How Netflix Works
CS144
2019

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#netflixeverywhere
No ads | Uninterrupted entertainment | All episodes at once

원하는 시간에
원하는 방식으로
원하는 장소에서 시청

Watch When You Want.
How You Want.
Where You Want.

The Netflix journey

1997

Netflix
Starts

2007

Streaming video service
begins in the US

2008

Canada expansion
- first launch
outside the US

2013

Original Series
<*House of Cards*>
launched

2016

130 countries,
including Korea

Netflix in 190+
countries since then

What about today?


More Than
190 Countries
Over 151 Million
Paid Memberships
60+% from
Outside of the U.S.

1,700+ 넷플릭스 지원 기기 Different types of devices

518M+ 글로벌 회원이 넷플릭스를 시청하는 기기 Unique devices globally


MONEY HEIST
WHEN THEY SEE US
CHEF'S TABLE
ROMA
BIRD BOX
DARK
CABLE GIRLS
NARCOS
THE NIGHT COMES FOR US
GLOW
BLACK MIRROR
RIVERDALE
STRANGER THINGS
TIDYING UP
OUR PLANET
THE UMBRELLA ACADEMY
CROWN
RUSSIAN DOLL
UGLY DELICIOUS
KINGDOM
Street Food
YOU

Bringing great stories from around the world to audiences the world over.


How Do We Deliver
a Great
Netflix
Experience
to Everyone?

What makes a great streaming

- Start quickly
- Great quality
- No interruptions

Diverse networks and devices

3G

LTE

5G

Cable

Satellite

Fibre

Wi-Fi

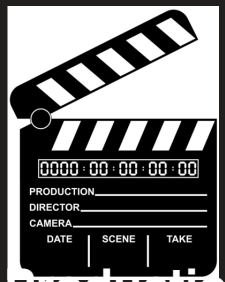
4K

HD

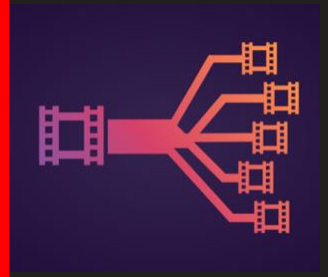
HDR

SD

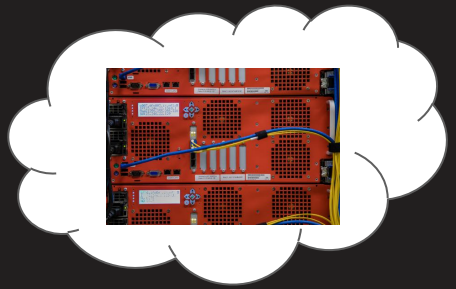
The building blocks of the Netflix streaming experience



Production



Encoding

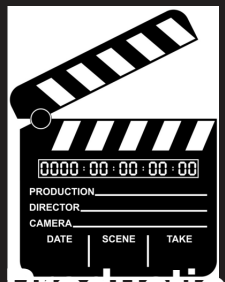


Deployment

Streaming

All of these are continually optimized to improve user experience

The building blocks of the Netflix streaming experience



Productio
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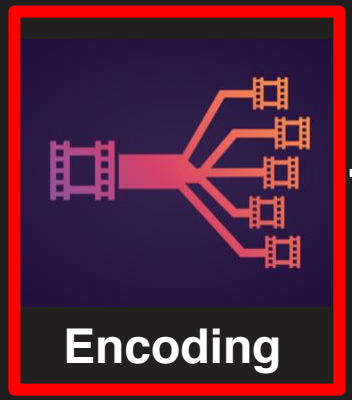

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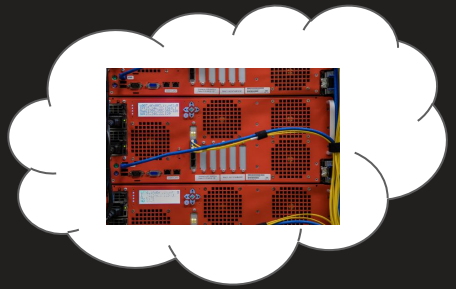


Deployment

Streamin
g

통합 인코딩 방식 적용

One-size-fits-all encoding

1050kbps 스탠다드 화질(SD)

