# PION

WEBRTC

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Lander Noterman
Leeward Bound
Levin Du
Lukas Herman

# WHAT IS WEBRTC?

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# Protocol for Browsers

E2E Secure Connection between Peers

Multiple Audio/Video Tracks

Binary Data

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

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# And More!

- aiortc (**Python**)
- GStreamer's webrtcbin **(C)**
- werift (**Typescript**)
- Pion (**Golang**)
- Shiguredo (**Erlang**)
- |pipe| (**Java**)
- rawrtc (**C++**)
- webrtc-rs (**Rust**)
- AWS WebRTC (**C/Embedded**)
- ?

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# WebRTC for the Curious

**Book on how WebRTC really works**

- Not just about the public APIs!
- Deep dive on protocols

**History of WebRTC**

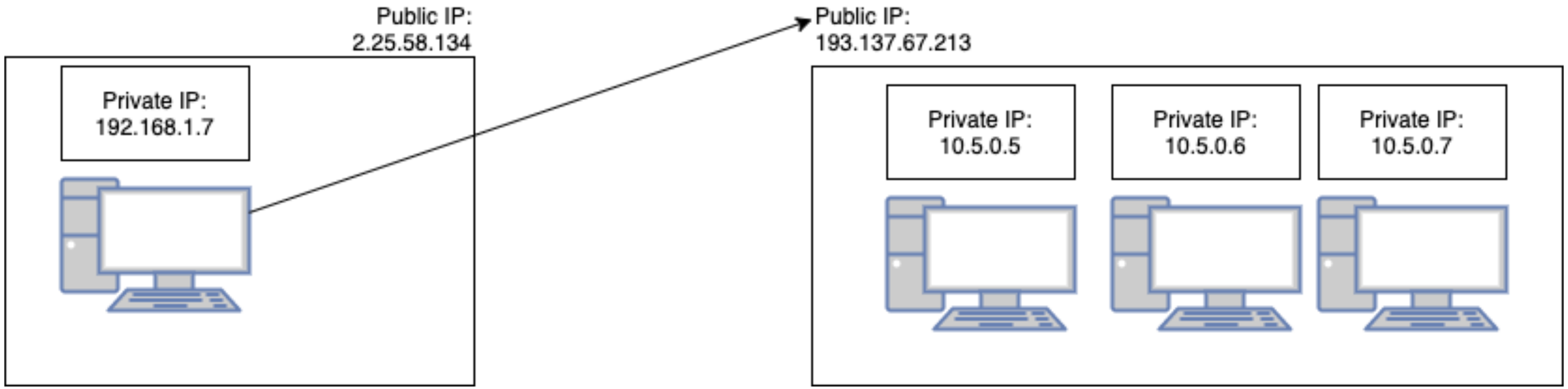
- Interviews with RFC authors

**WebRTC in practice**

- Debugging every piece
- Teach the sharp edges

# WHAT DOES IT SOLVE

# Problem: Connect two users with no Public IP



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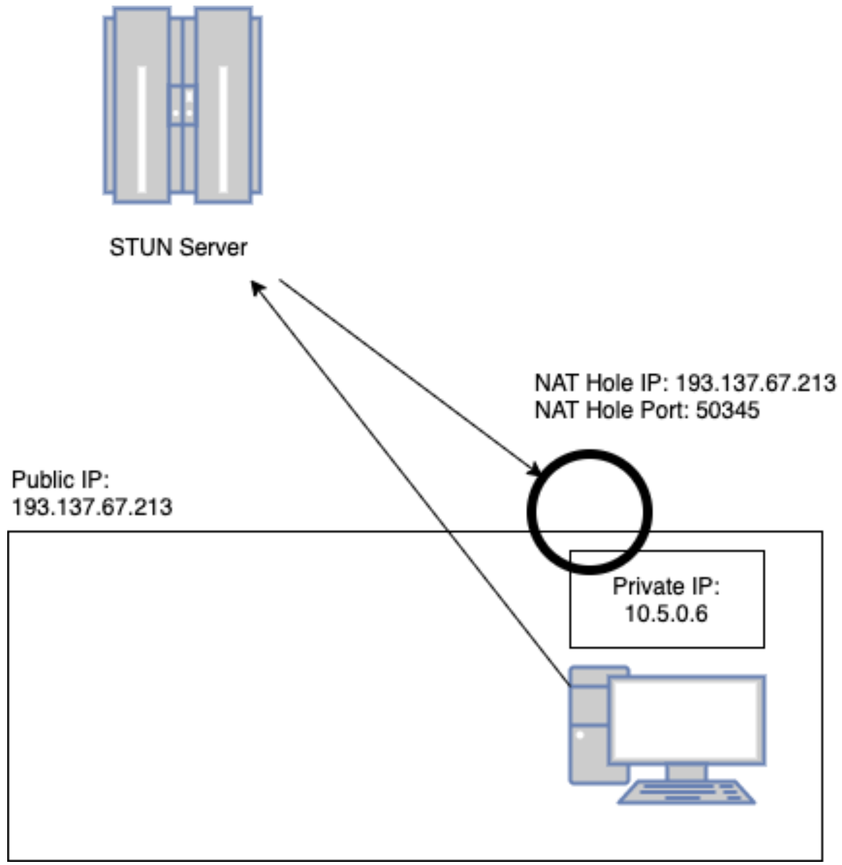
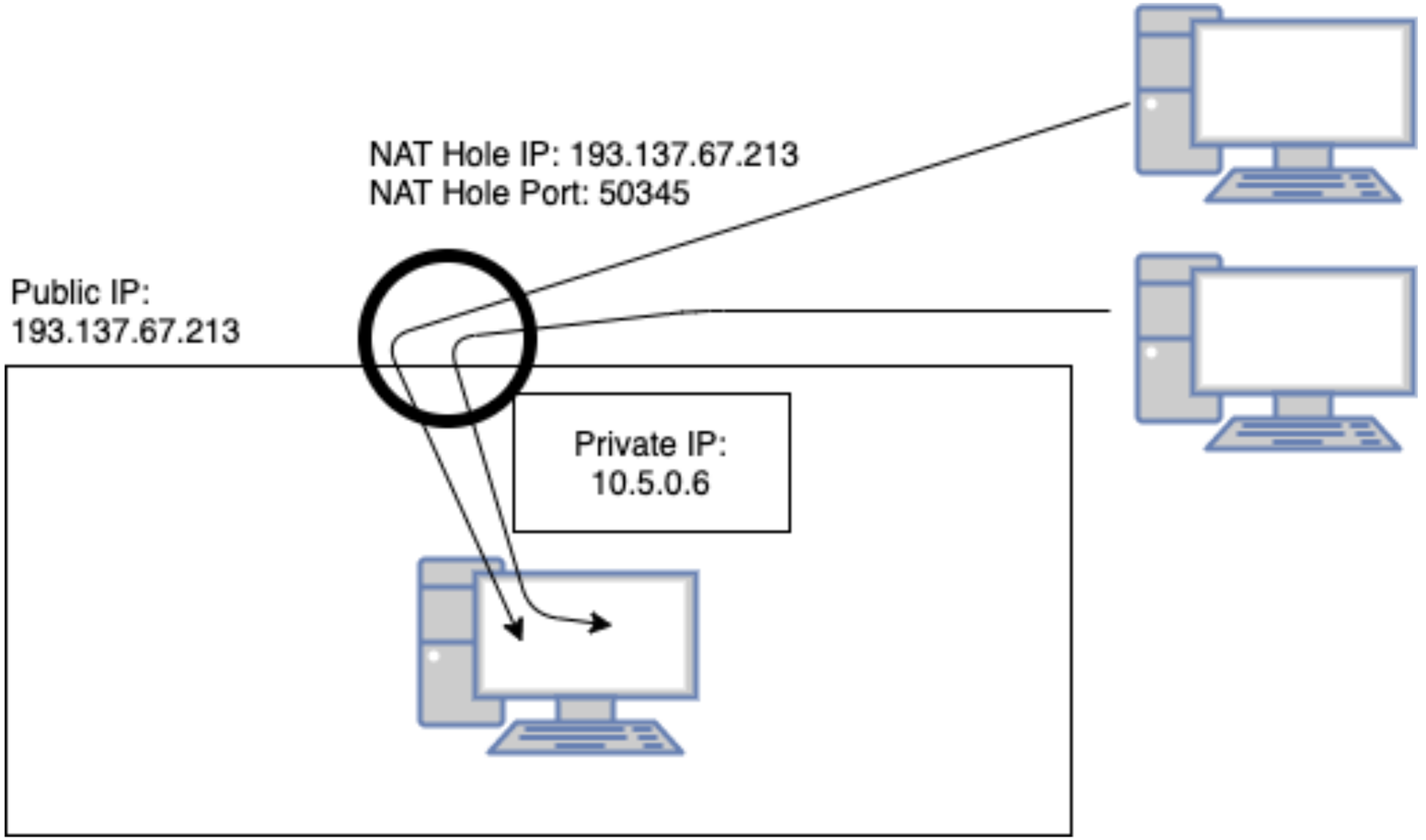
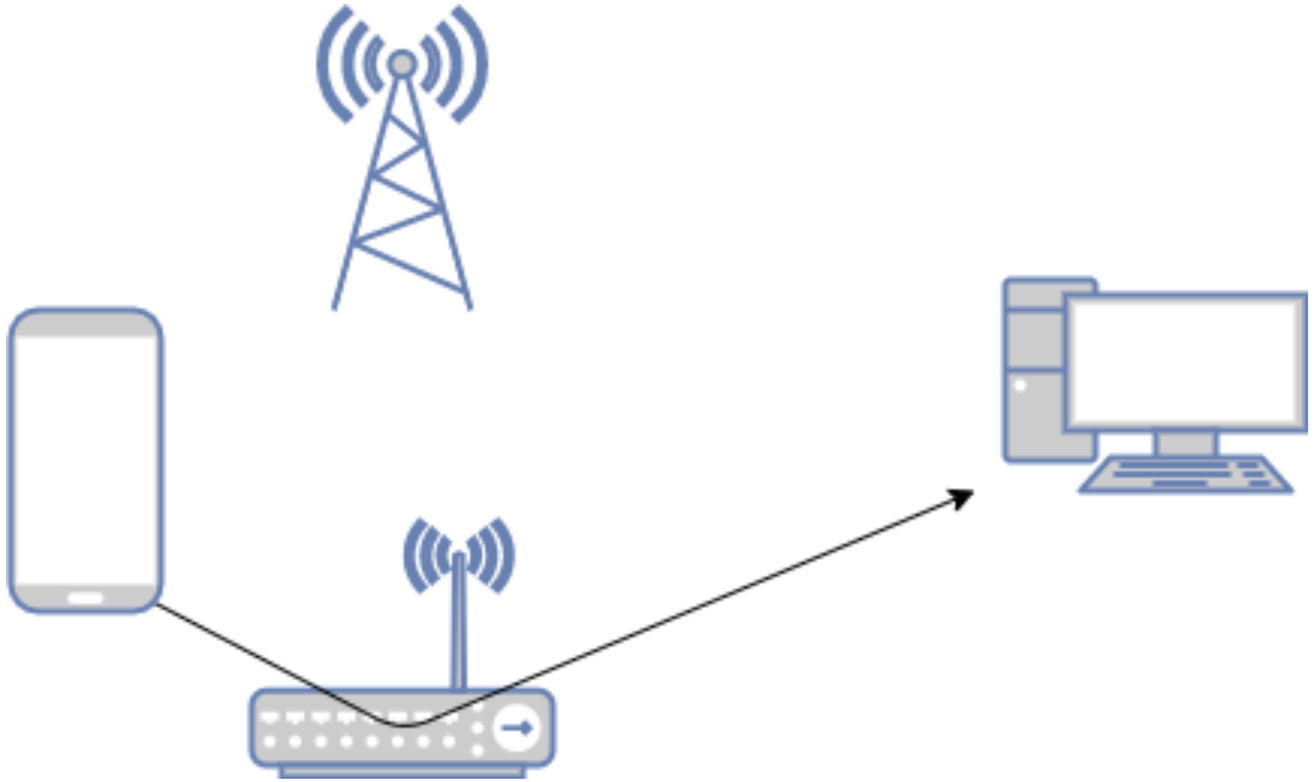
# Solution: NAT Traversal



