



# NETFLIX

Nina Bargisen  
March 2018

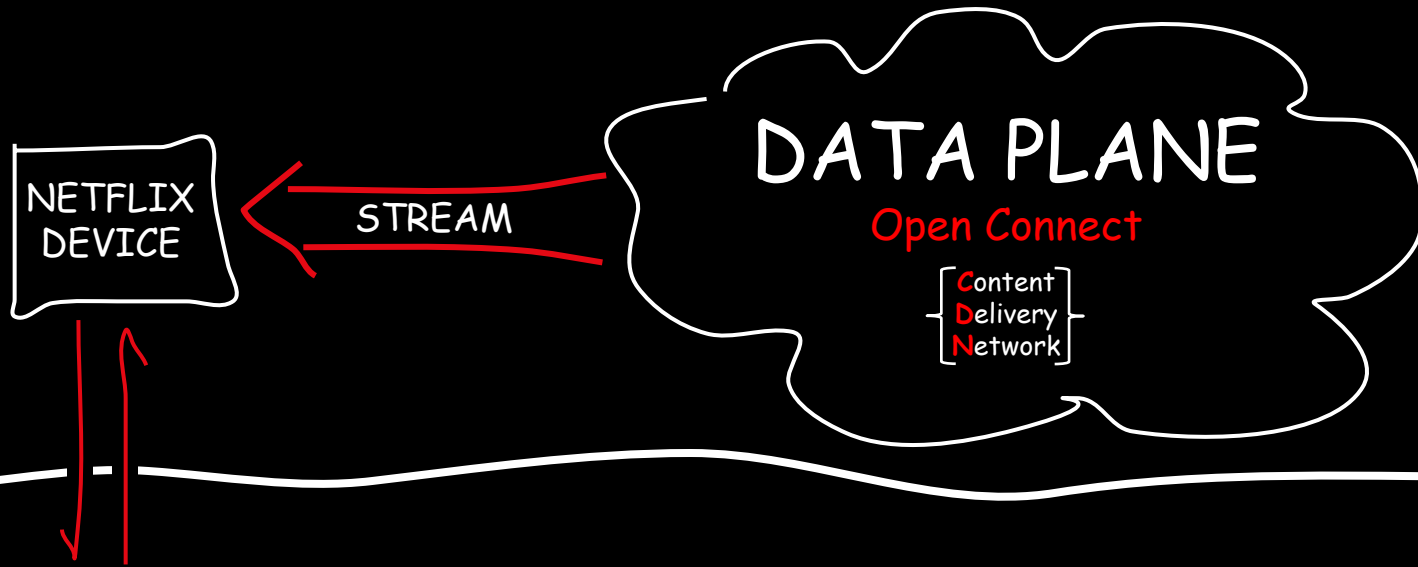
# NETFLIX

- >117 million members
- 190 countries
- > 140 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, glowing string lights in shades of blue, yellow, pink, and white. The room has wood-paneled walls and a window with white curtains in the background. The overall atmosphere is warm and festive, typical of a holiday season.

How  
**NETFLIX**  
Works





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**

★★★★★ 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](#)

The image shows a screenshot of the Netflix interface for the show "Stranger Things". It features a dark background with a video player overlay. The player shows a scene from the show with a large play button in the center. The text on the left side of the player provides details about the show, including its rating, release year, and a description of the next episode. At the bottom, there are navigation tabs for "OVERVIEW", "EPISODES", "TRAILERS & MORE", "MORE LIKE THIS", and "DETAILS".

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

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?

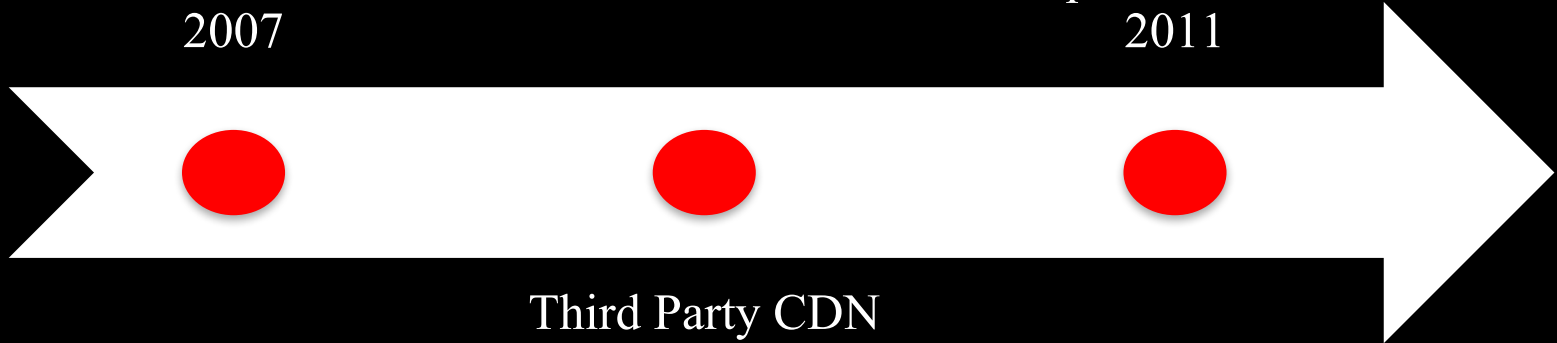
A: Geographically distributed content servers attached to networks  
+  
a way of routing requests to the closest (and/or best performing)  
server / network path

