

NETFLIX

Nina Bargisen

Nov 6 2017

NETFLIX

- >109 million members
- > 190 countries
- > 125 million hours of TV shows and movies per day

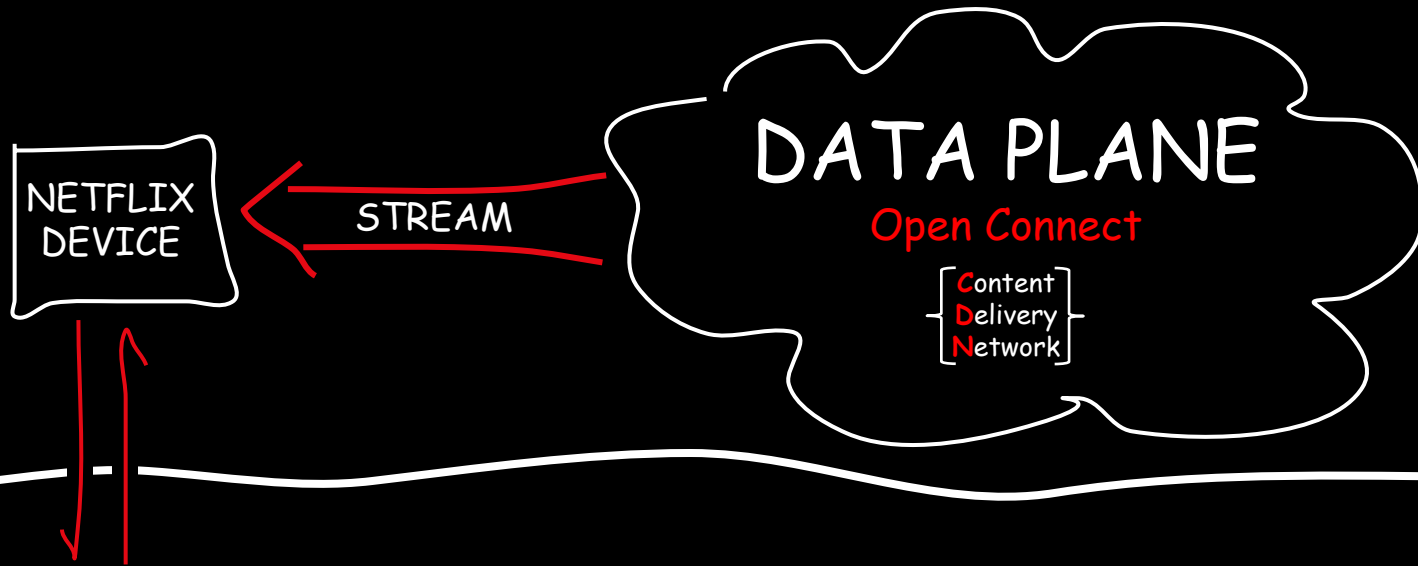
A young man with long, wavy hair, wearing a dark jacket over a striped shirt, is looking upwards with a concerned expression. He is standing in a room decorated with numerous strings of colorful, multi-colored string lights (red, green, blue, yellow, pink) that are strung across the ceiling and walls. The room appears to be a living area with a window in the background and a bookshelf or storage unit on the right. The overall atmosphere is warm and festive, typical of a holiday season.

How
NETFLIX
Works

Inventing Internet TV:

- The architecture of internet streaming
- Quality of Experience





CONTROL PLANE



NETFLIX ORIGINAL STRANGER THINGS

★★★★★ 2016 TV-14 1 Season

Next Up

S1:E4 "Chapter Four: The Body"

Refusing to believe Will is dead, Joyce tries to connect with her son. The boys give Eleven a makeover. Nancy and Jonathan form an unlikely alliance.

 MY LIST

OVERVIEW


EPISODES

TRAILERS & MORE

MORE LIKE THIS

DETAILS



before streaming starts = control plane = 

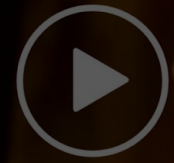
NETFLIX ORIGINAL
STRANGER THINGS

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- OVERVIEW
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DETAILS

streaming = data plane = Open Connect

A young girl with short, dark hair, wearing a blue jacket over a light-colored, textured sweater, stands in a rocky, outdoor setting. She has a serious expression and is looking directly at the camera. The background consists of dark, jagged rocks and some sparse, dry vegetation.

Data Plane

(streaming playback)



Open Connect

A NETFLIX
ORIGINAL

Q: What is a Content Delivery Network?

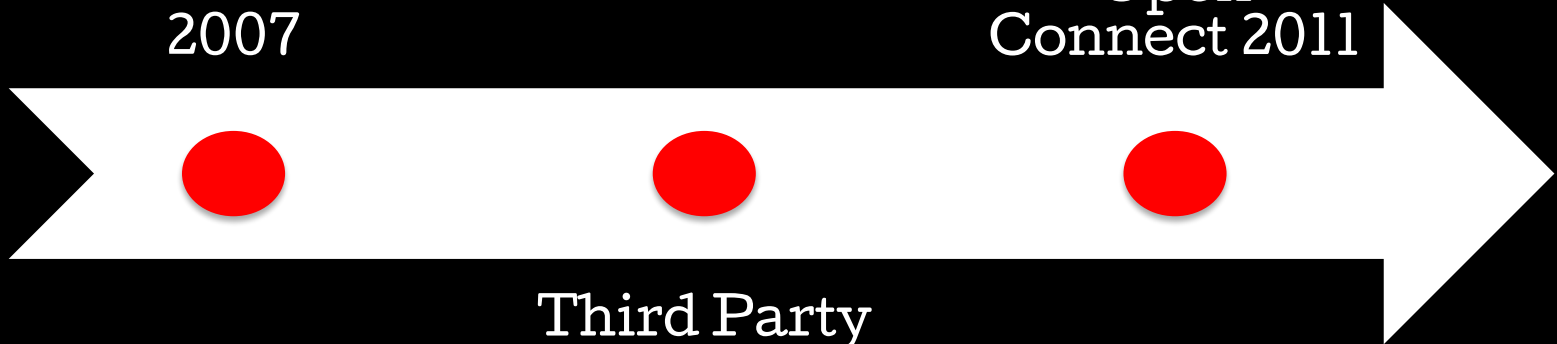
A: Geographically distributed content servers attached to networks
+
a way of routing requests to the closest (and/or best performing) server / network path