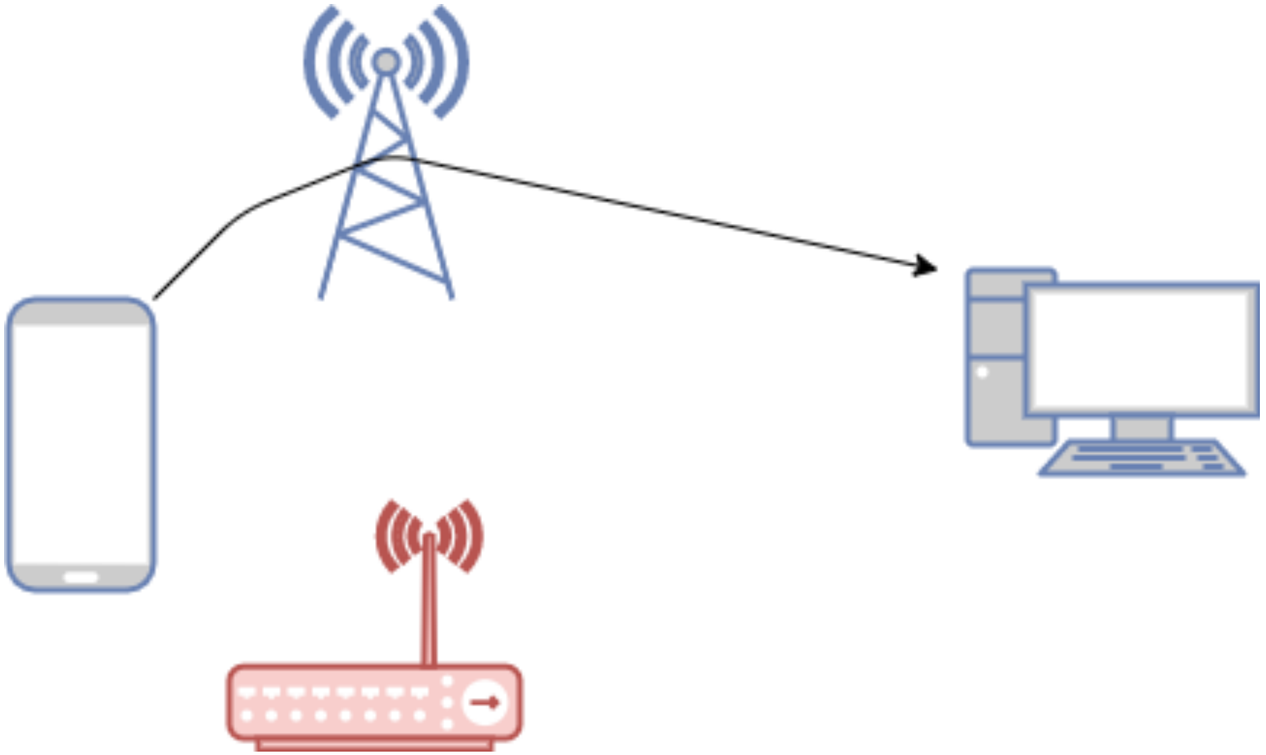
# Solution: NAT Traversal



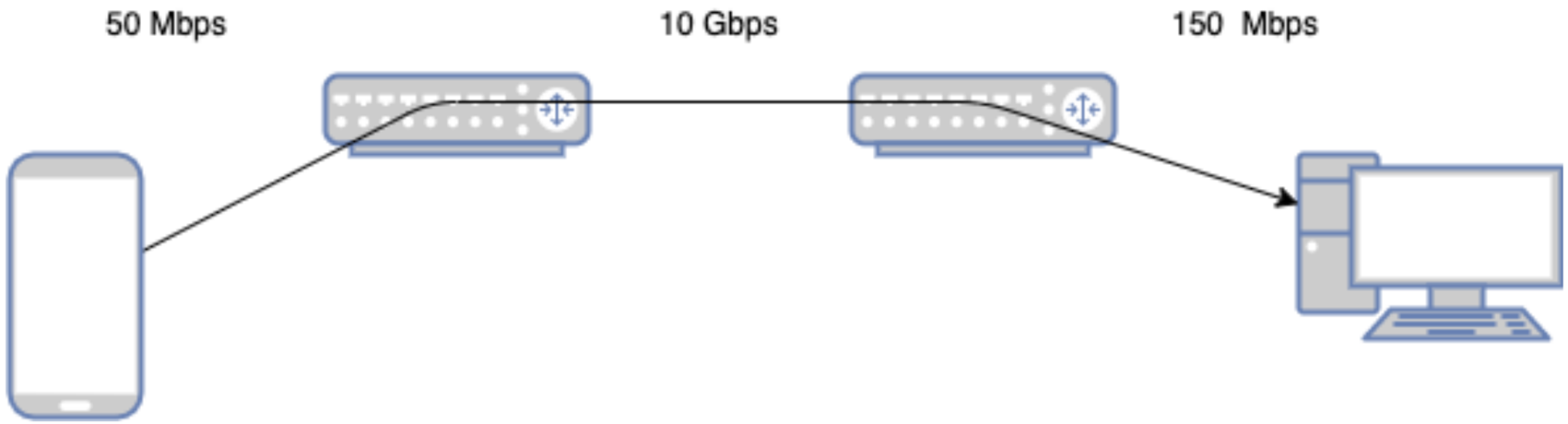
# Problem: Stay connected on the move



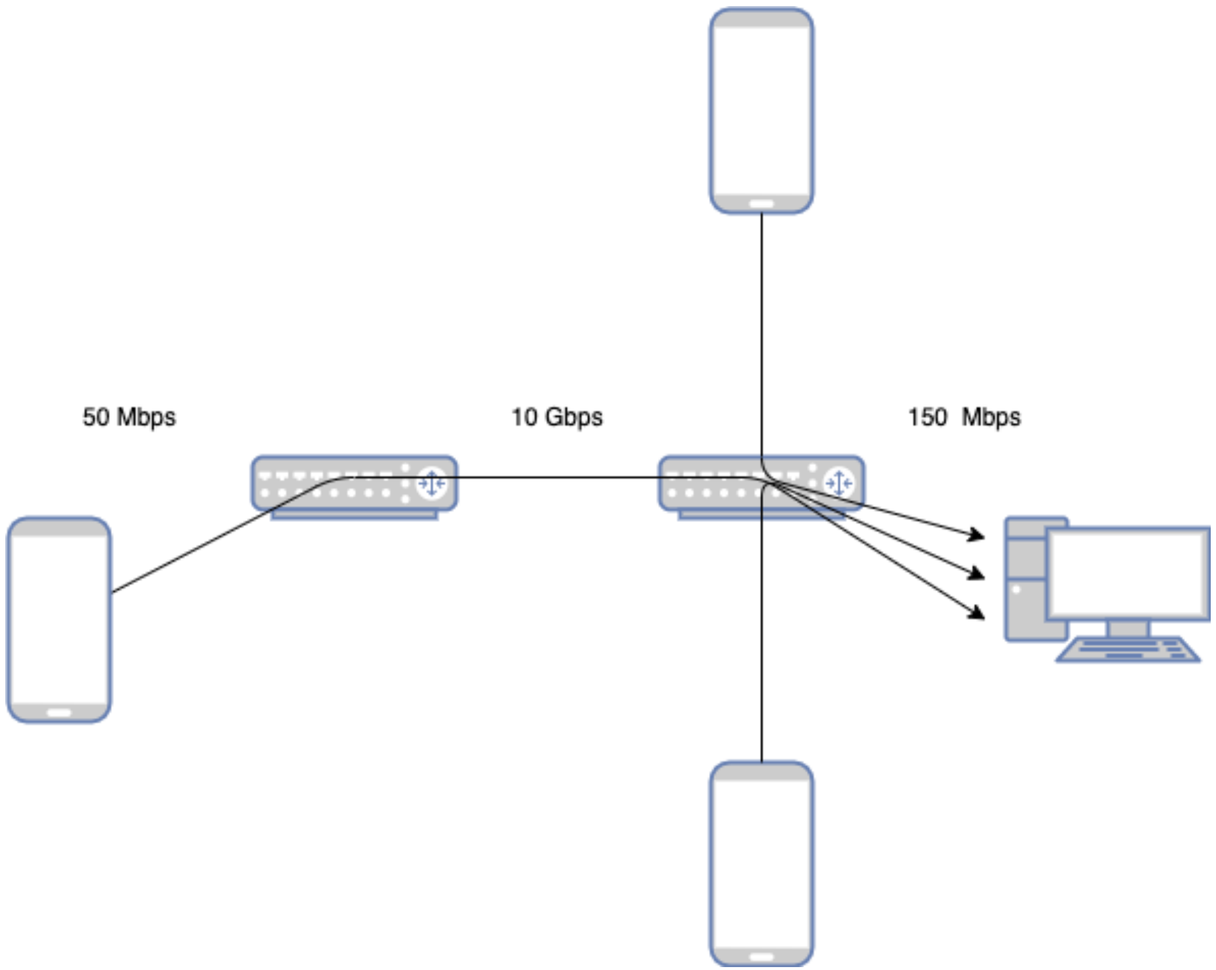
# Solution: ICE Restart



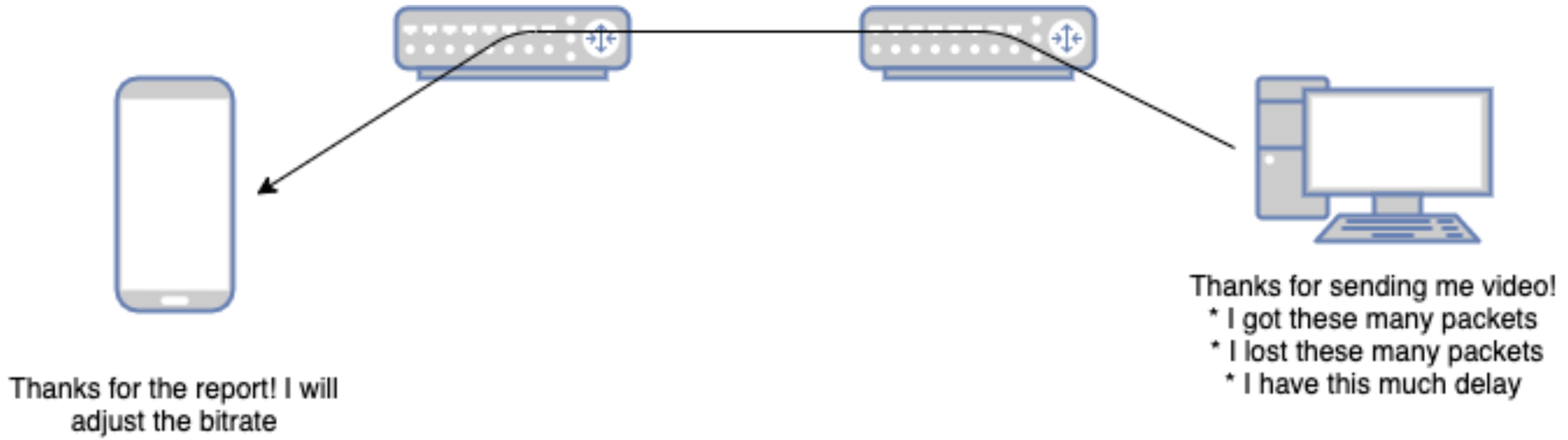
# Problem: What bitrate do I upload?



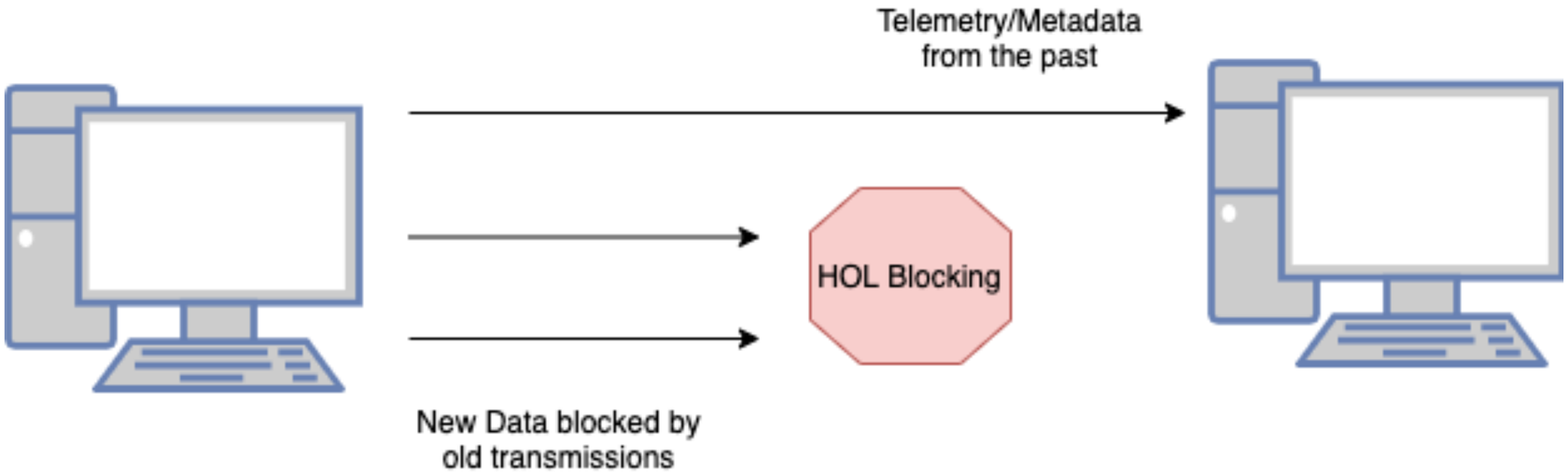