# History

Streaming  
Launched  
("EHub")  
2007

Open Connect  
2011

Third Party CDN  
2009



# Hardware

Open

Connect

Appliances

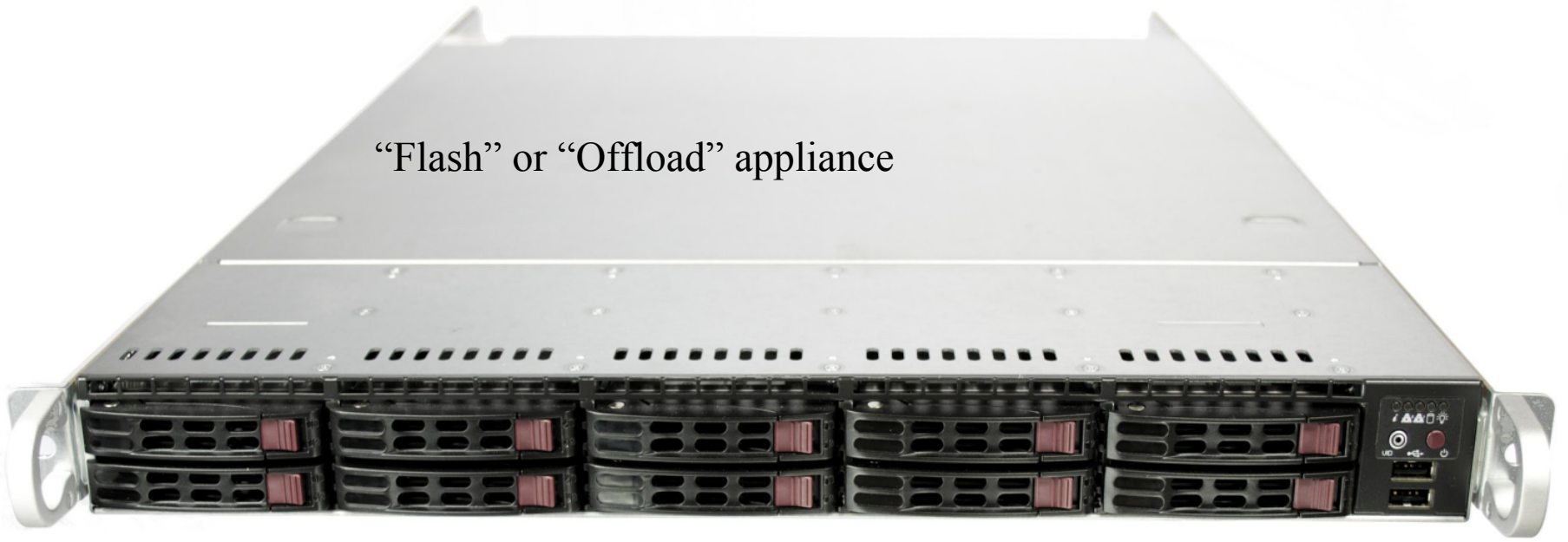


“Storage” appliance



Designed for bulk storage of the entire large regional content catalogs

“Flash” or “Offload” appliance



High-throughput servers, used to serve very popular content

# Open Connect

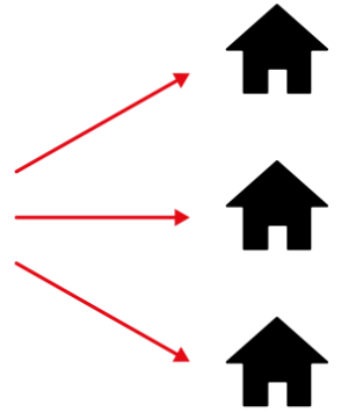
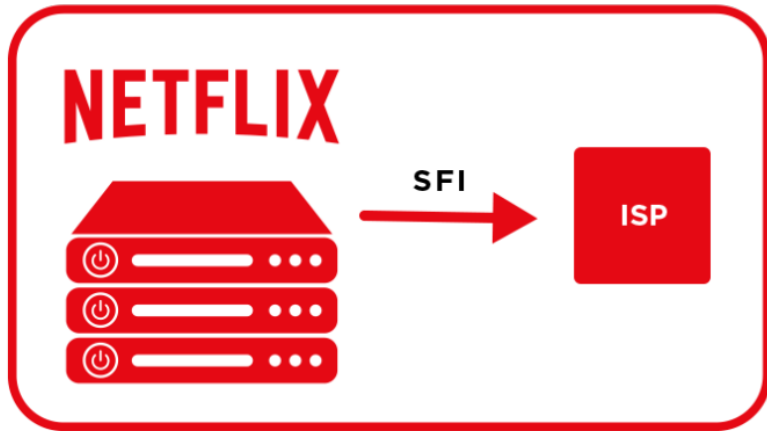
connects directly to

residential ISP networks.