History

Streaming
Launched
("EHub")
2007

Open
Connect 2011

Third Party
CDN 2009

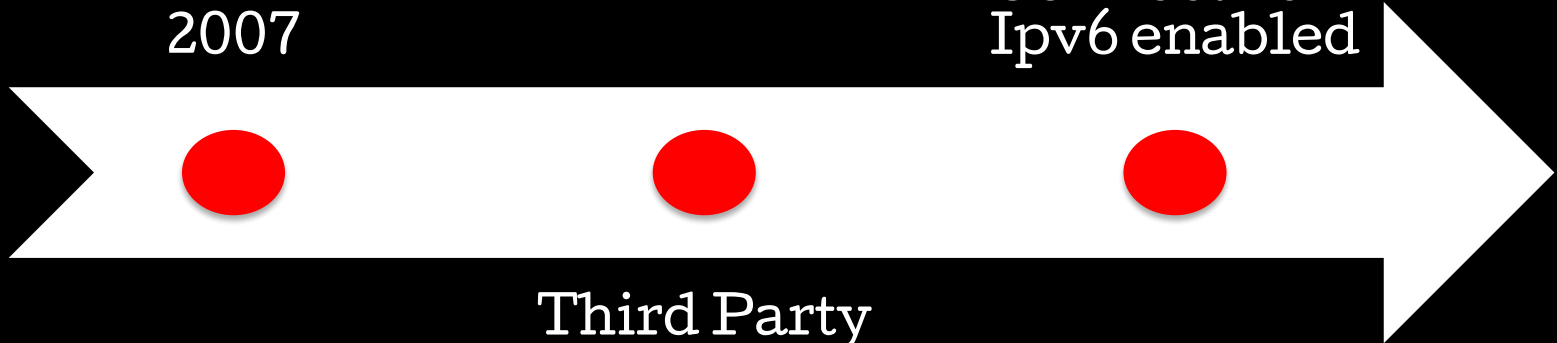


History

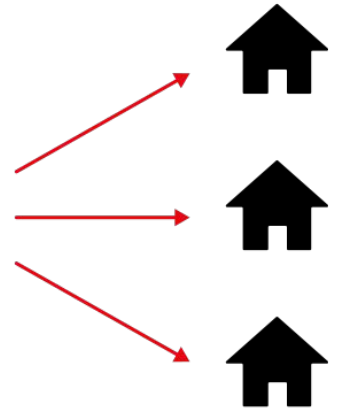
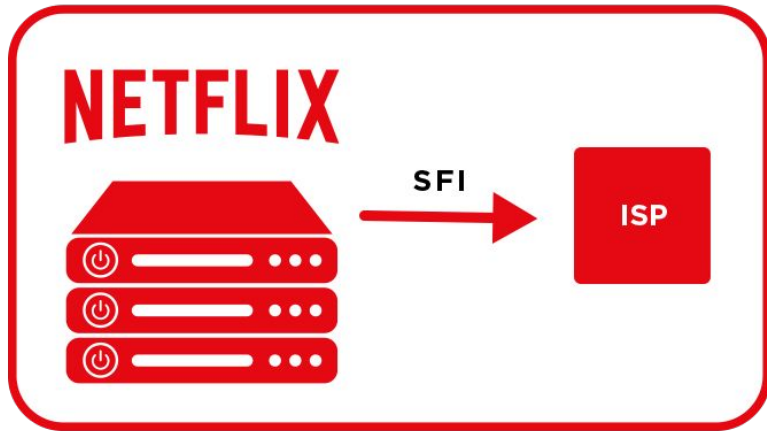
Streaming
Launched
("EHub")
2007

Open
Connect 2011
Ipv6 enabled

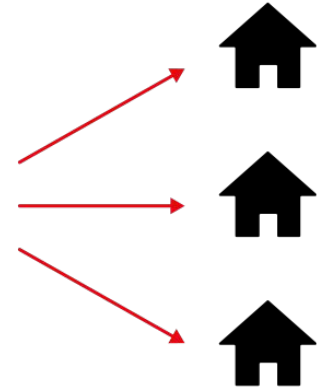
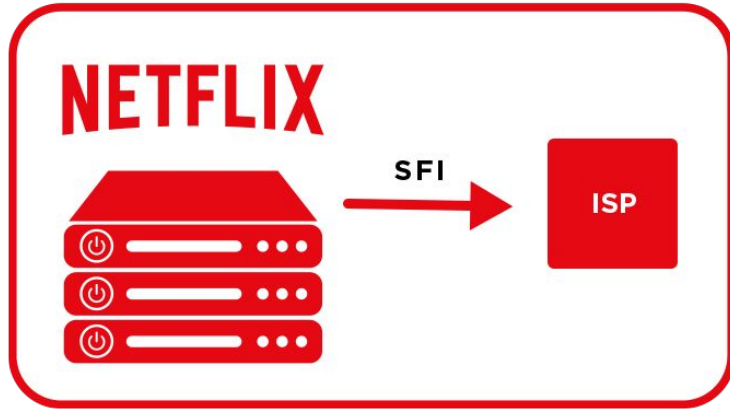
Third Party
CDN 2009
IPv6 enabled