# Problem: What bitrate do I upload?



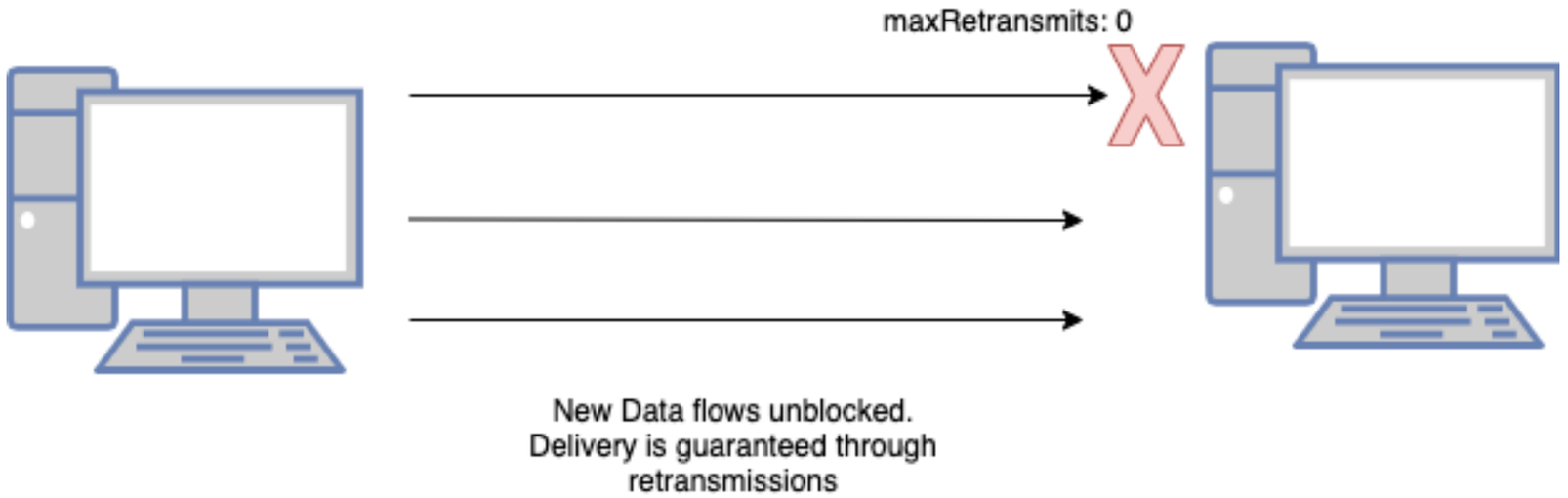
# Solution: Congestion Control



# Problem: Don't block on the past



# Solution: SCTP



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)
    })
})
```

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# 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)
    }
}
```

