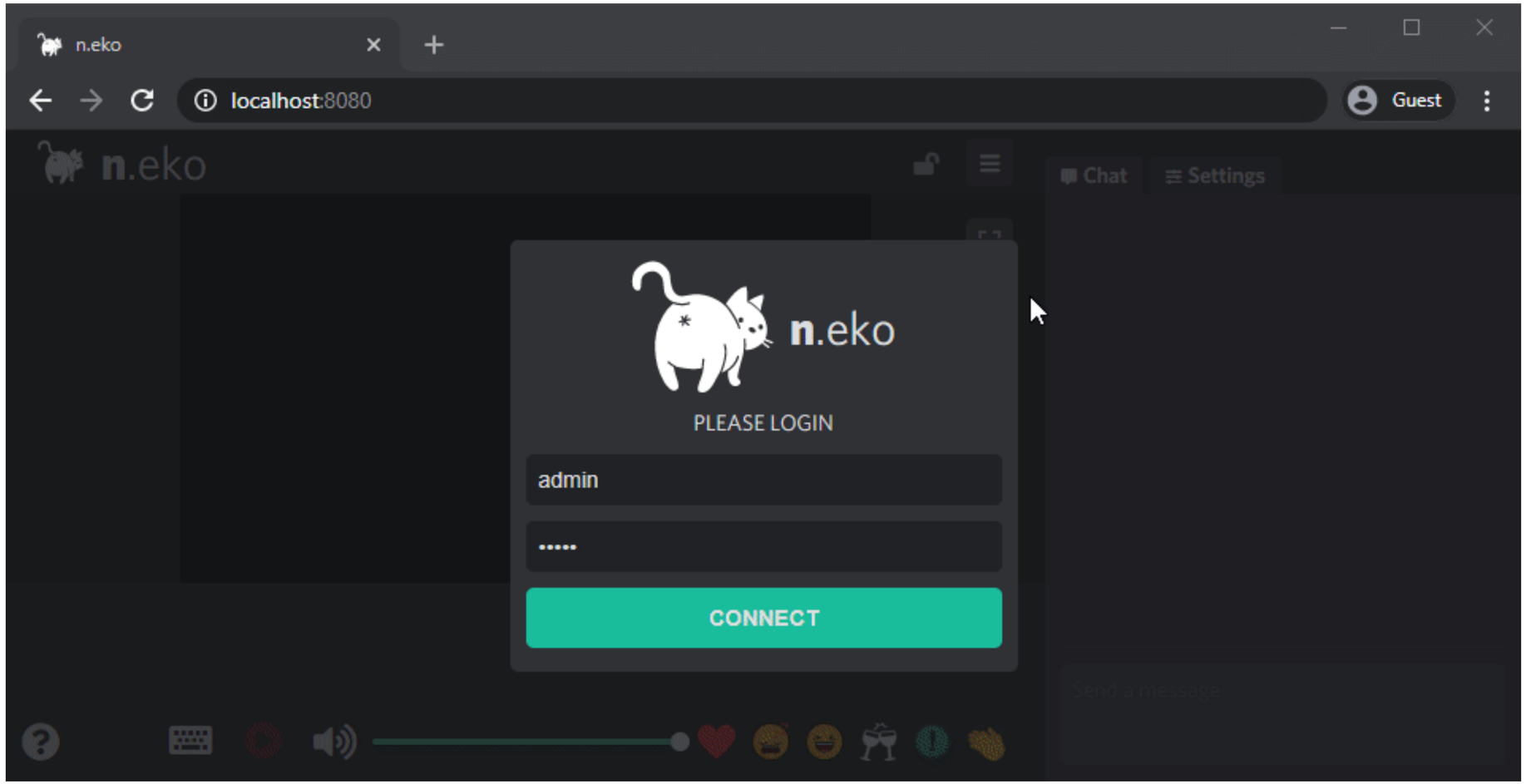
Ion

github.com/pion/ion



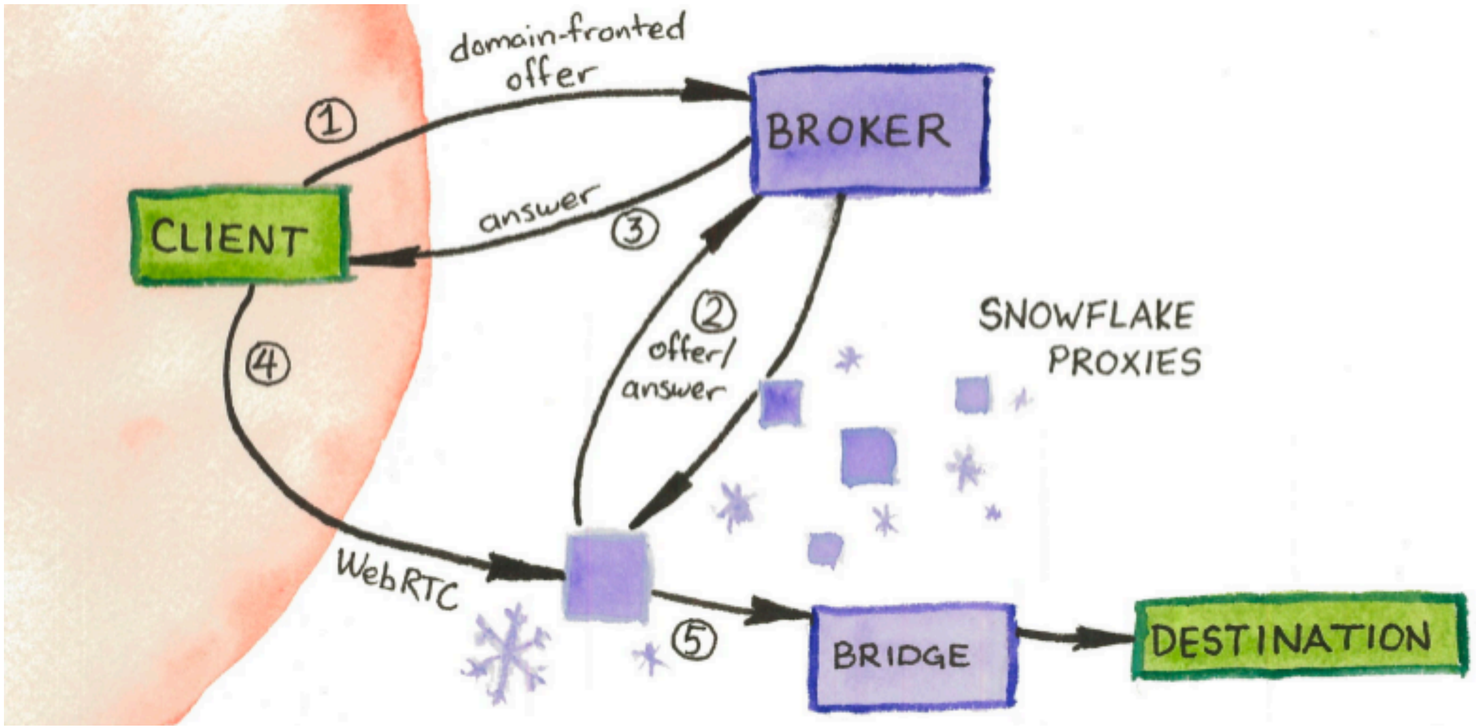