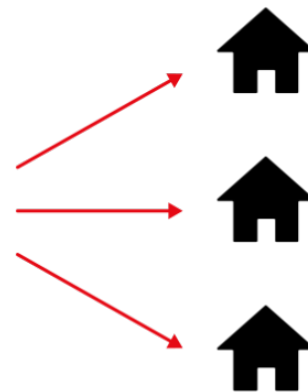
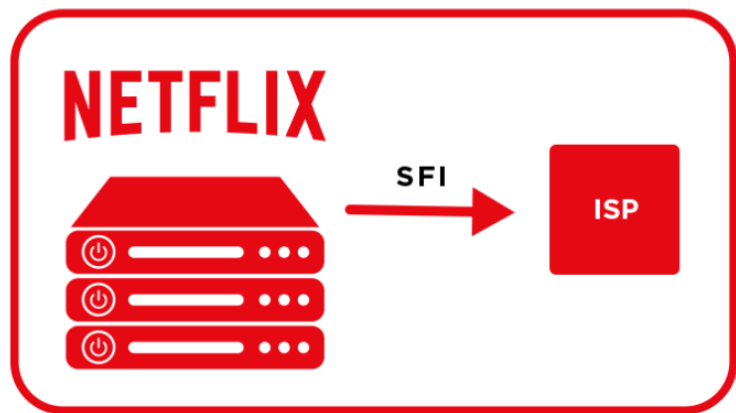
95% of our traffic is directly  
connected.