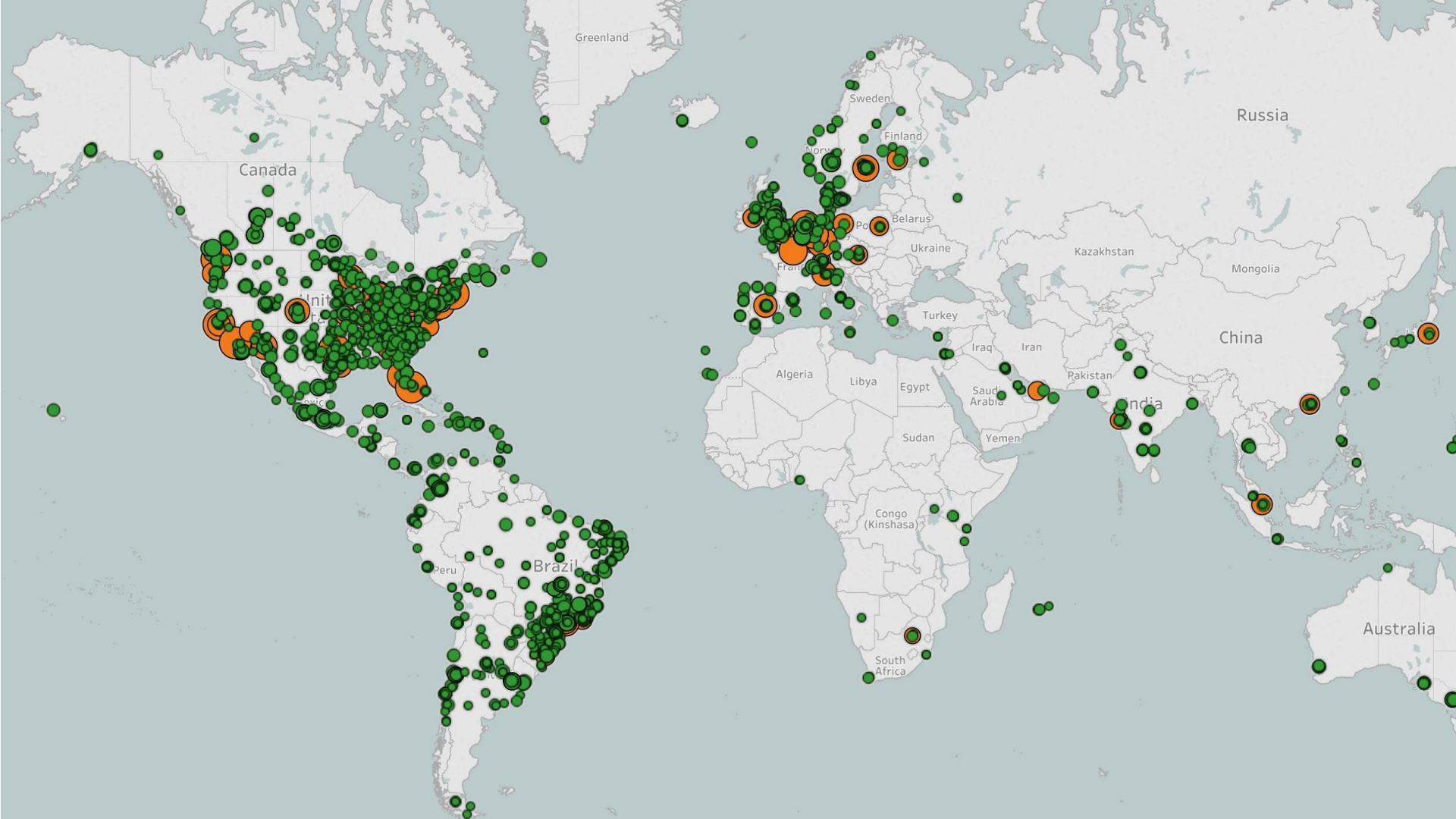


IX SITE

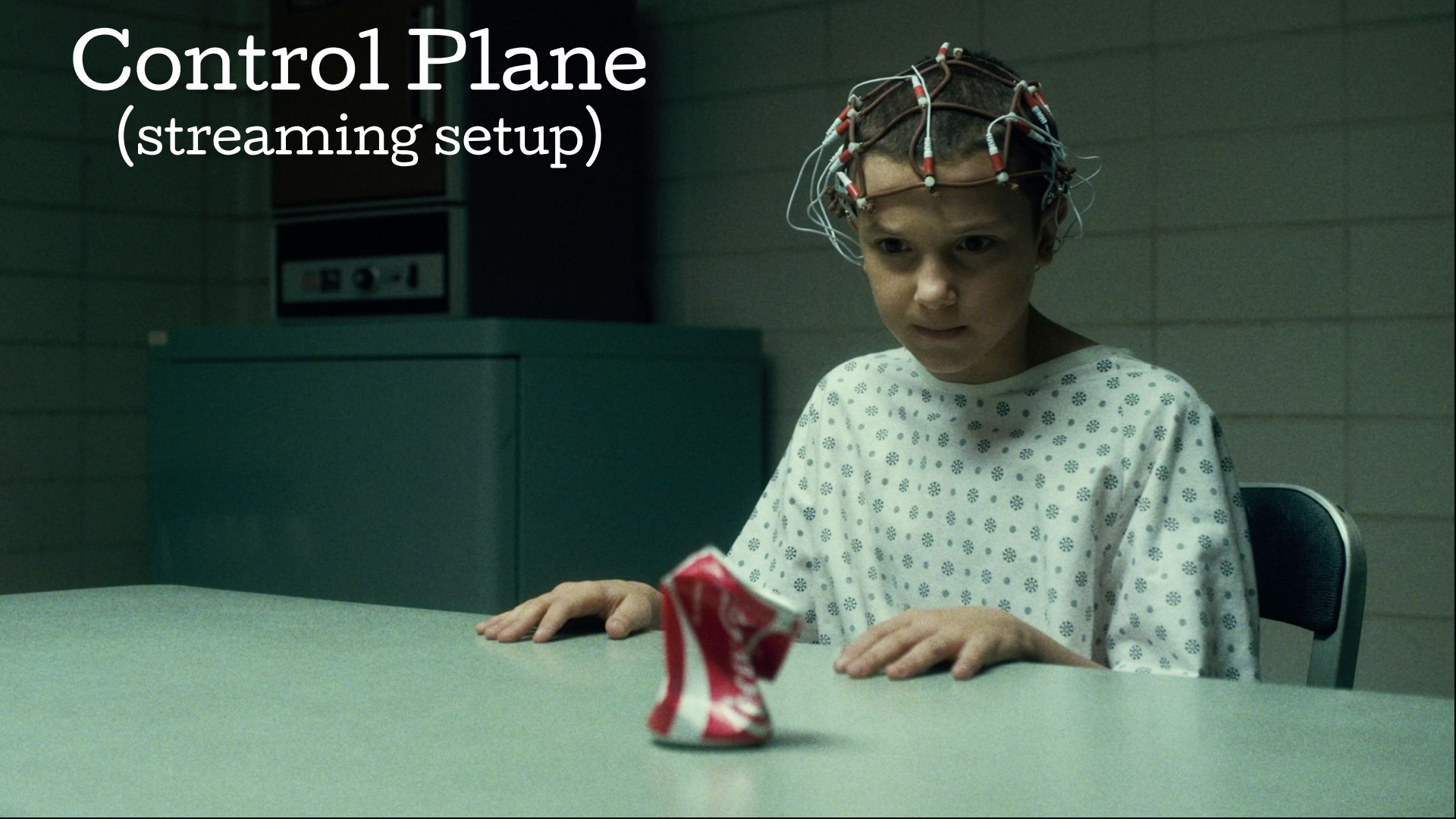


IX SITE





Control Plane (streaming setup)



NETFLIX ORIGINAL STRANGER THINGS

★★★★★ 2016 TV-14 1 Season

Resume

S1:E8 "Chapter Eight: The Upside Down"

52 of 54m

Dr. Brenner holds Hopper and Joyce for questioning while the boys wait with Eleven in the gym. Back at Will's, Nancy and Jonathan prepare for battle.

+ MY LIST

OVERVIEW

EPISODES

TRAILERS & MORE

MORE LIKE THIS

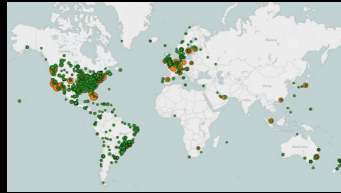
DETAILS

Determine the preferred experience

TITLE



LOCATION



DEVICE



LANGUAGE



- Dansk
- Deutsch
- English
- Español
- Français
- Nederlands
- Norsk bokmål
- Português
- Suomi
- Svenska
- 日本語

NETWORK



Broadband - wired or
wifi
Cellular - Edge, 3G,
LTE, ...