Neko

github.com/nurdism/neko

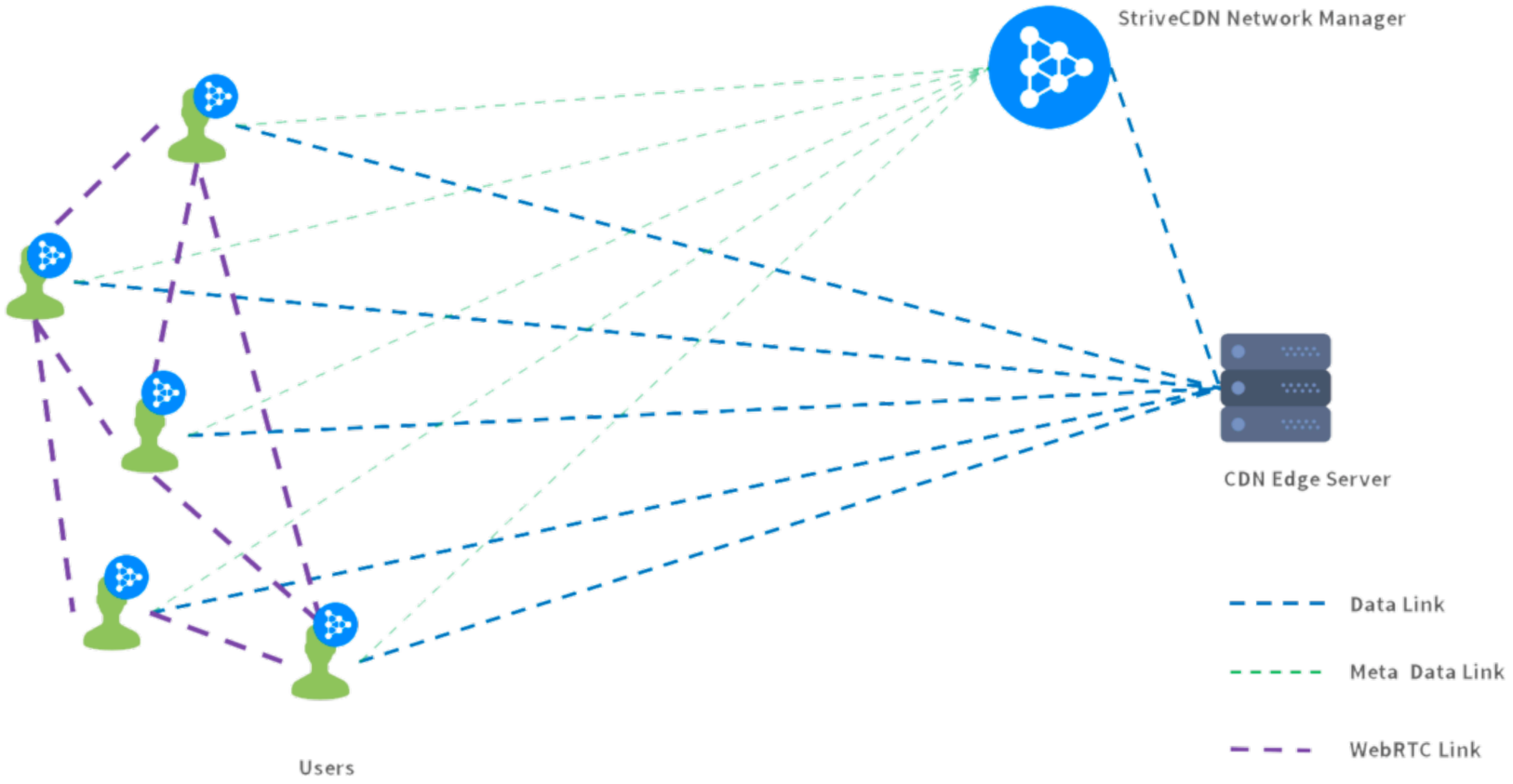