Standard Definition (SD) at 1050 kbps

2011년 2012 2013 2014 2015 2016 2017 2018

타이틀 별 인코딩 방식 구분

Per-title encoding

640 kbps

710 kbps

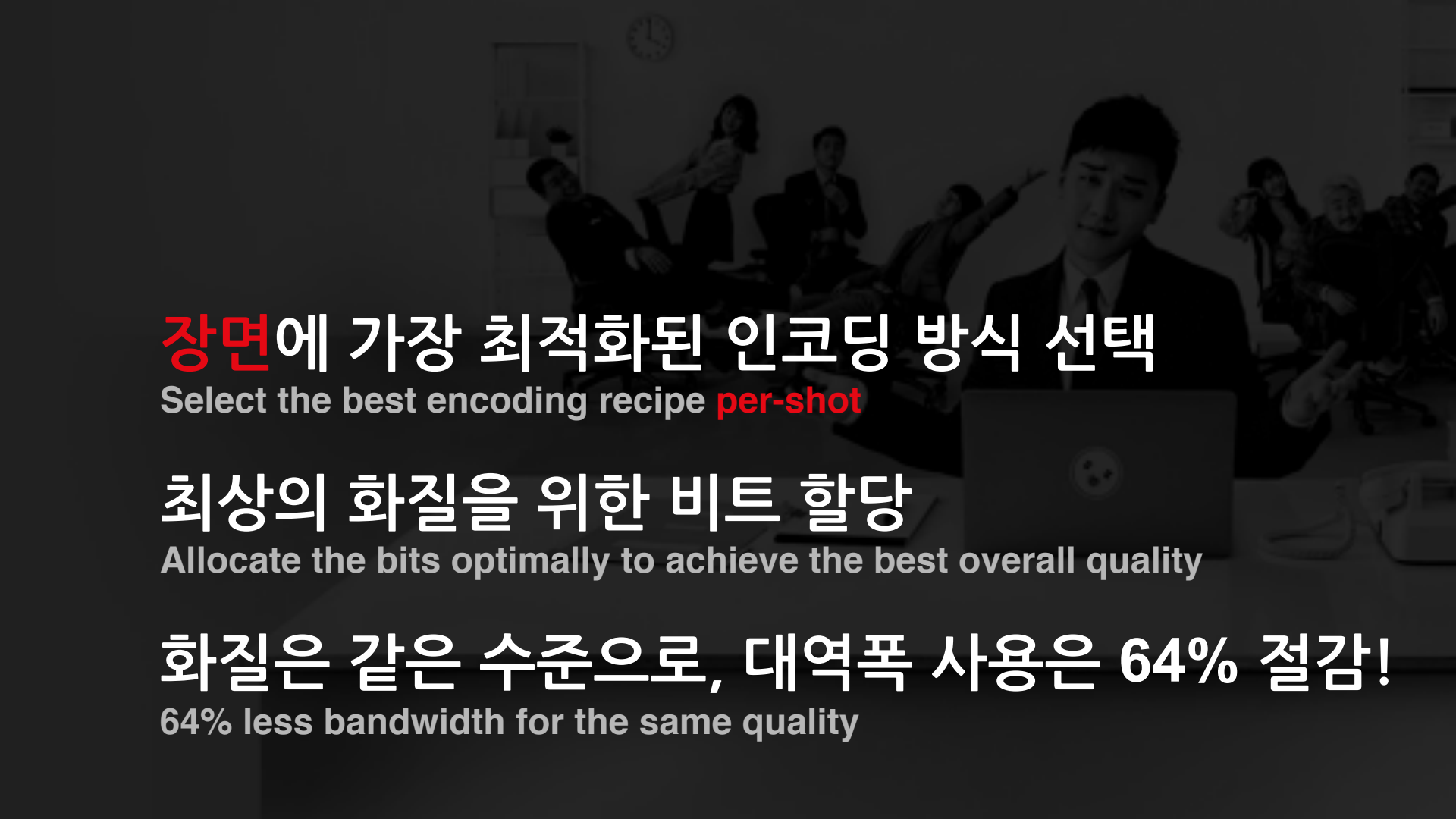
910 kbps