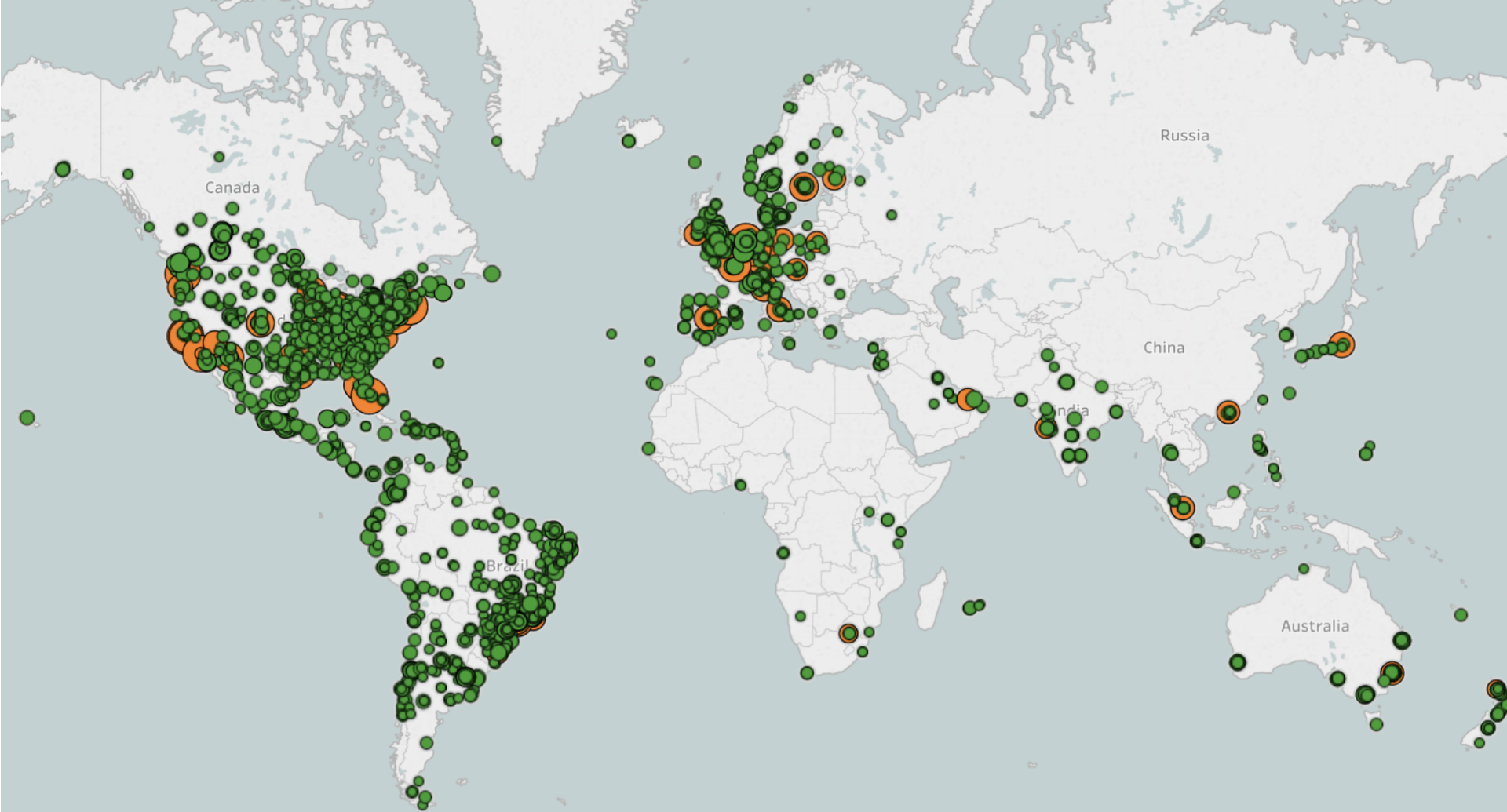


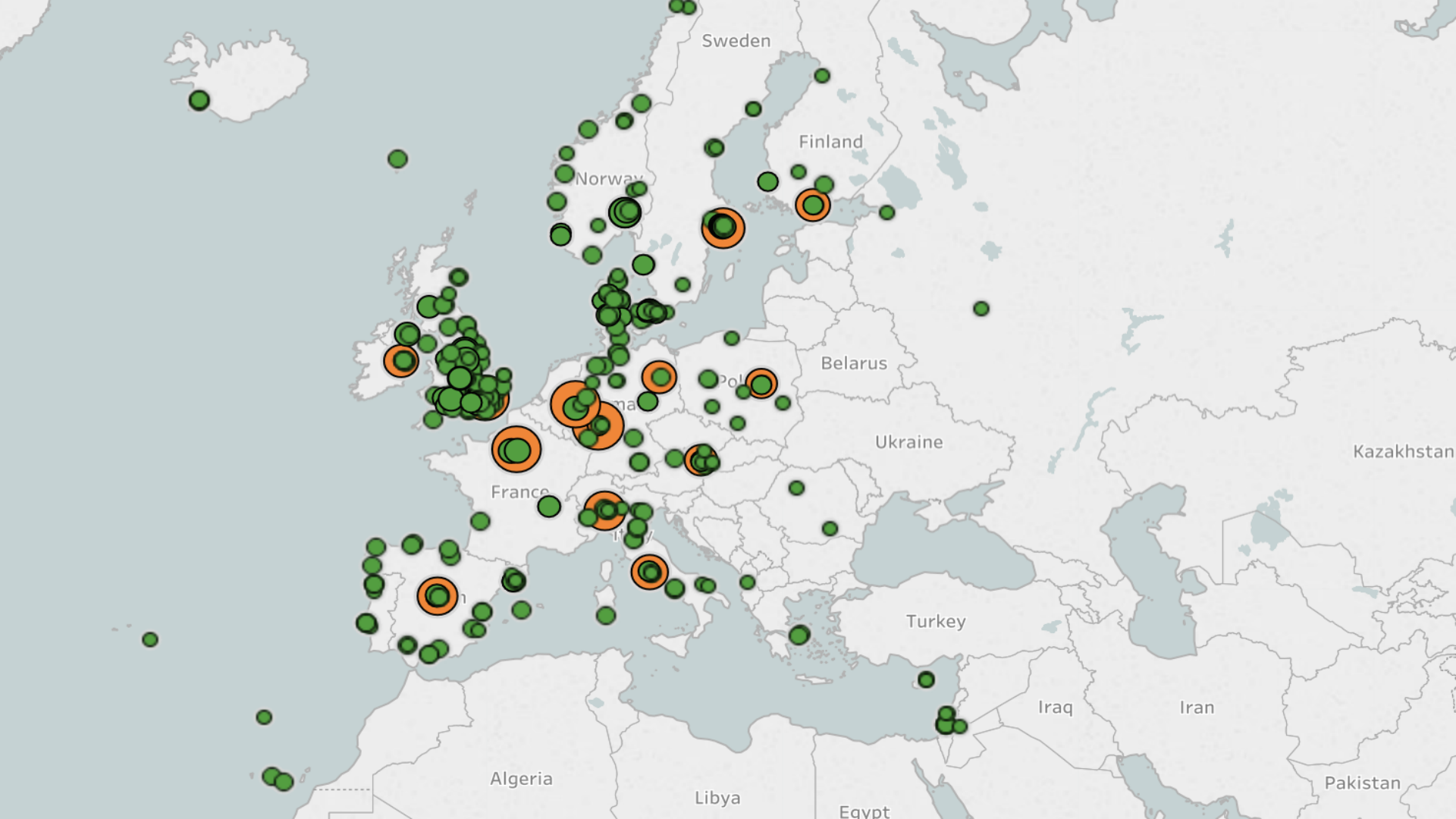
## IX SITE



## IX SITE

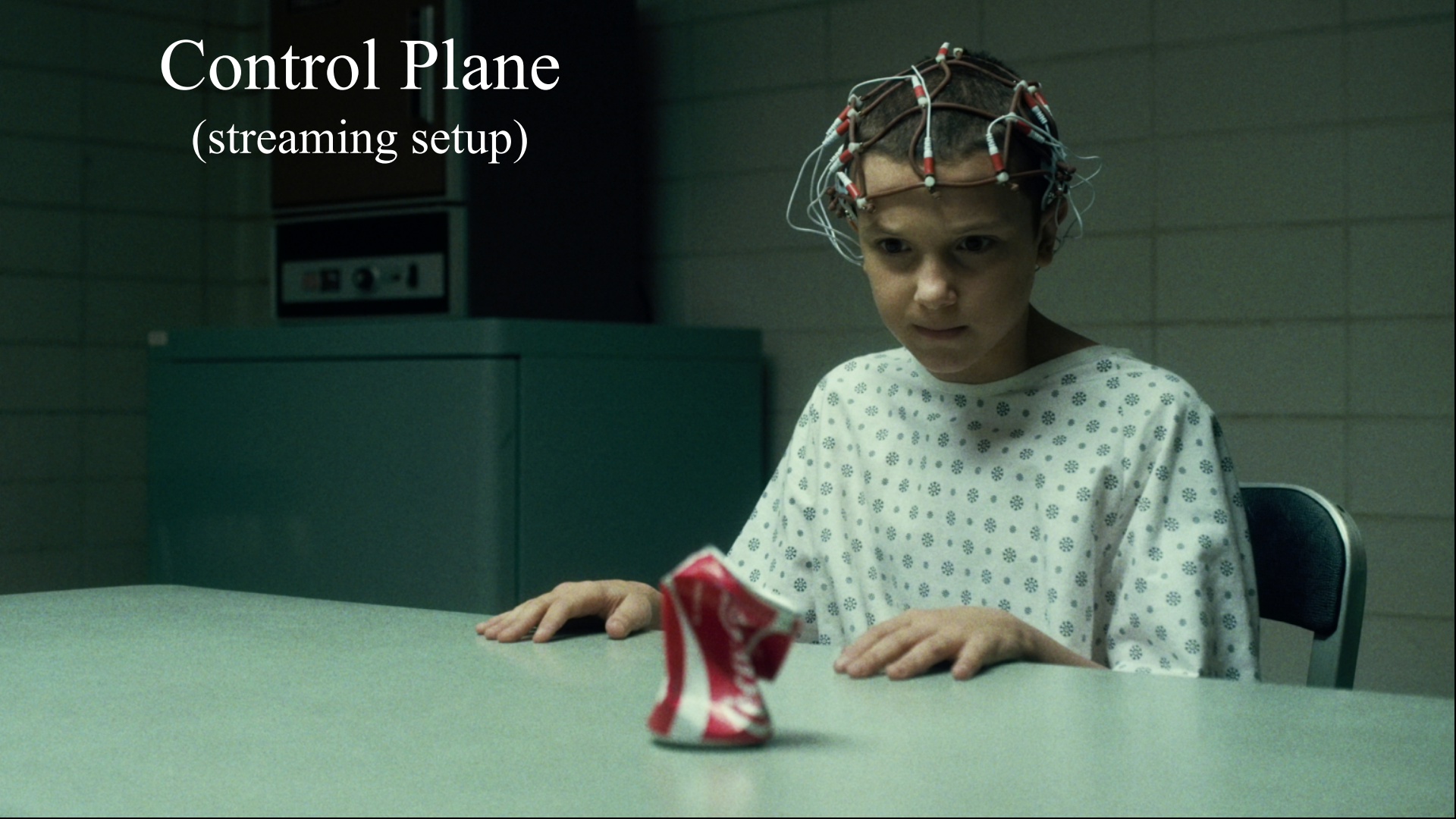






# Control Plane

(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

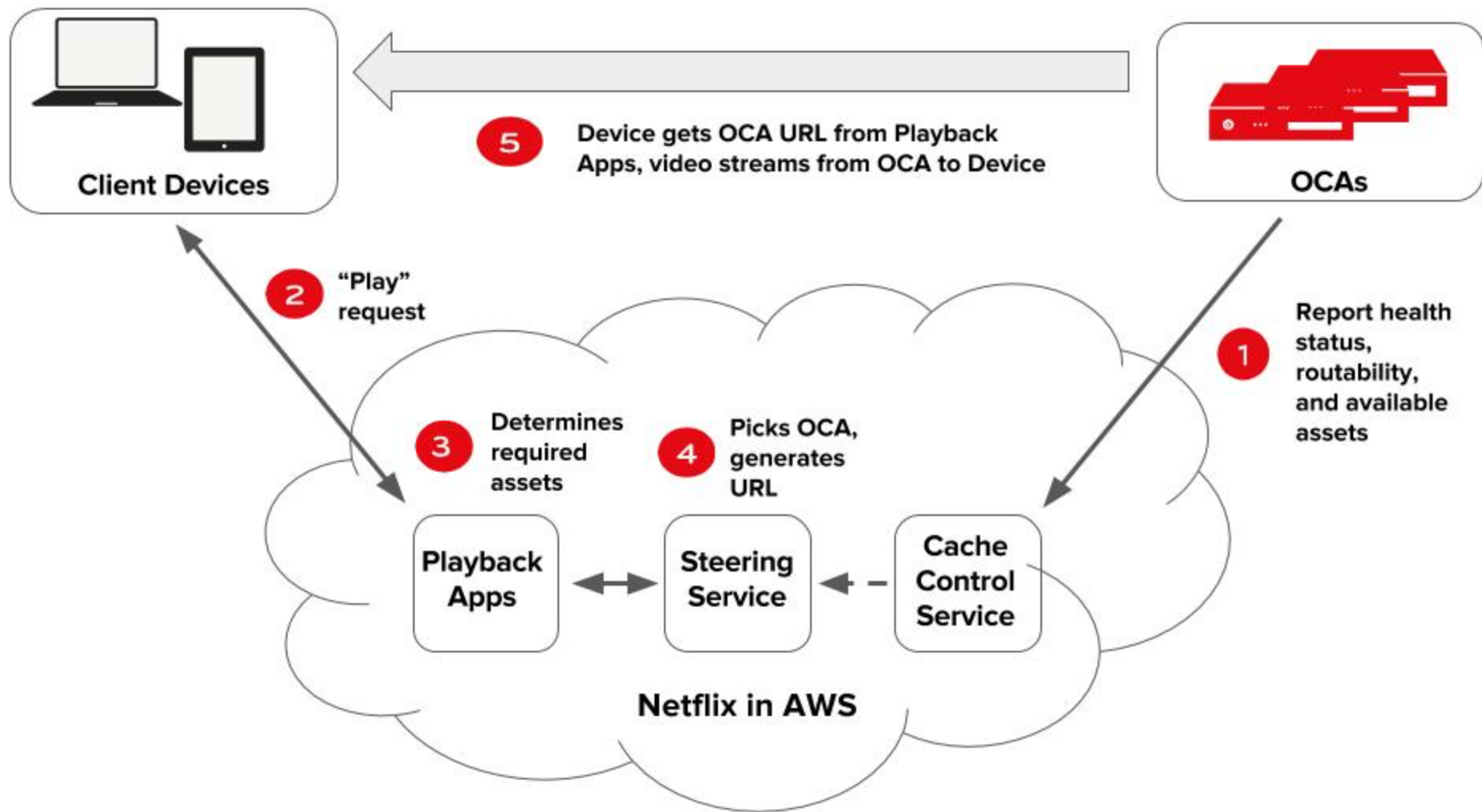
GENERATE  
PLAYBACK  
MANIFEST

PLAYBACK  
MANIFEST

▶ PLAY

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







# STRANGER THINGS



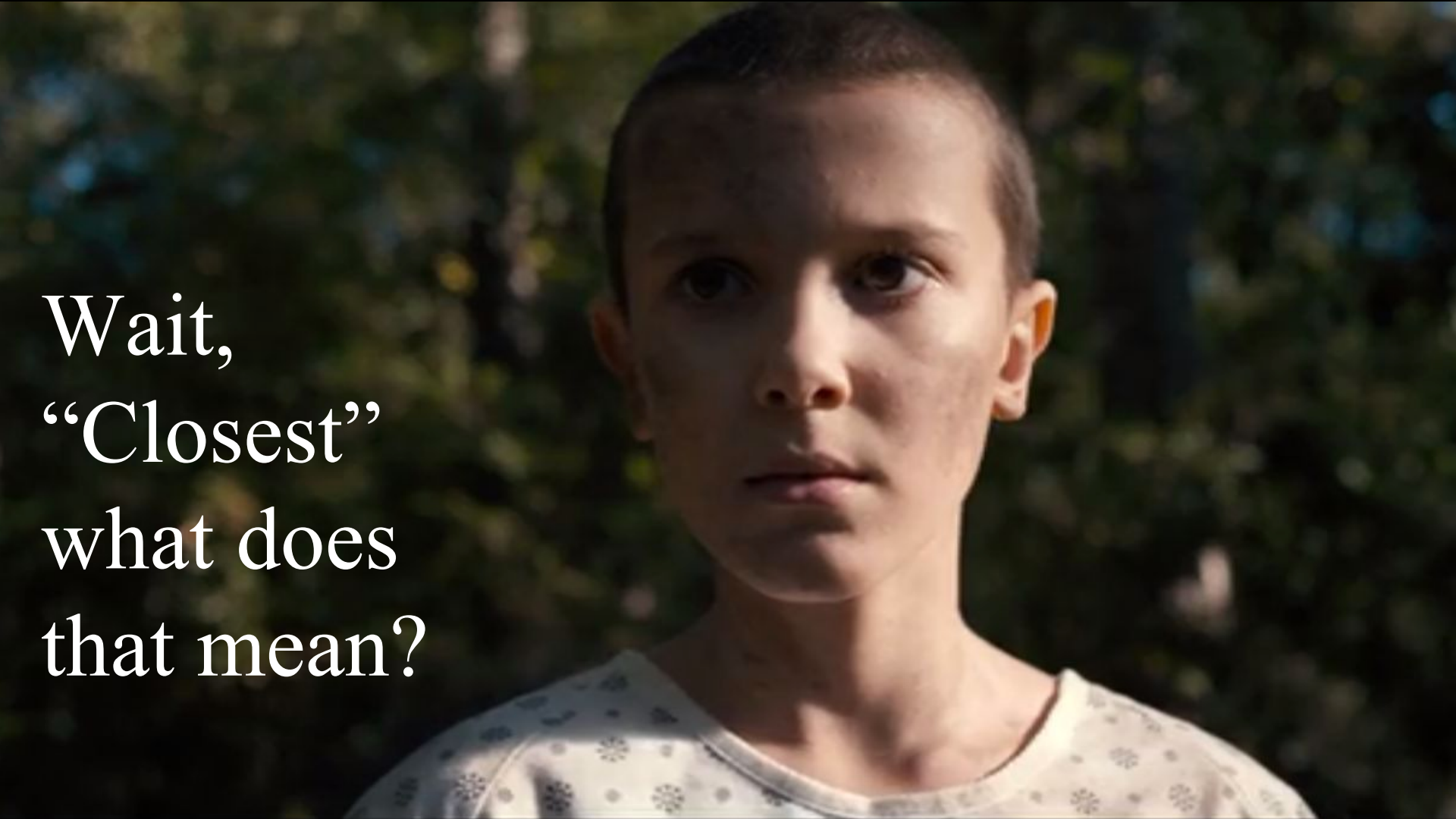
39:13



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