Snowflake

snowflake.torproject.org

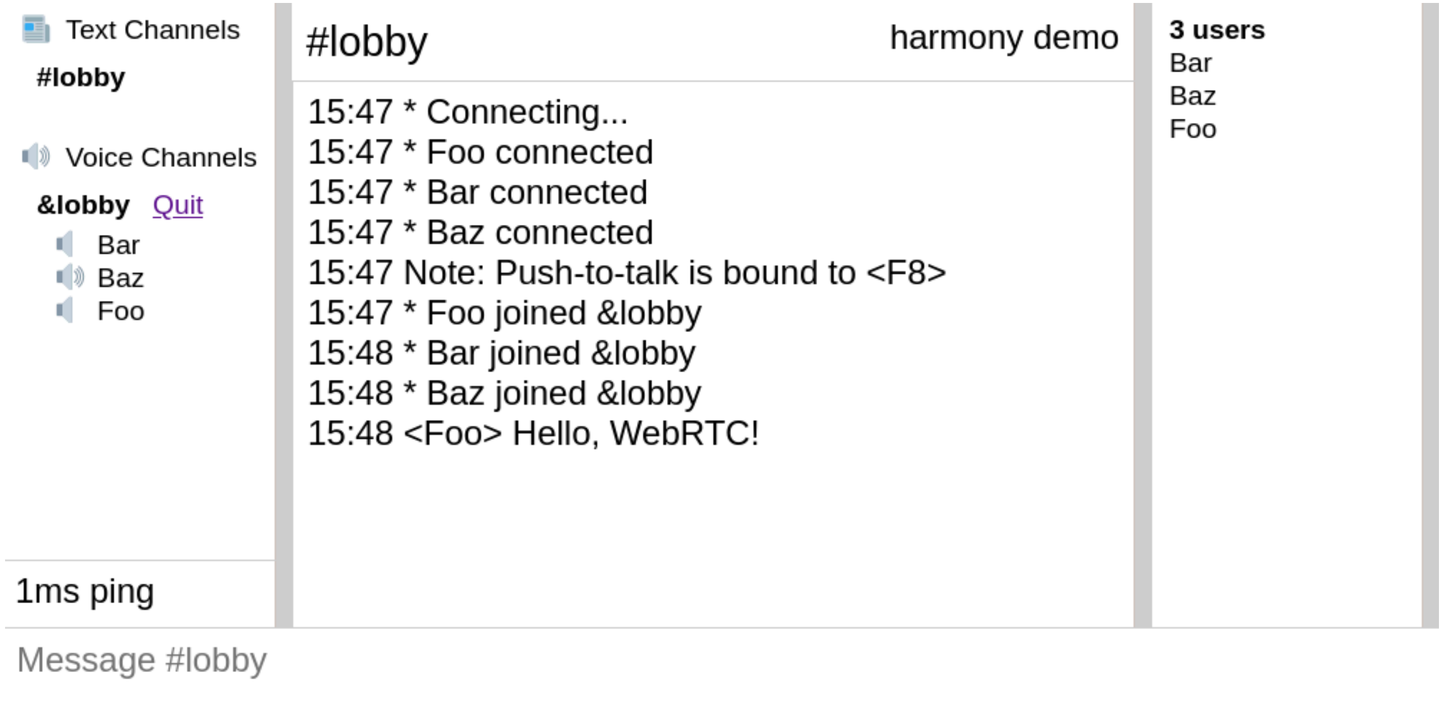


Strive CDN


StriveCDN Network Manager
CDN Edge Server
Users
Data Link
Meta Data Link
WebRTC Link