2011 2012 2013 2014 **2015년** 2016 2017 2018

장면당 인코딩 구분

Per-shot encoding

2011 2012 2013 2014 2015 2016 2017 **2018년**



장면에 가장 최적화된 인코딩 방식 선택

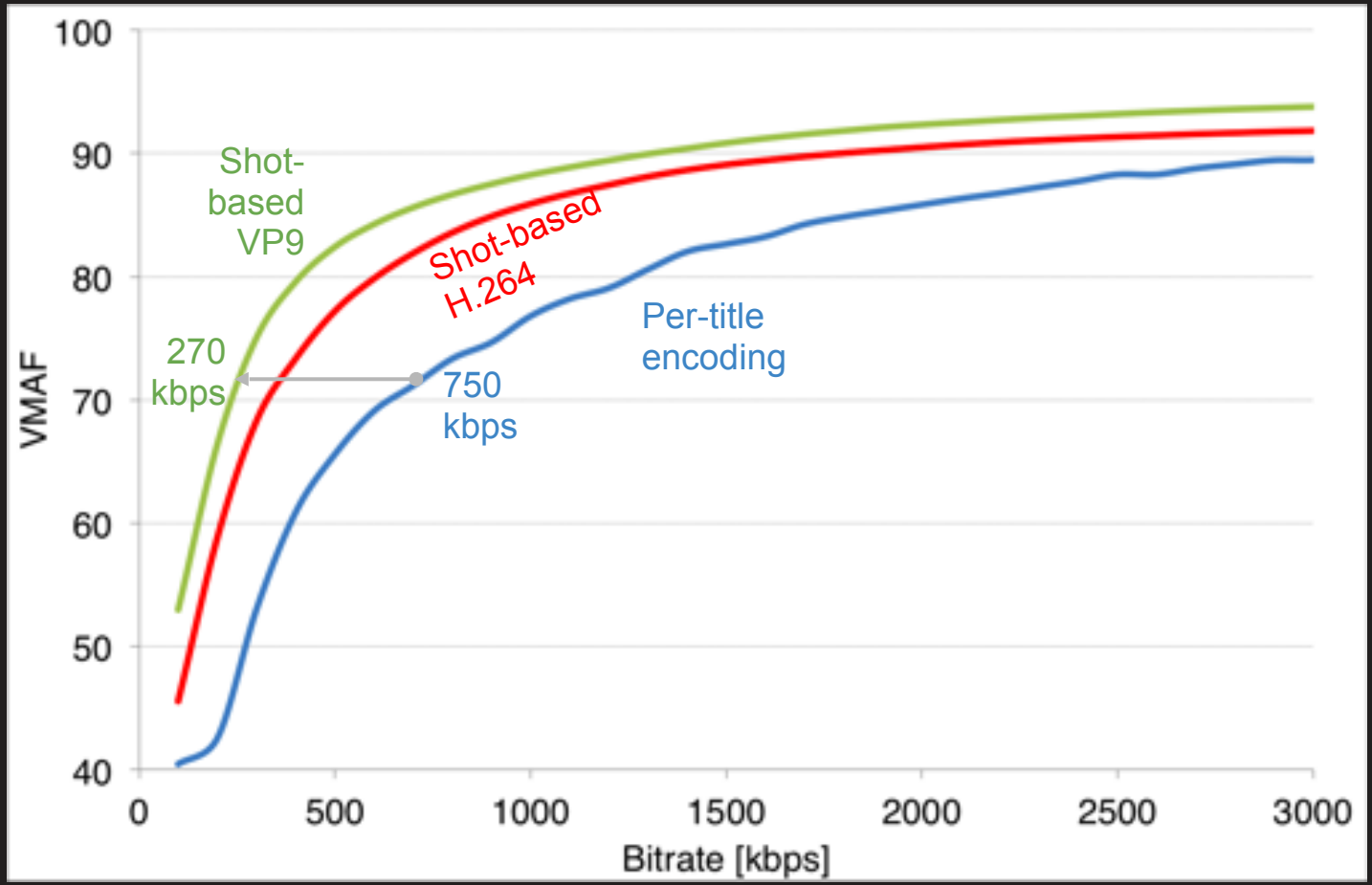
Select the best encoding recipe per-shot