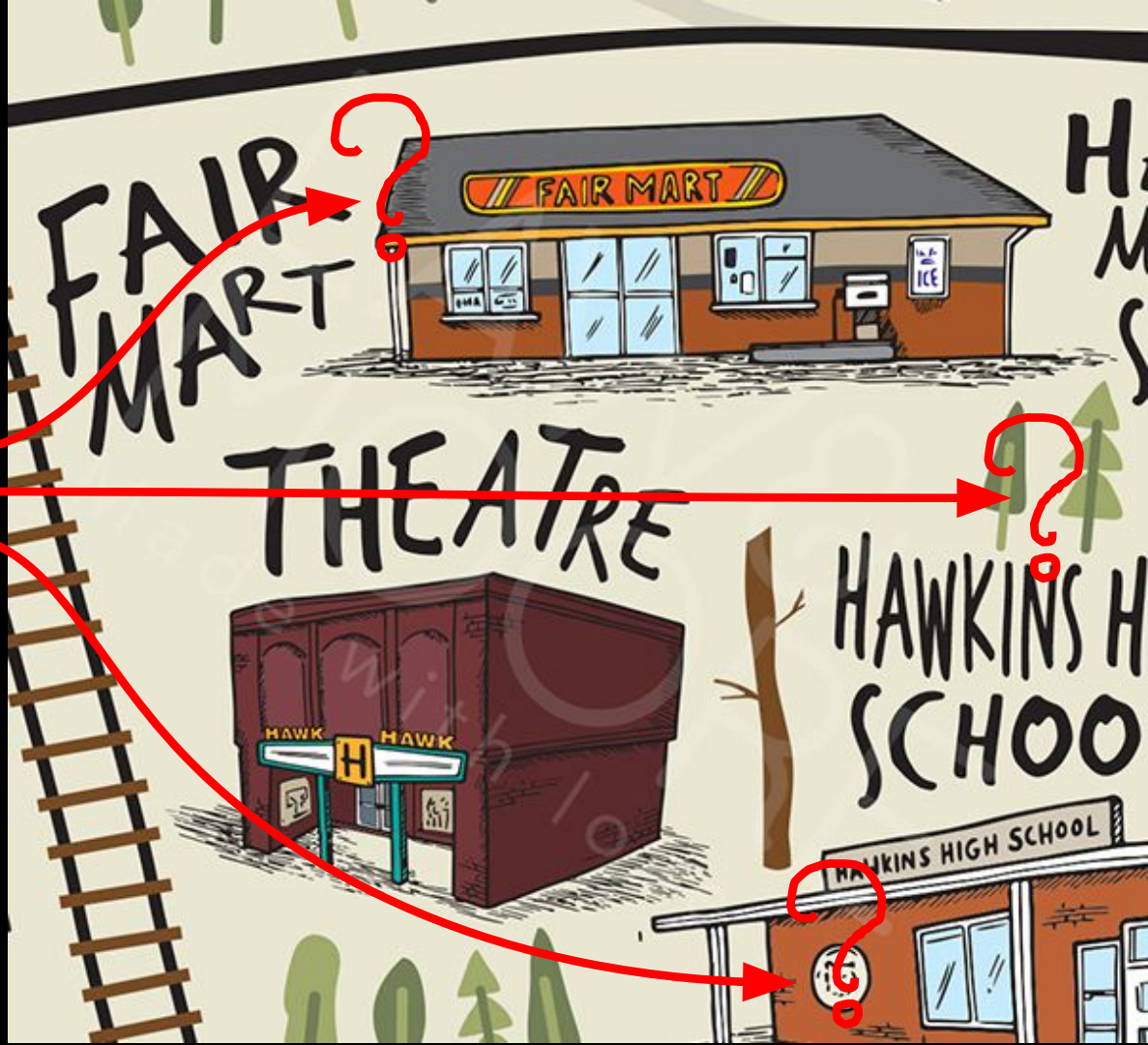
CONNECTIONS



HDCP support,
etc.

That's exactly what I want

...now
where
can I get
it?