Wait,  
“Closest”  
what does  
that mean?

# BGP

*We use what you know*

# The nitty details

## The BGP decision tree

- Longest match
- Local Pref
- AS PATH
- Origin
- MED
- eBGP over iBGP
- Router ID
- Age

## Netflix Steering

- Longest match
- Local Pref
- AS PATH
- Origin
- MED
- eBGP over iBGP
- Router ID
- Age
- Geo

Our  
Default

Preferences



**1. Embedded**

**2. PNI peering**

**3. Public peering**

1. Prefixes are collected from Open Connect Servers - both those that are present at our POPs and embedded servers
2. Open Connect Servers belong to AS 40027
3. Netflix peering are with AS 2906

The same prefix announced both to a private or public peering session (using AS2906) and to an OCA (using AS40027) will always be preferred on the appliance over peering, because the Open Connect control plane will have two BGP entries for that prefix:

- one with an AS PATH LENGTH of 1 (<AS\_NUMBER>) from the appliance itself
- one with an AS PATH LENGTH of 2 (2906 <AS\_NUMBER>) from an IX location

When OCAs and Open Connect SFI peering is combined, OCAs are nominal and peering is used primarily for backup, for filling, and for serving long-tail titles.

We use MED to empathise the preference of the embedded OCAs and to prefer Private Interconnections over Public peering.

- We do not add MED on prefixes learnt from an OCA
- We **add** MED 50 to the existing MED for prefixes learnt on a private peering
- We **add** MED 100 to the existing MED for prefixes learnt on a public peering.