최상의 화질을 위한 비트 할당

Allocate the bits optimally to achieve the best overall quality

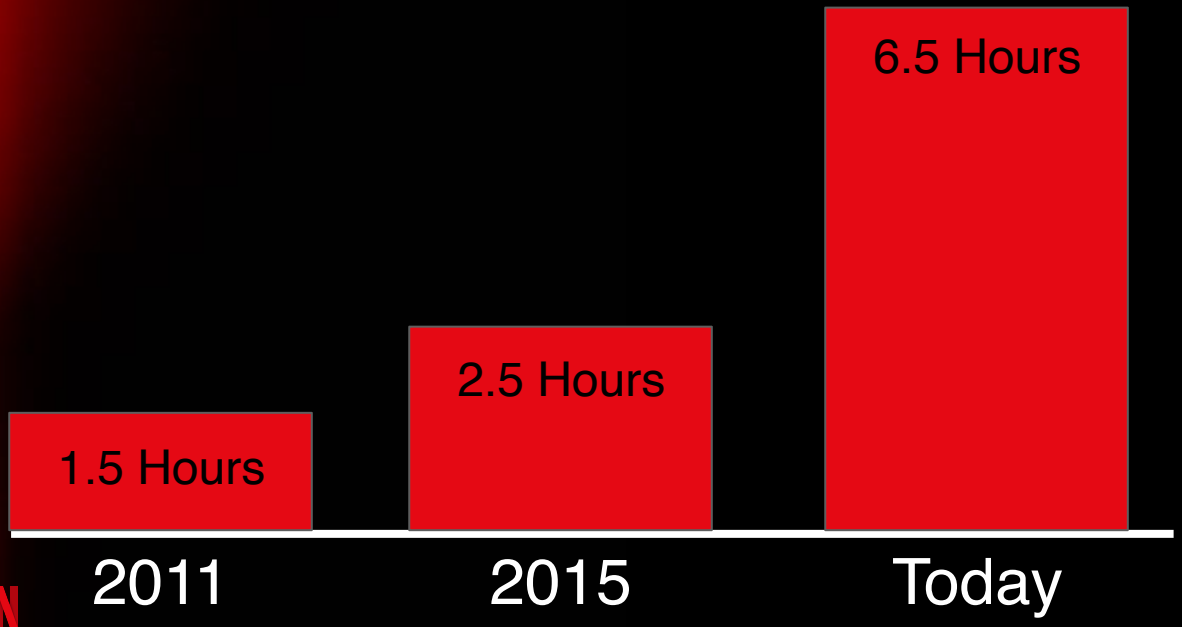
화질은 같은 수준으로, 대역폭 사용은 64% 절감!

64% less bandwidth for the same quality



64% less bits for the same quality

Hours of Netflix content in 1GB of data

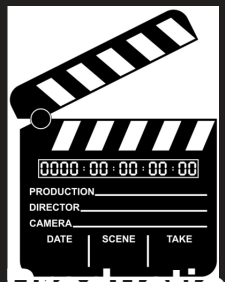


8 episodes !

AV1

Coming soon …

The building blocks of the Netflix streaming experience



Productio
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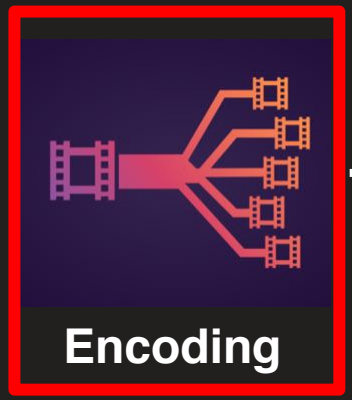

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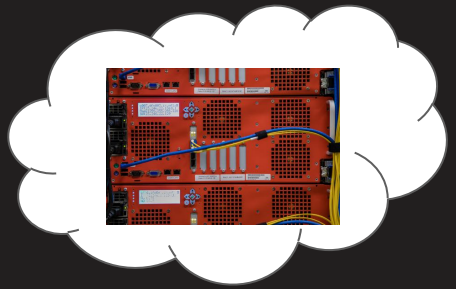

Deployment

Streamin
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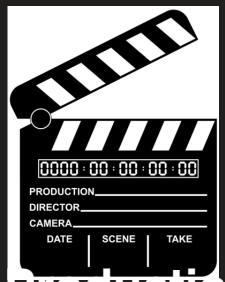
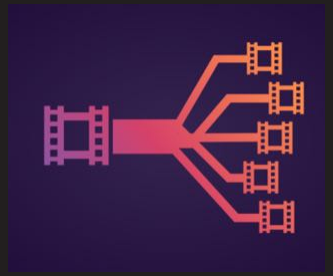
The building blocks of the Netflix streaming experience