PLAYBACK

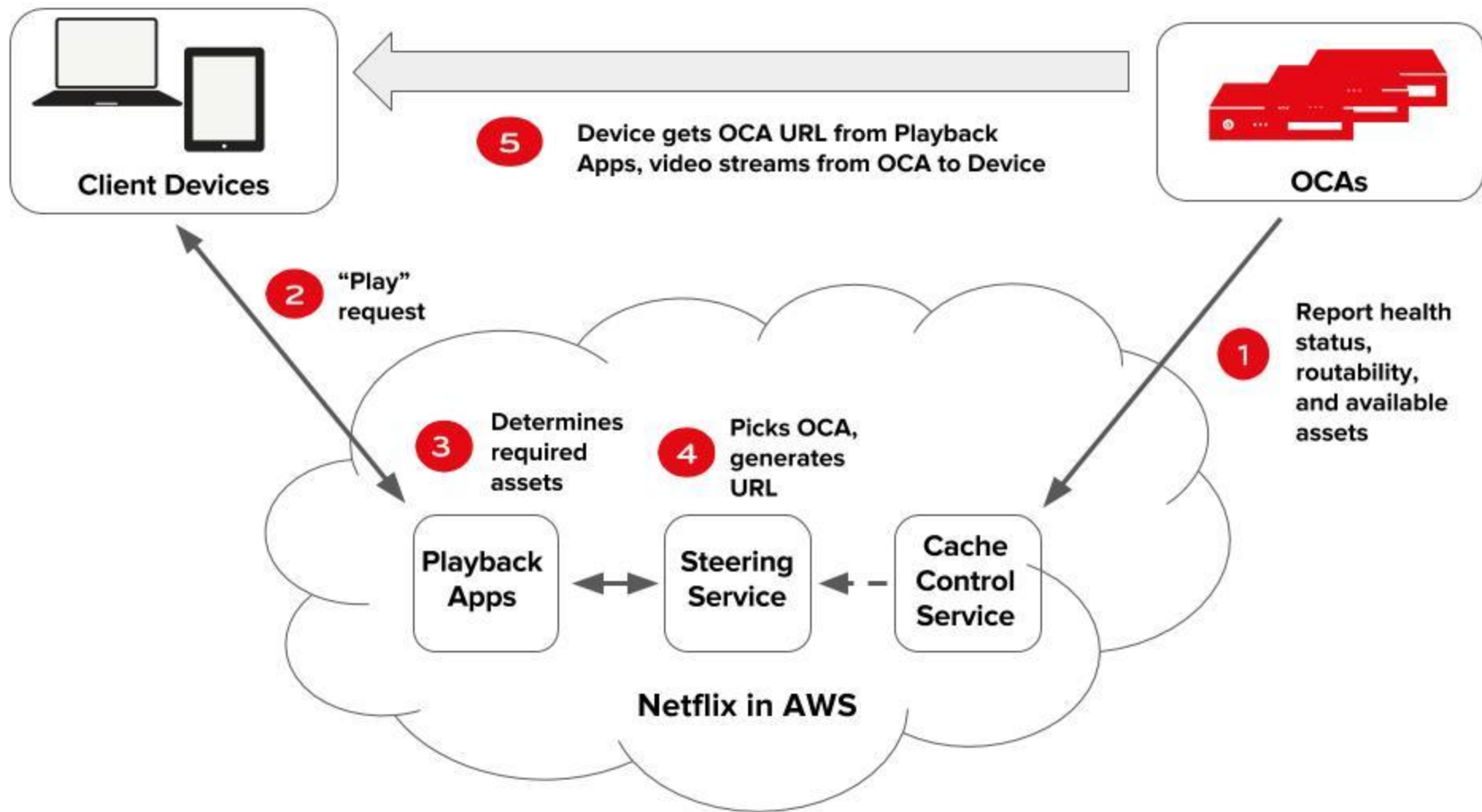
GENERATE
PLAYBACK
MANIFEST

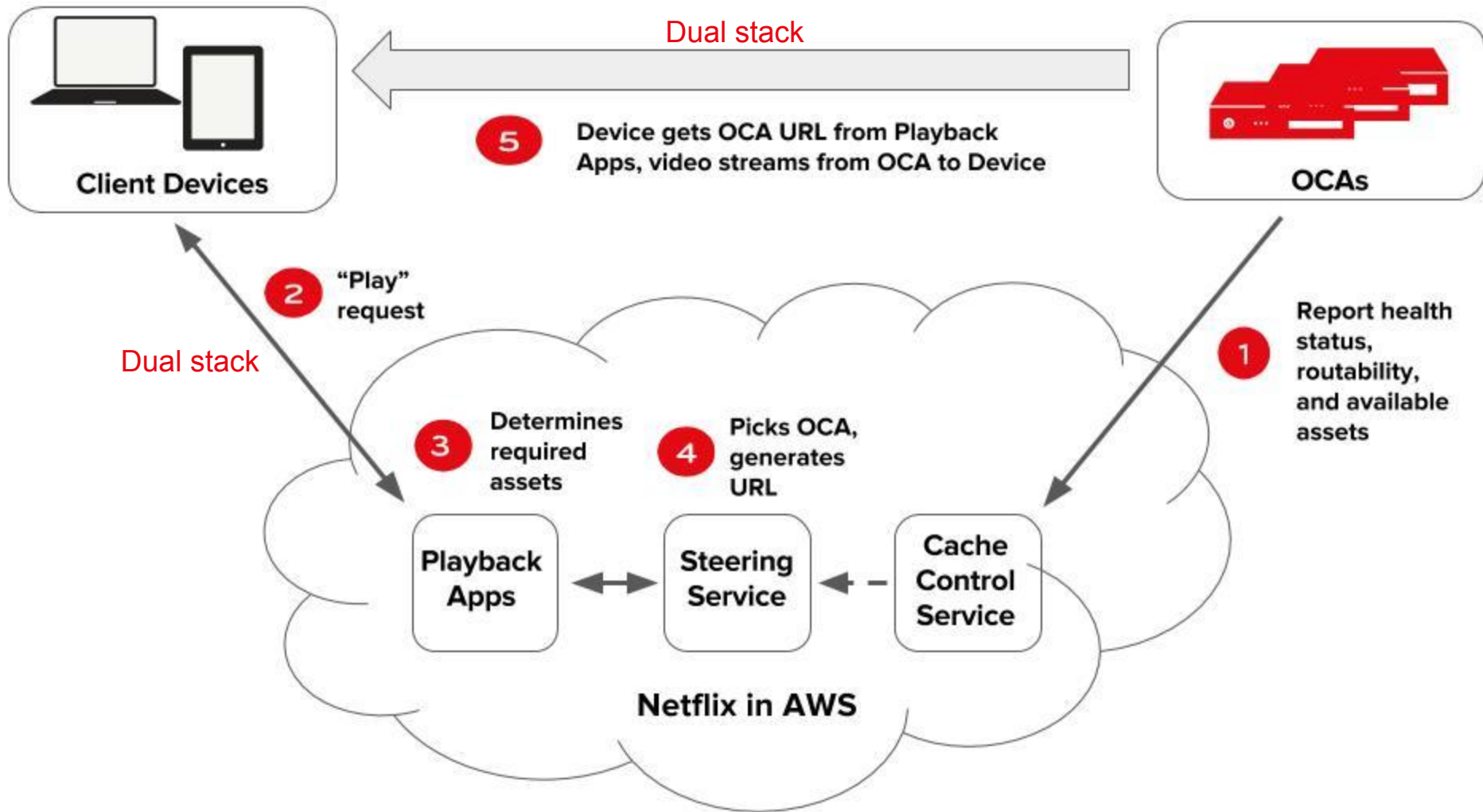
PLAYBACK
MANIFEST

▶ **PLAY**

{ This is how we steer the request to the
correct server/network/location }









STRANGER THINGS



39:13



Stranger Things Season 1: Ep. 1 Chapter One: The Vanishing Of Will Byers



IPv6

pre-play



Zooming in on pre-play

- Name Resolution

- We resolve IPv6 and IPv4 hostnames in parallel
- If the DNS resolution successful for IPv6 attempt connection over IPv6
- If not (fail or timeout) use the DNS resolution for IPv4
- If DNS resolution is successful for IPv4 attempt connection and IPv6 DNS failure
- If not, log DNS failure

Zooming in on pre-play

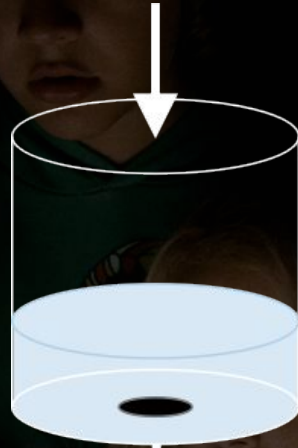
- Connection
 - Attempt connection with timeout
 - If connection fails or times out, attempt connection over IPv4 and log IPv6 connection failure
 - If connection fails or times out log connections failure

Note that for everything not streaming, we failover to IPv4 to the same host

A dark, atmospheric photograph of three individuals wearing hooded rain gear, standing in the rain. Each person is holding a bright flashlight, which illuminates the scene and creates a strong lens flare effect. The background is dark and blurry, suggesting an outdoor setting at night.