**OCA:**

med=0

as\_path ISP\_ASN

**NAP:**

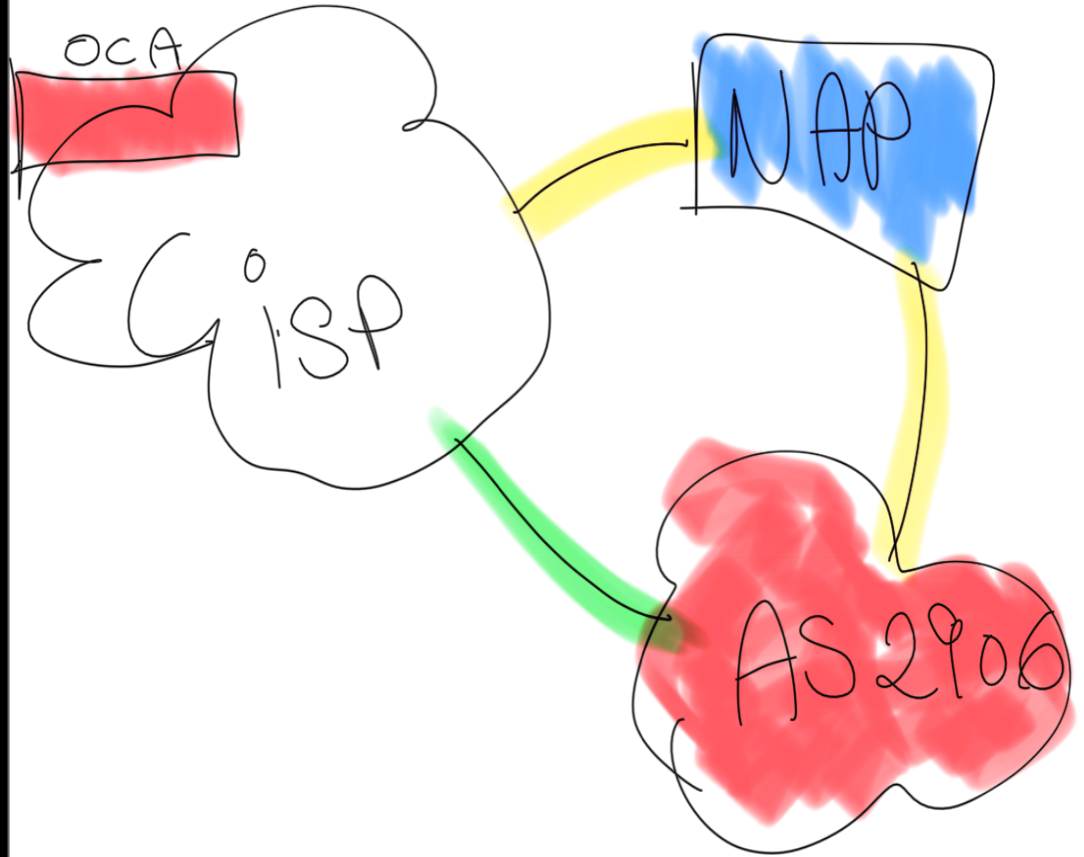
med=100

as\_path 2906 ISP\_ASN

**PNI:**

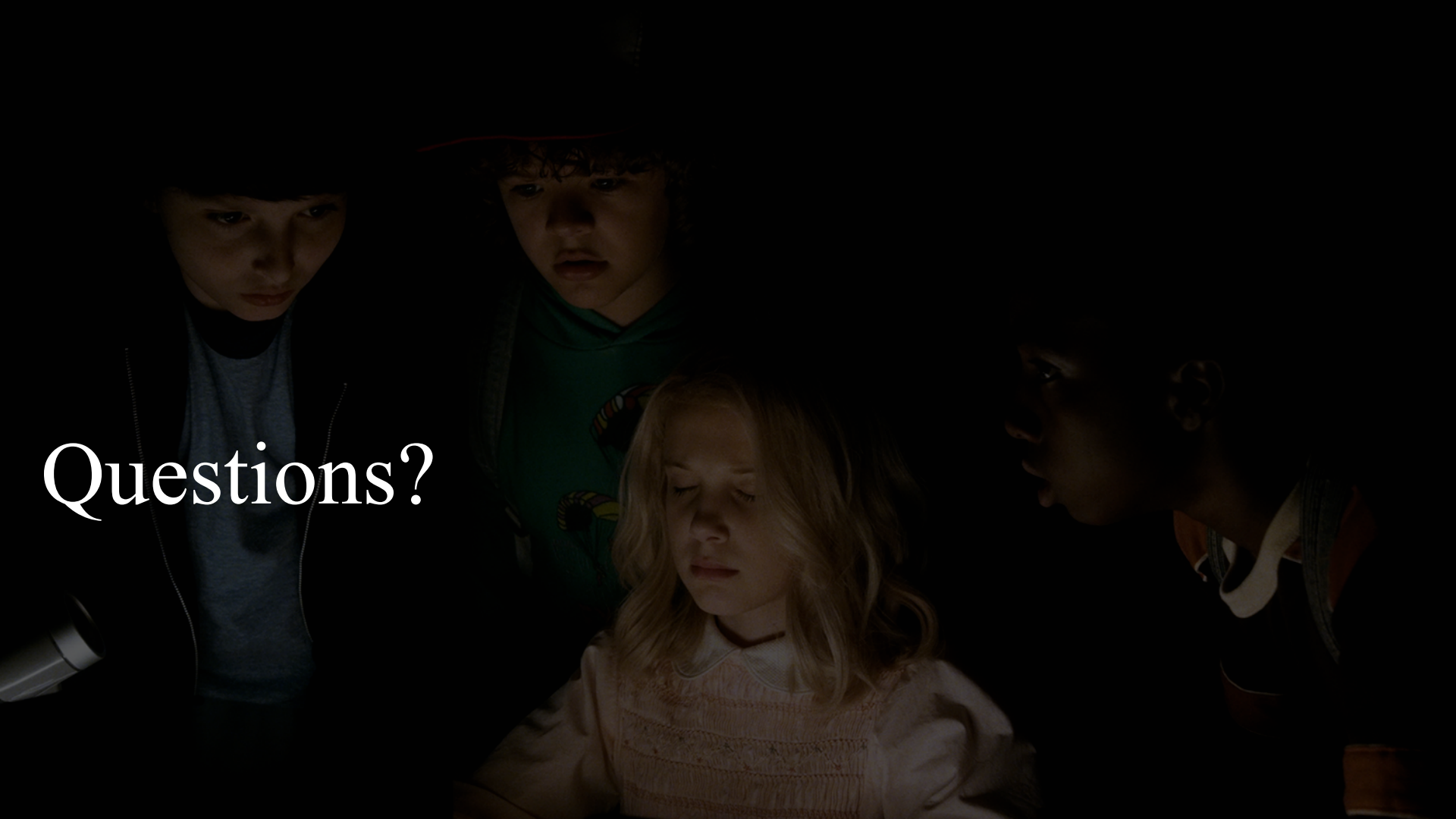
med=50

as\_path 2906 ISP-ASN



You can implement  
your preferences by  
using BGP





Questions?