Harmony

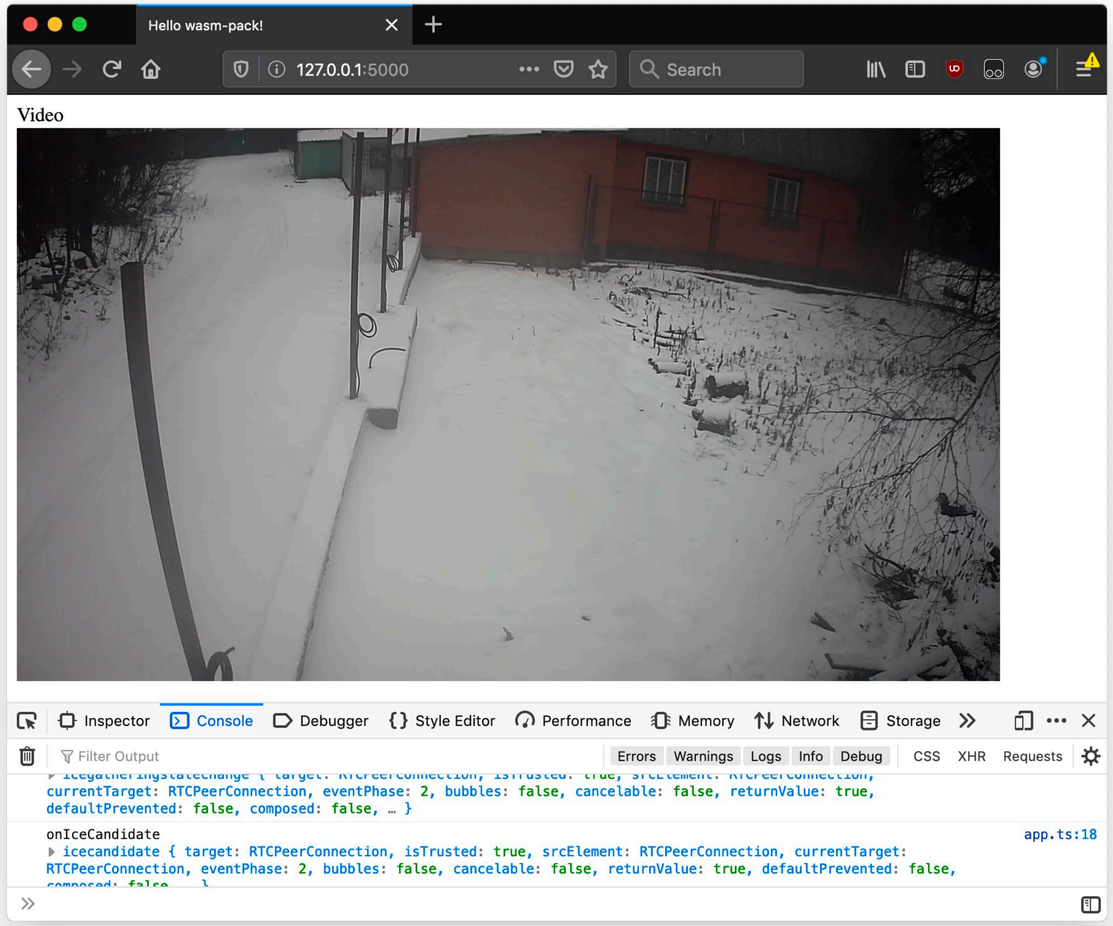
gitlab.com/tslocum/harmony



TelloGo

https://github.com/Ragnar-H/TelloGo

IoT Camera


Hello wasm-pack!
127.0.0.1:5000
Search
Video
Inspector
Console
Debugger
Style Editor
Performance
Memory
Network
Storage
Filter Output
Errors
Warnings
Logs
Info
Debug
CSS
XHR
Requests
currentTarget: RTCPeerConnection, eventPhase: 2, bubbles: false, cancelable: false, returnValue: true,
defaultPrevented: false, composed: false, … }
onIceCandidate
app.ts:18
icecandidate { target: RTCPeerConnection, isTrusted: true, srcElement: RTCPeerConnection, currentTarget:
RTCPeerConnection, eventPhase: 2, bubbles: false, cancelable: false, returnValue: true, defaultPrevented: false,