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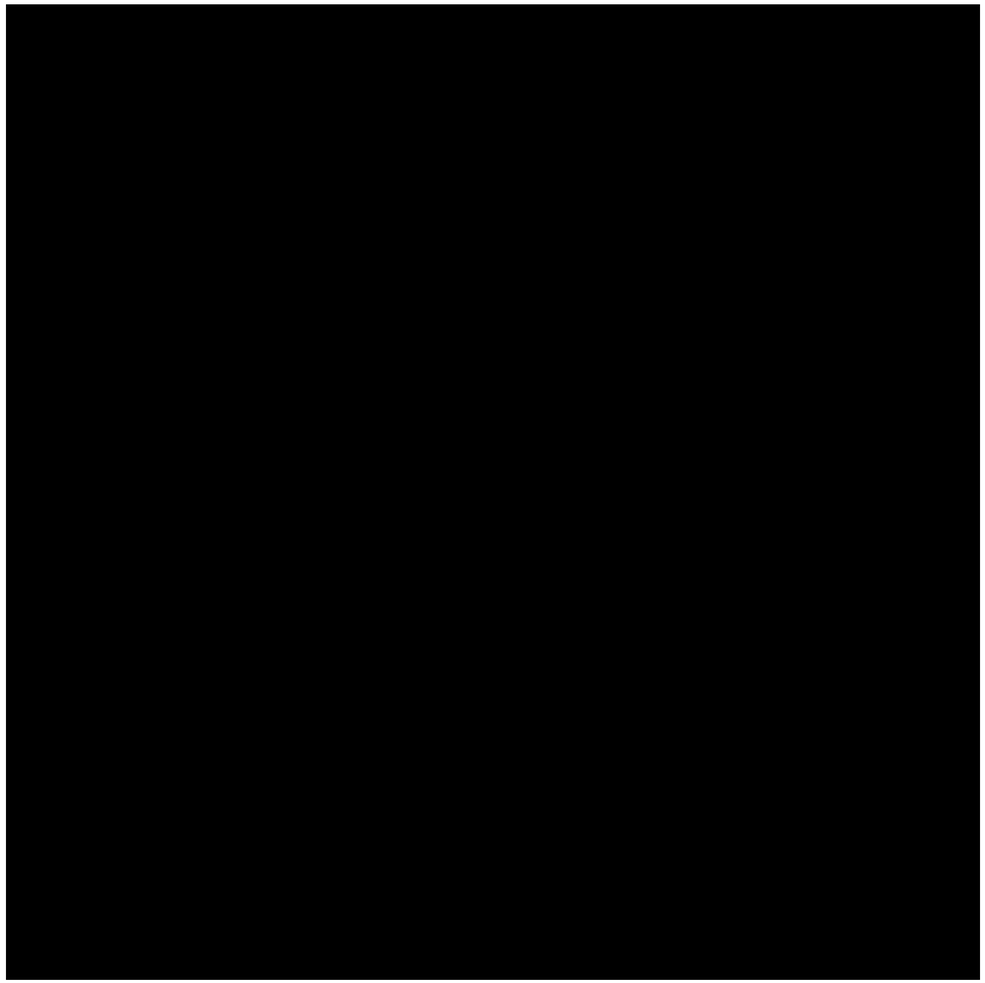
# Receive Video

```
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

# ns-remote



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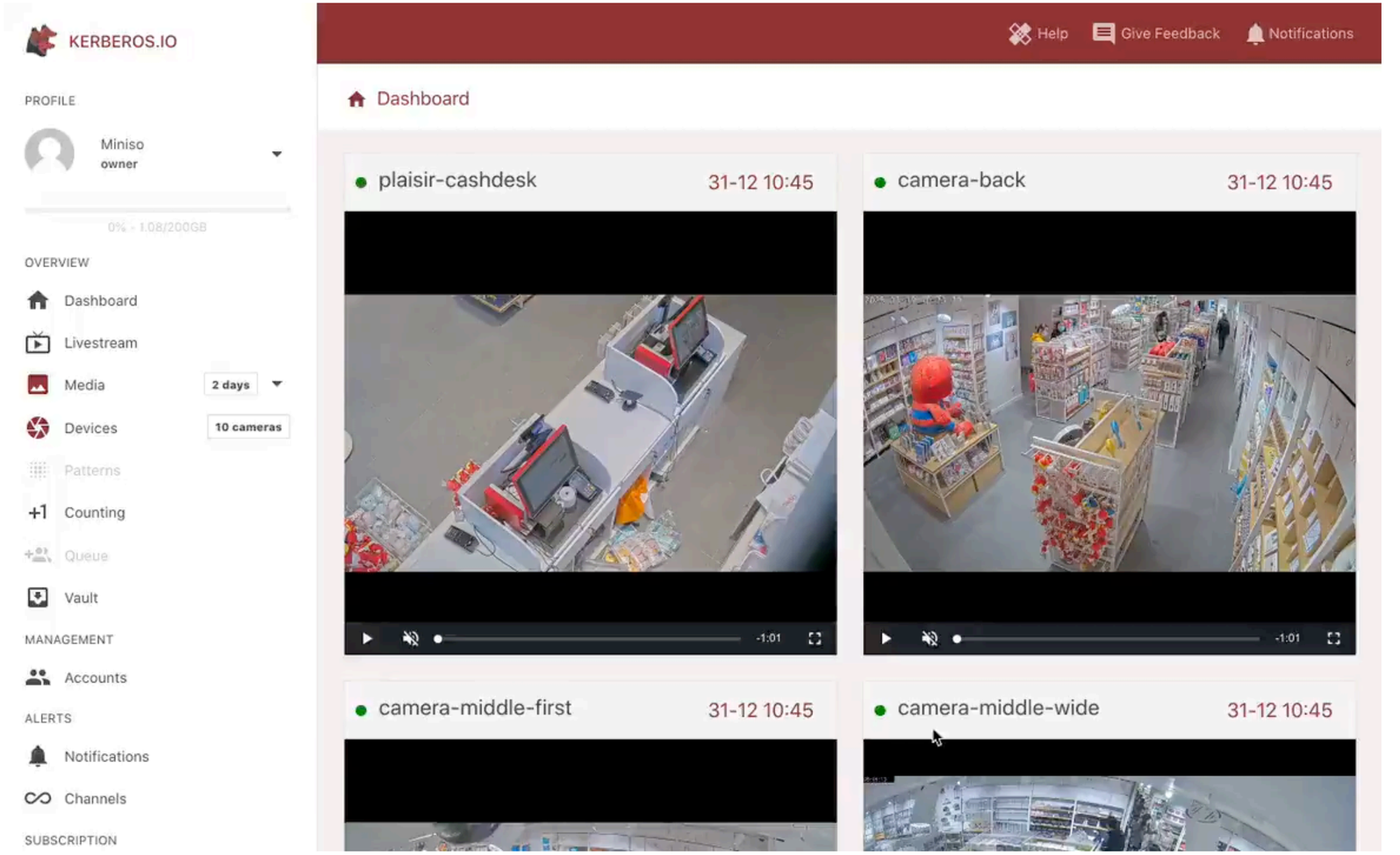
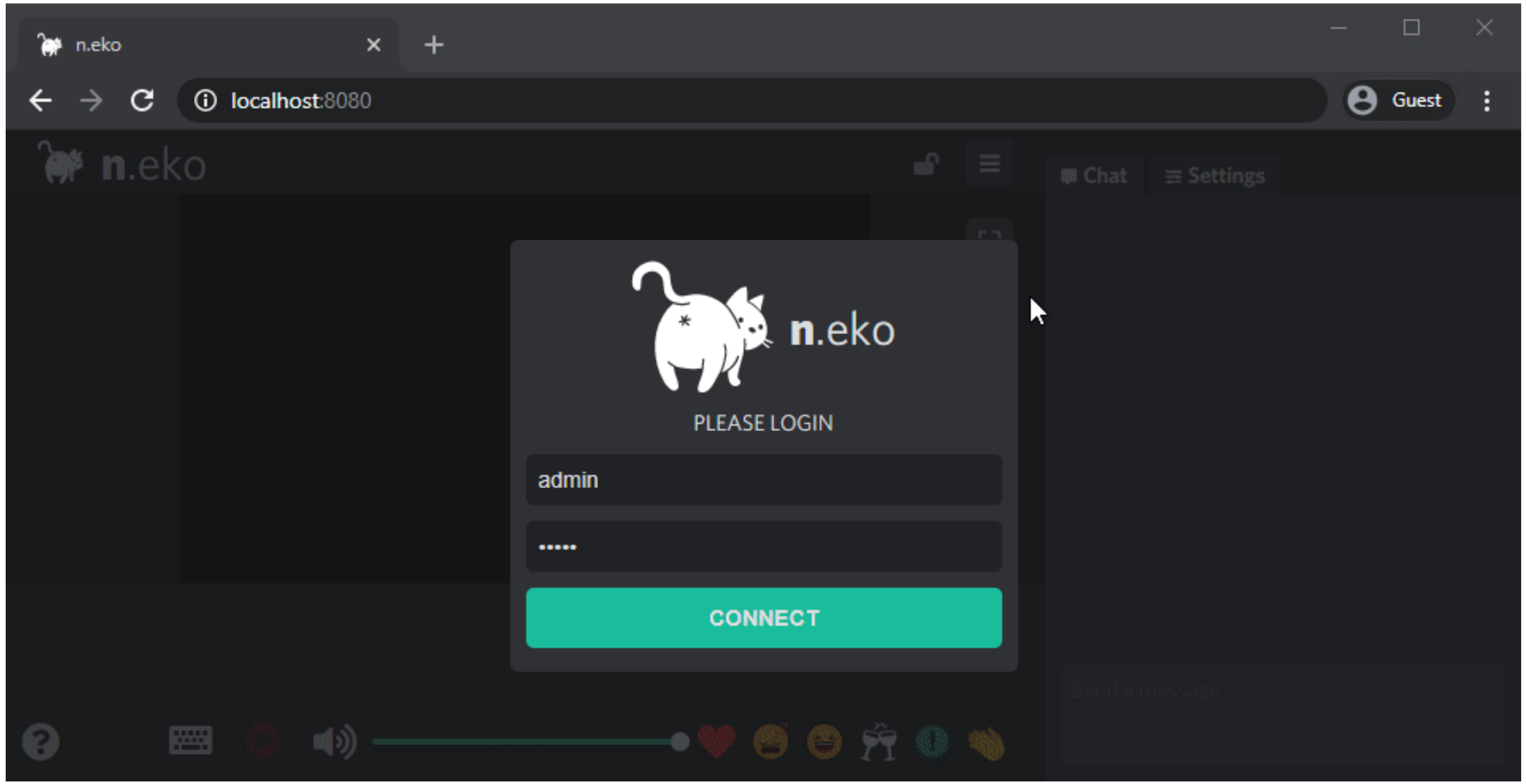