Production



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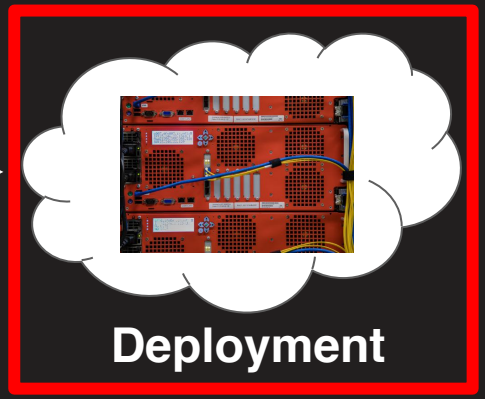
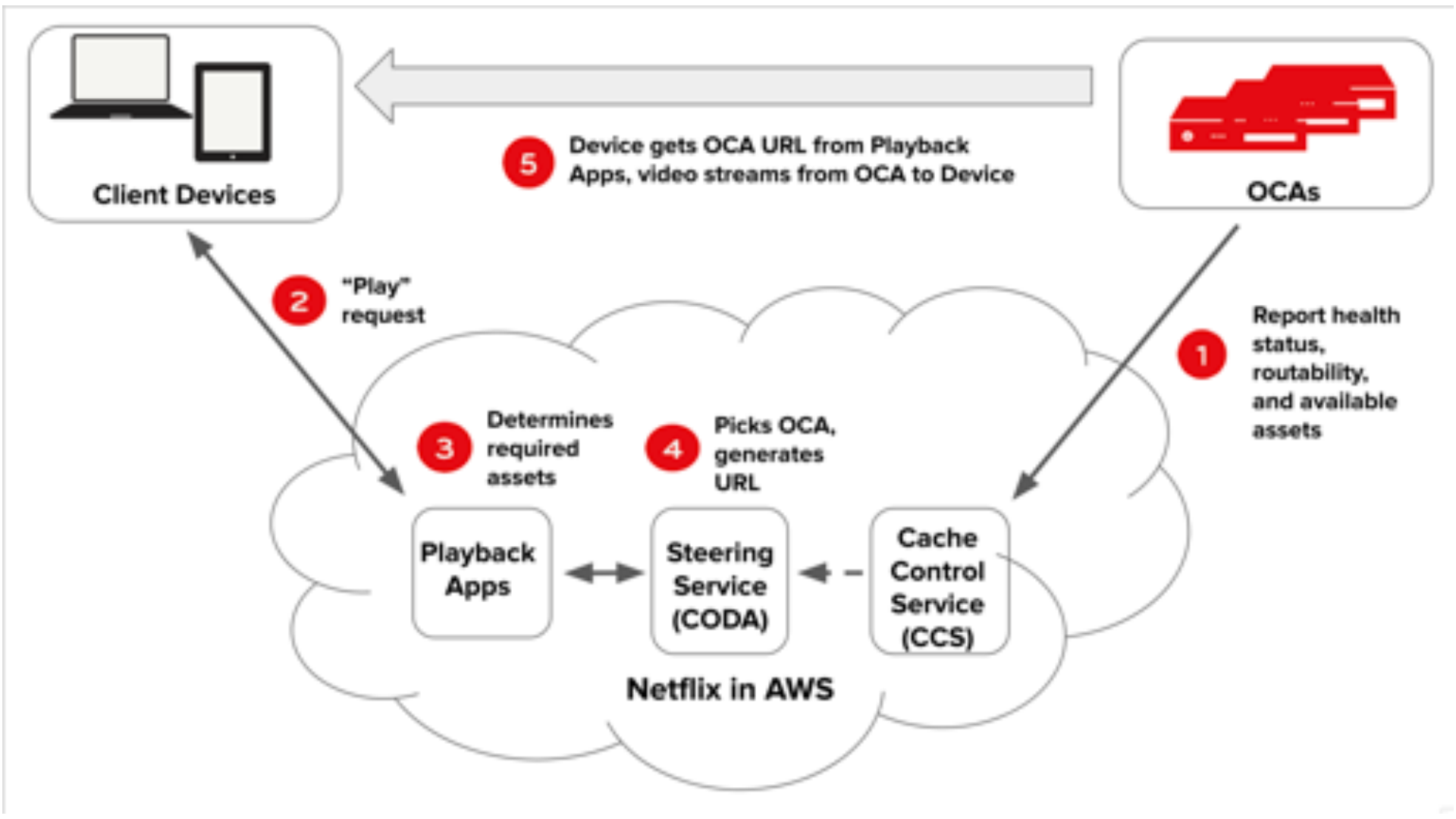