Insight into performance
Quality of Experience

input rate (from network)



buffer level

output rate (to screen)

video buffer
(leaky bucket)

The Tradeoff

playdelay

quality

interruption risk



Another
dimension
of resiliency



Failover

The manifest includes 3 servers in priority. If quality is lower than we want, the clients switch to the next server

If the client has an IPv6 address, the first entry is an IPv6 host name

The second is IPv4 based and is a different server from the first server.

If the first connection fail (at either DNS or connection), client switches to the second server using IPv4

Failover

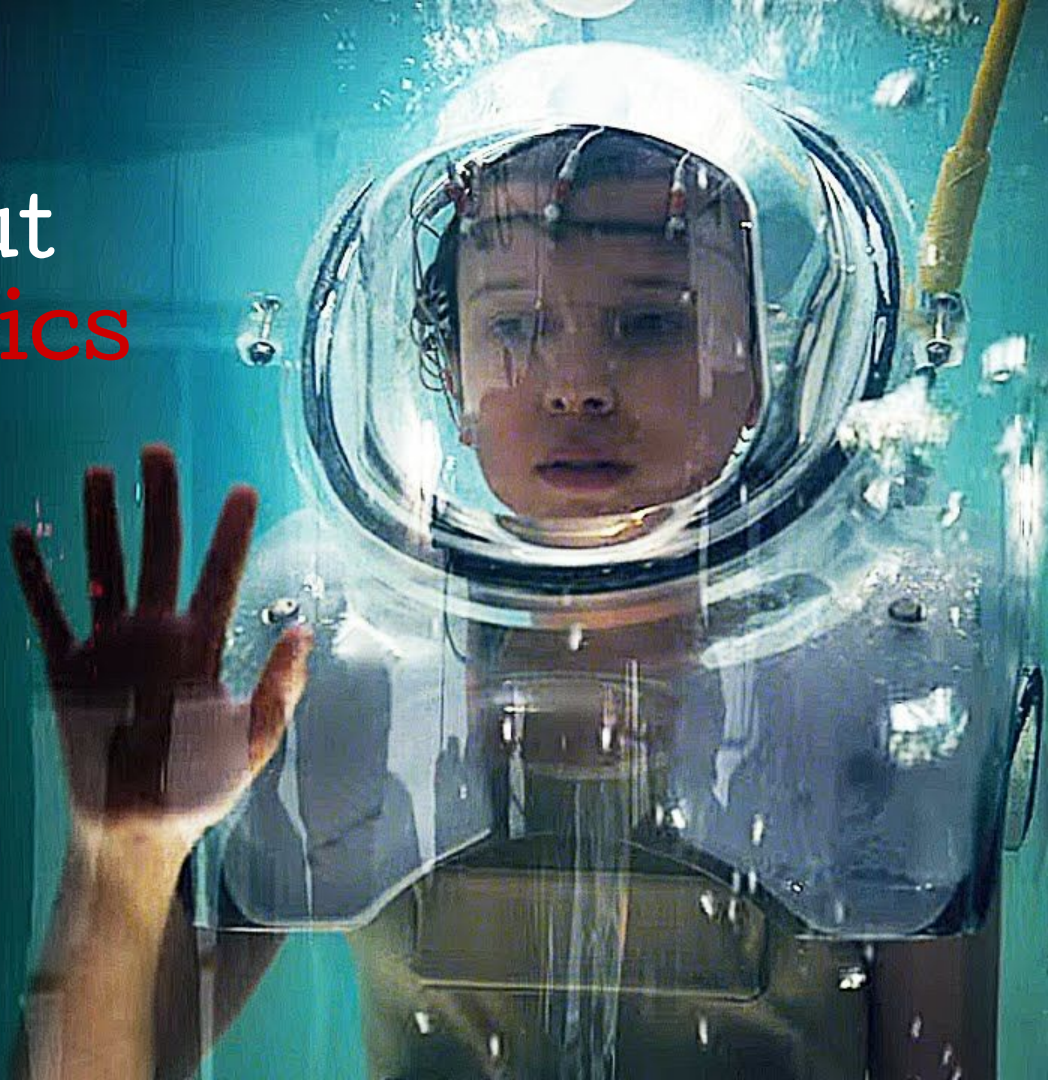
We have similar logging in place as for pre-play. If hosts or clients repeatedly fail on IPv6 , they will be flagged as IPv4 only and we will cease to attempt using IPv6 for that host or client.

Disclaimer

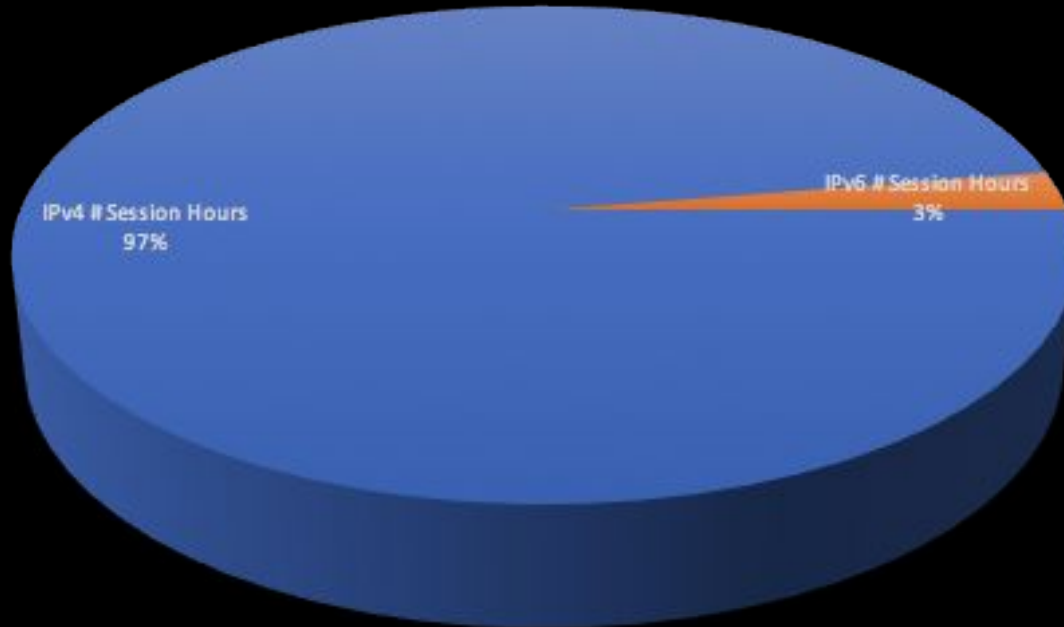
Netflix clients comes in almost all shapes and forms, for devices of all shapes and forms. The above principles are principles, but the actual implementation will vary from client to client.