# kerberos.io



# CloudRetro.io

# Neko

## github.com/nurdism/neko



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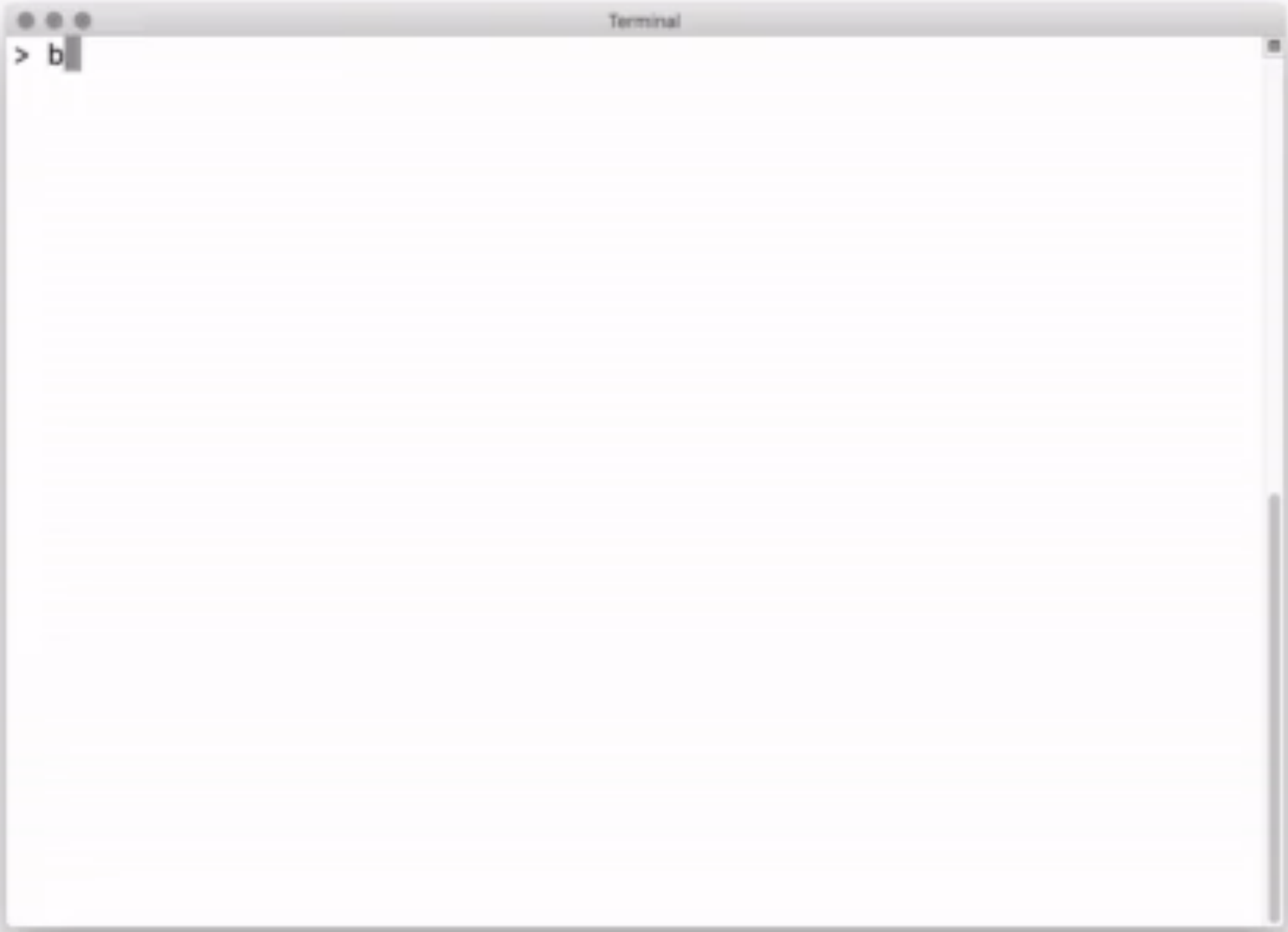
# TelloGo


localhost:3000
Distance
Speed
Distance
Speed
Distance
Speed
Distance
Speed
Distance
Speed
Distance
Speed
Distance

25