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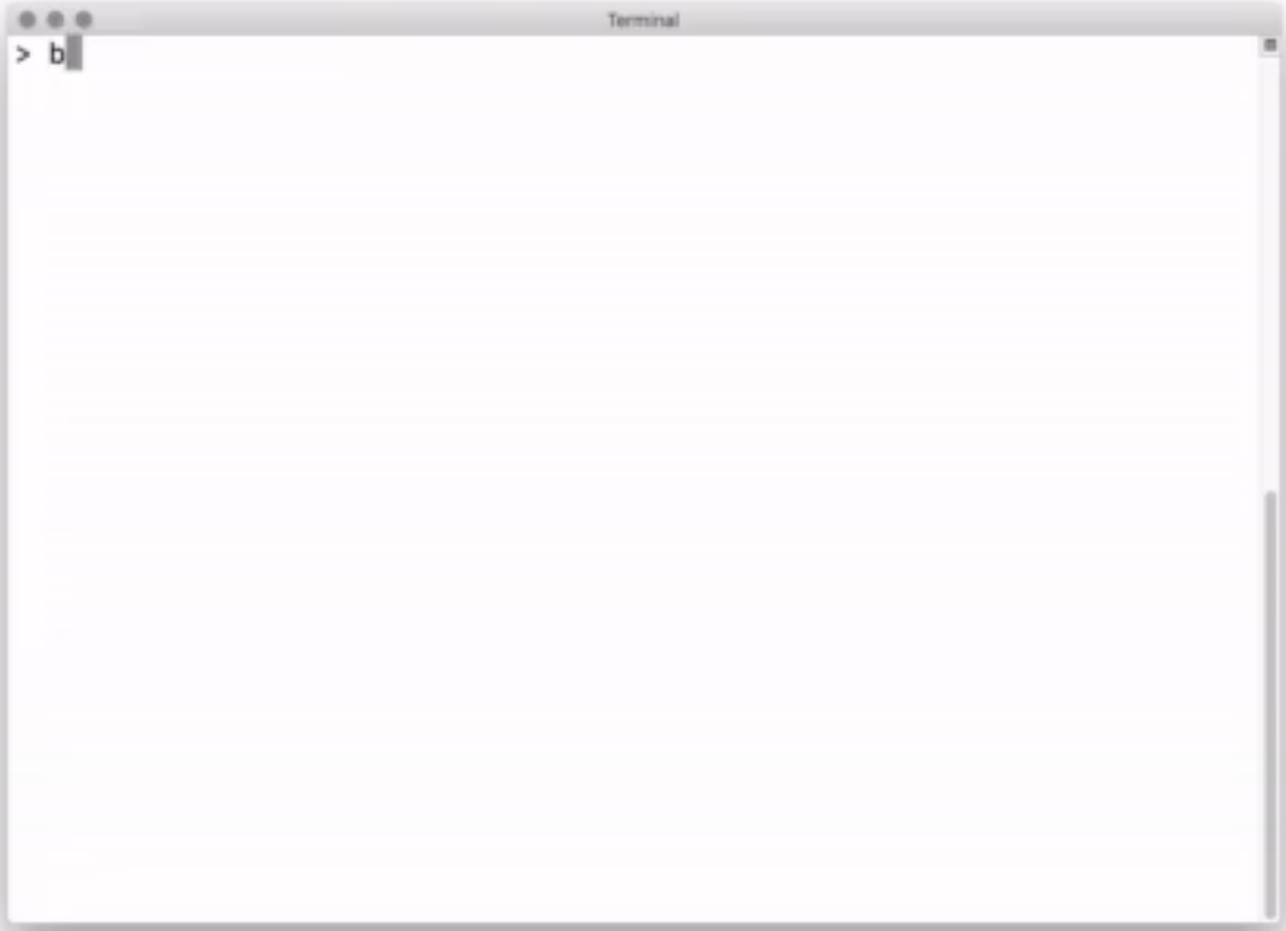
ascii

https://github.com/dialup-inc/ascii



Pion needs you

Empower those helping the internet!

Gain deep WebRTC knowledge

A fun challenge where you pick the goals

github.com/pion

pion.ly/slack

twitter.com/_pion