We try to learn and adapt so it will also vary from version to version...

Never
without
Statistics

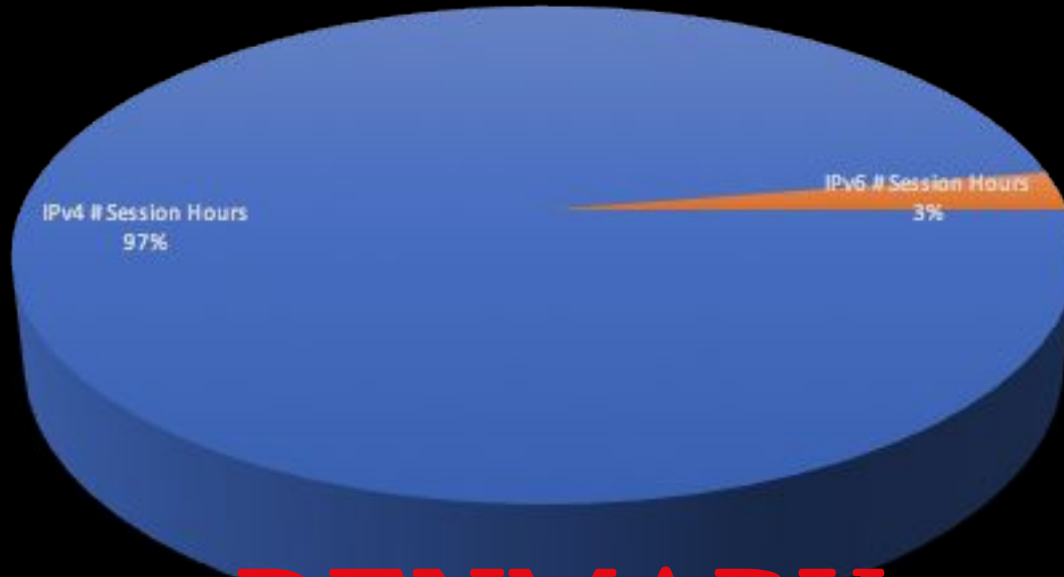


Really?



■ IPv4 # Session Hours ■ IPv6 # Session Hours

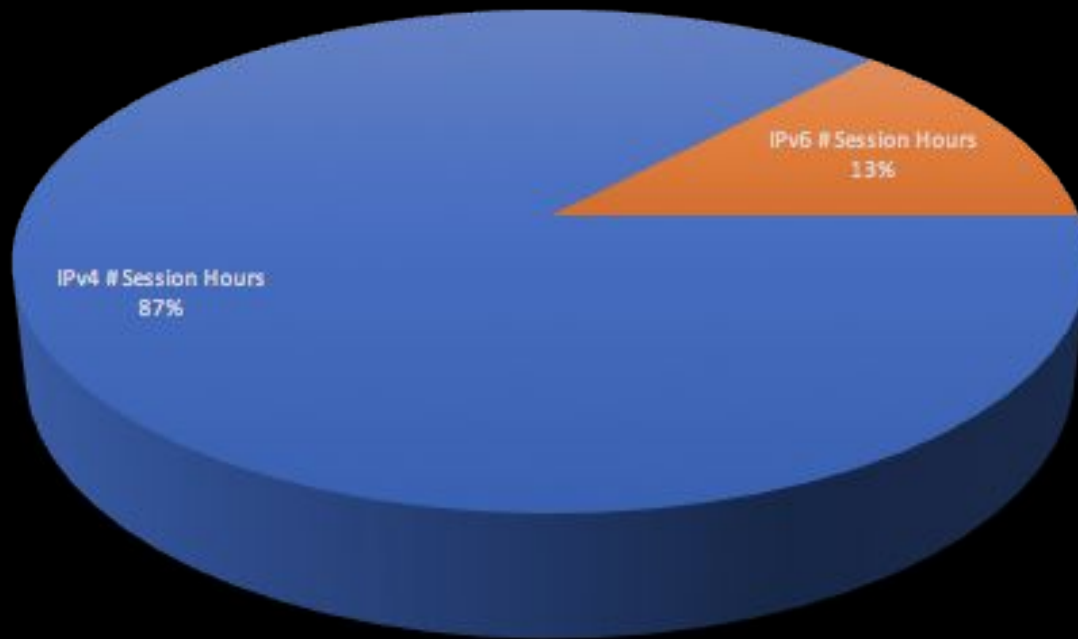
Really?



DENMARK

■ IPv4 # Session Hours ■ IPv6 # Session Hours

Global



■ IPv4 # Session Hours ■ IPv6 # Session Hours

A young girl with a serious expression looking directly at the camera against a blurred green background. She is wearing a white patterned shirt.

Questions?

Open Connect team 2016