# ascii



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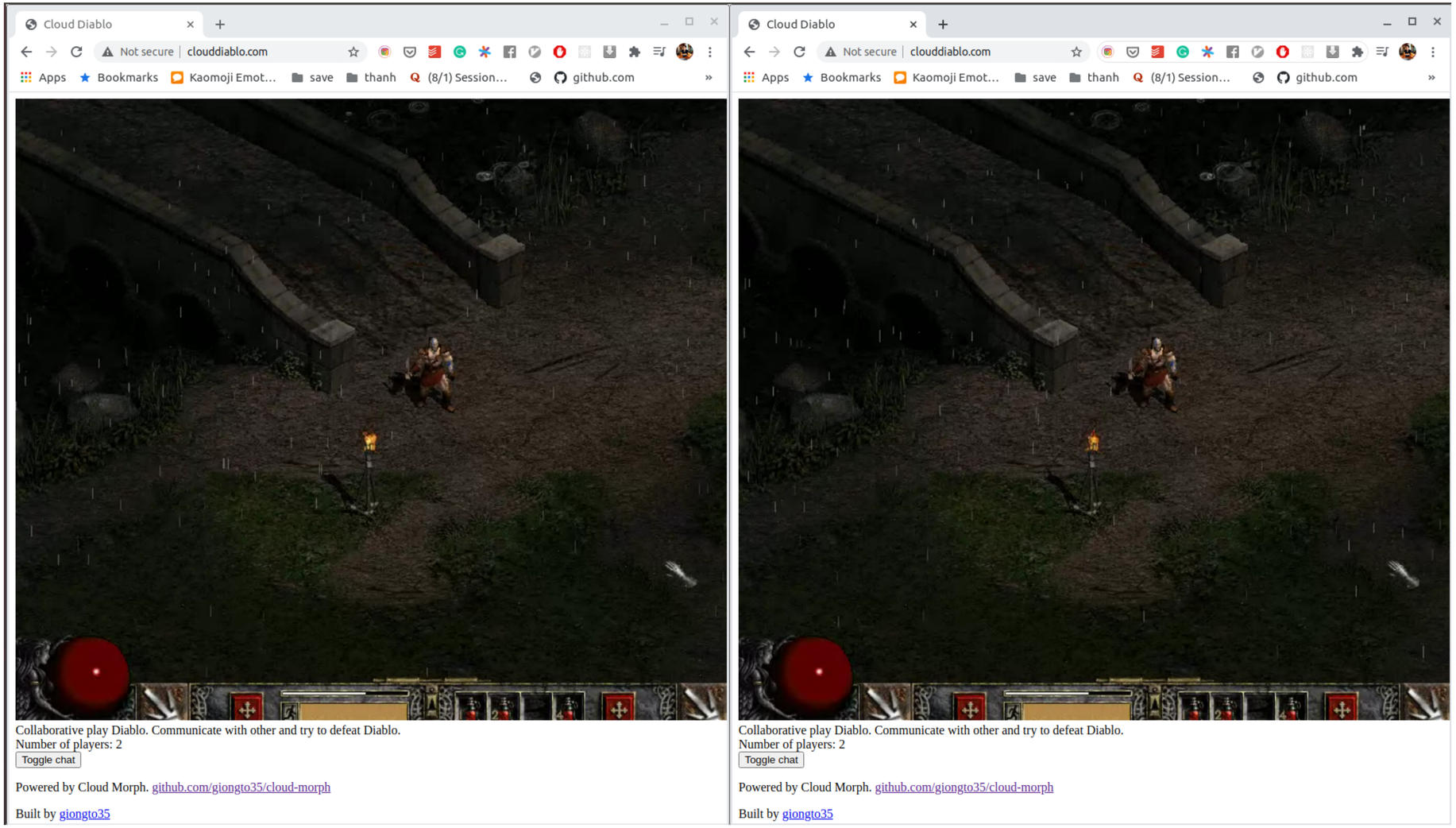
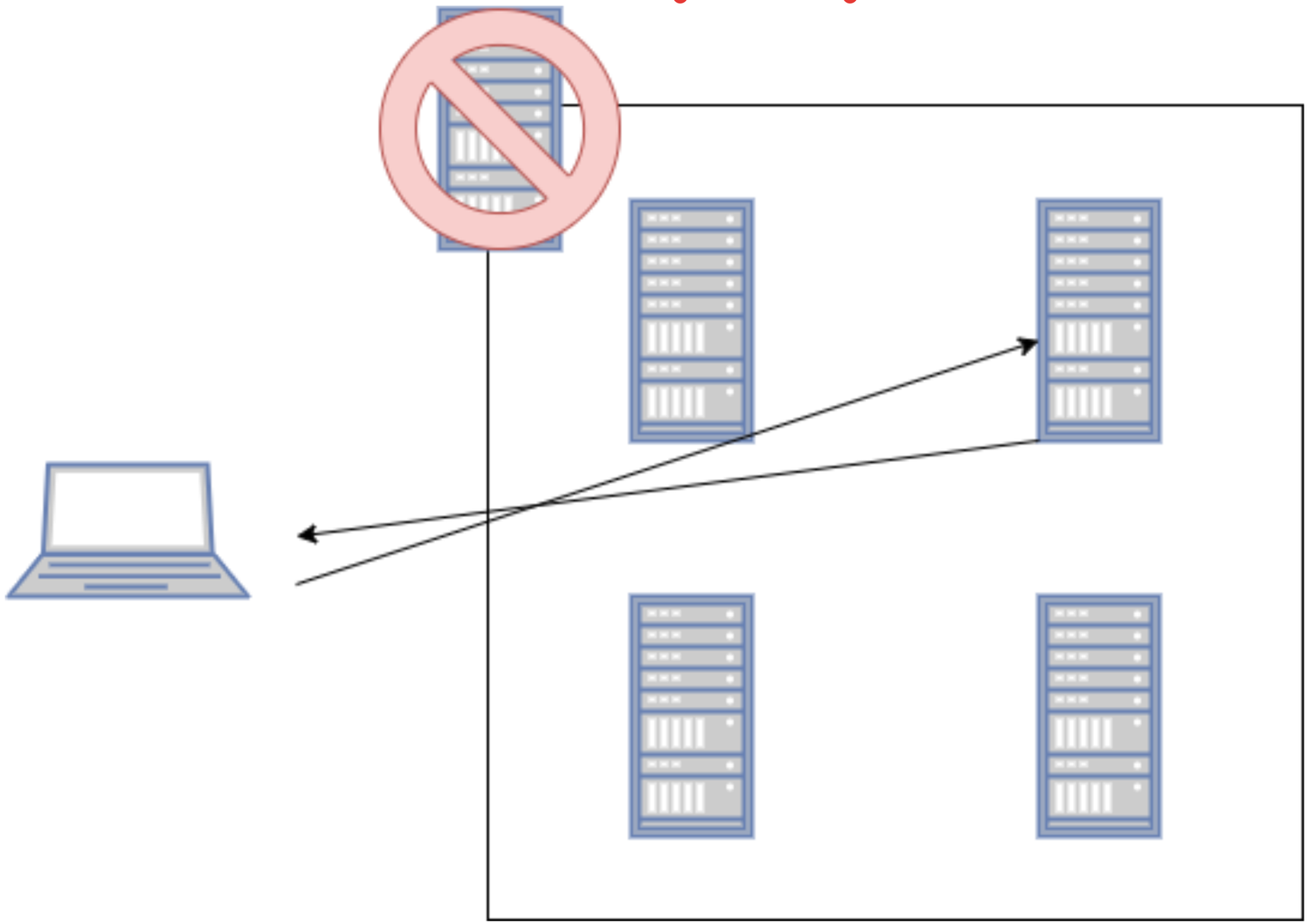
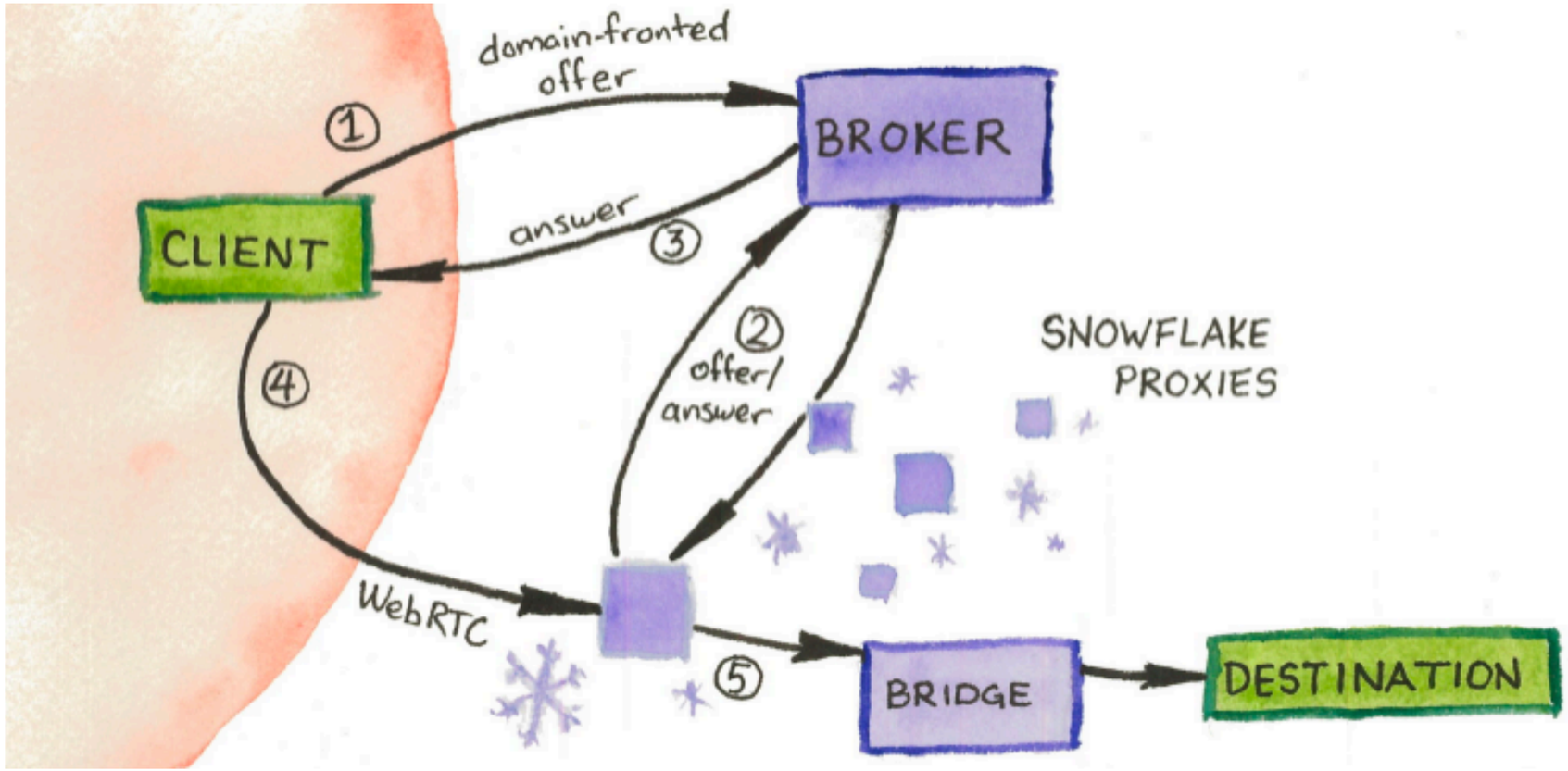
# cloud-morph



# ssh-p2p



# Snowflake


domain-fronted
offer
1
BROKER
CLIENT
answer
3
2
offer/
answer
SNOWFLAKE
PROXIES
4
WebRTC