Deployment

Streaming

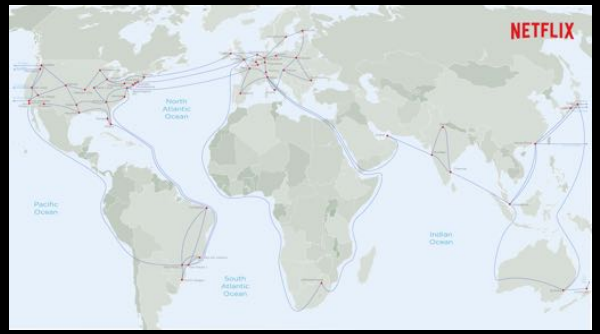
Global Netflix Delivery Architecture

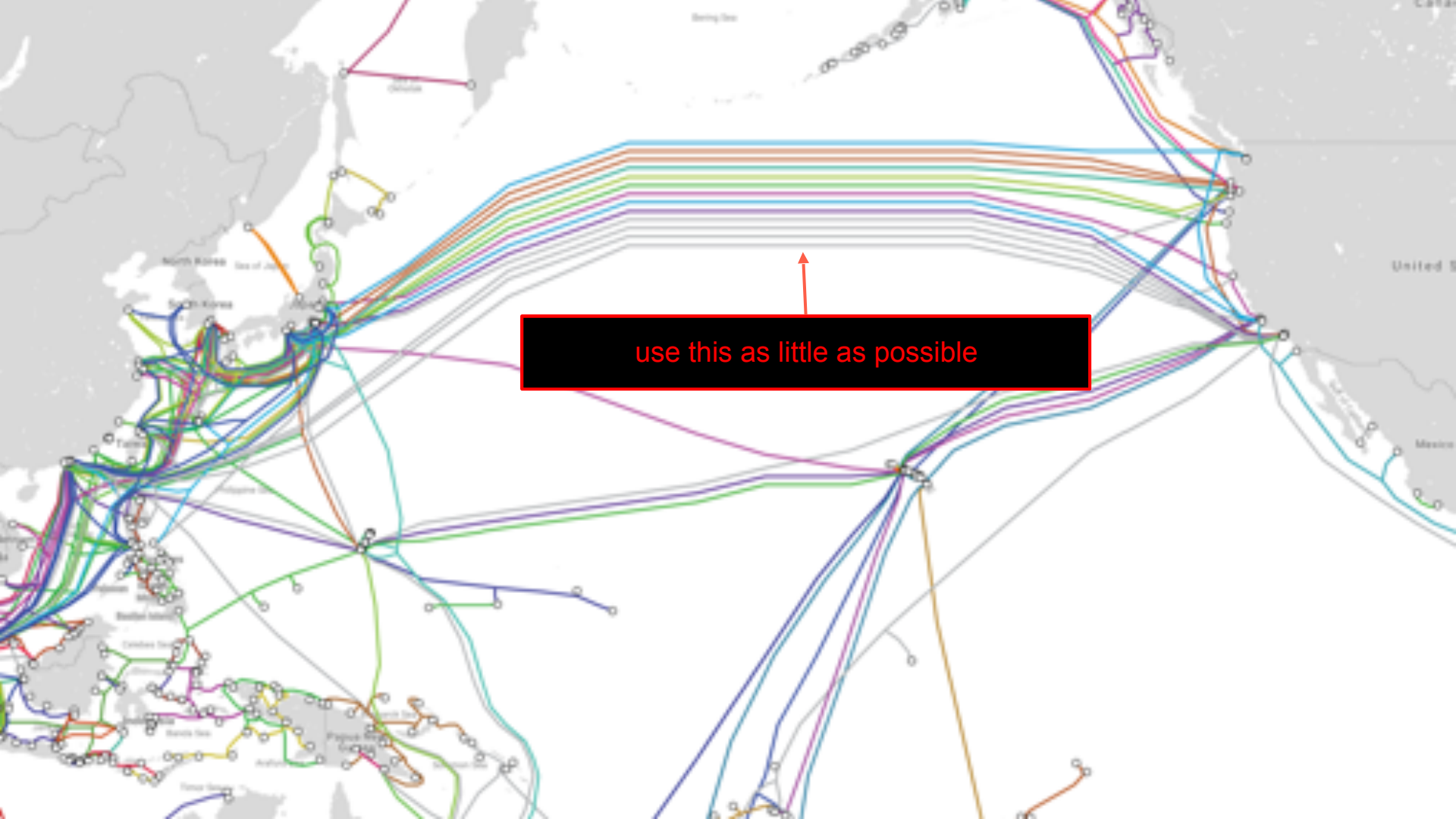

NETFLIX
Open Connect


Client Devices
OCAs
5
Device gets OCA URL from Playback Apps, video streams from OCA to Device
2
"Play" request
1
Report health status, routability, and available assets
3
Determines required assets
4
Picks OCA, generates URL
Playback Apps
Steering Service (CODA)
Cache Control Service (CCS)
Netflix in AWS

servers (OCA)