5
BRIDGE
DESTINATION

# webwormhole.io

# s4y/space

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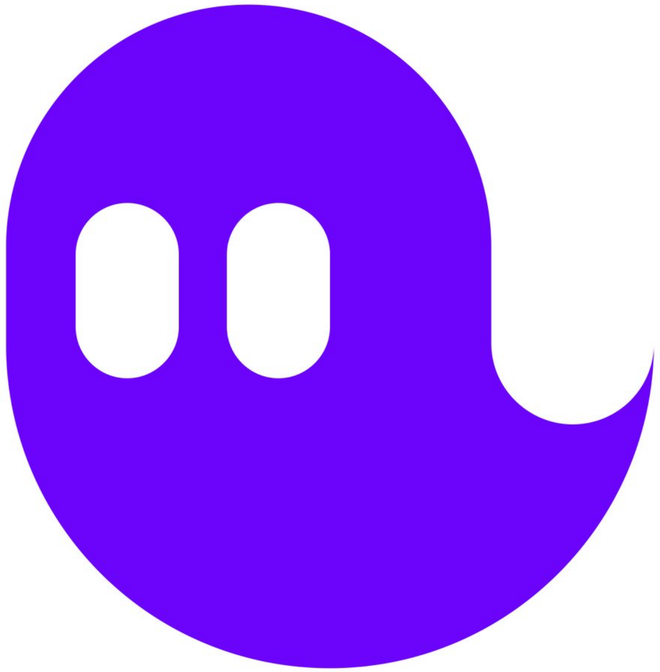
# Project Lightspeed



# Even more projects

GitHub.com/pion/awesome-pion

We want to share your projects!

# 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