networks

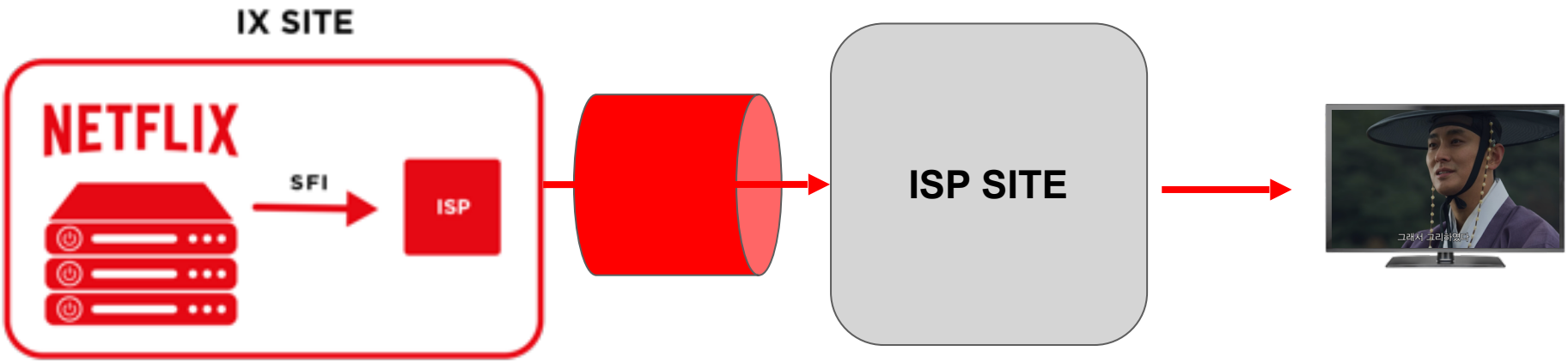


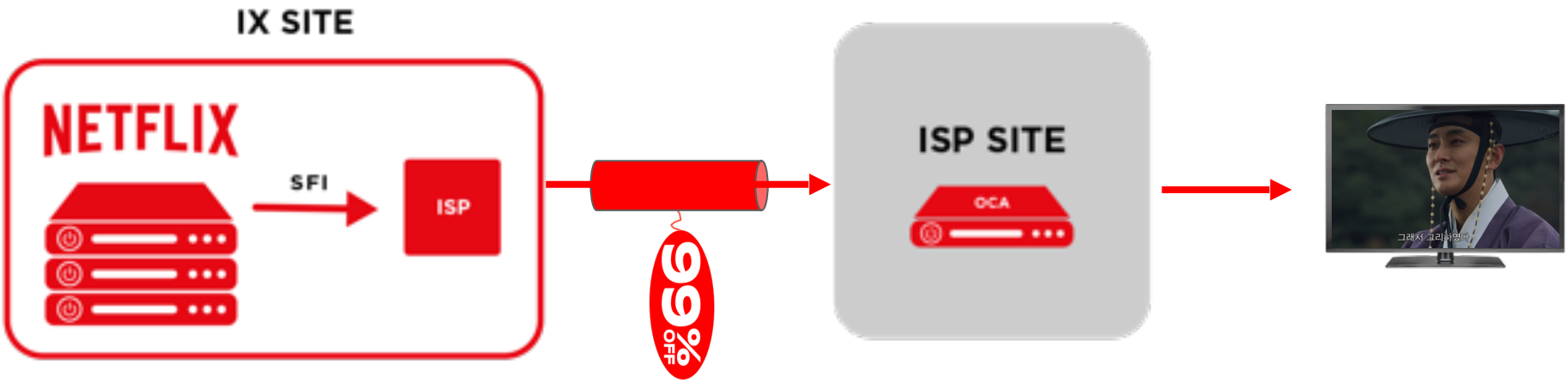

use this as little as possible


North Korea
Japan
Taiwan

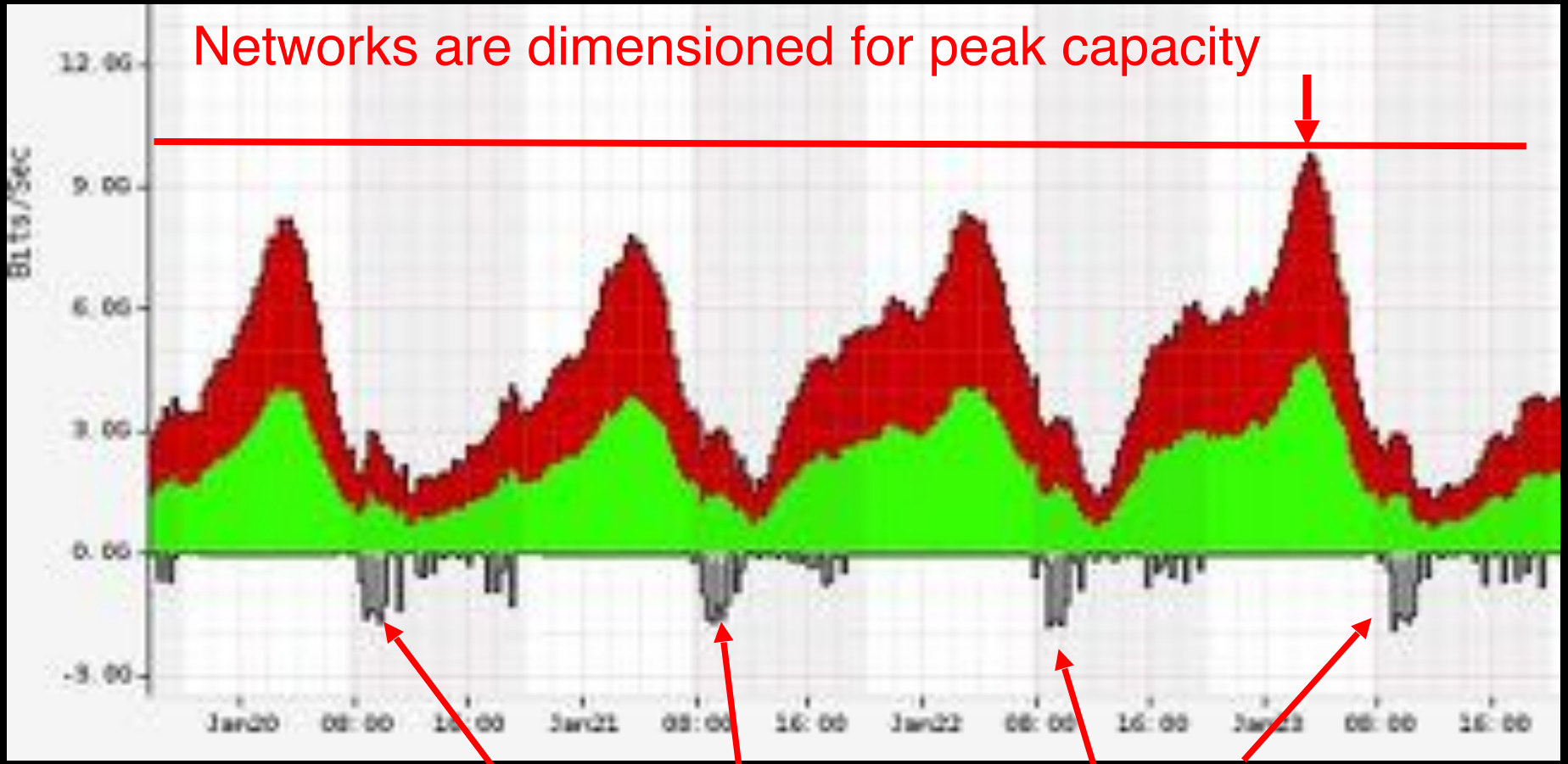
Order of 100 globally

Order of 10,000 globally


IX SITE
NETFLIX
SFI
ISP
ISP SITE


IX SITE
NETFLIX
SFI
ISP
99% OFF
ISP SITE
OCA


caches fill while you sleep

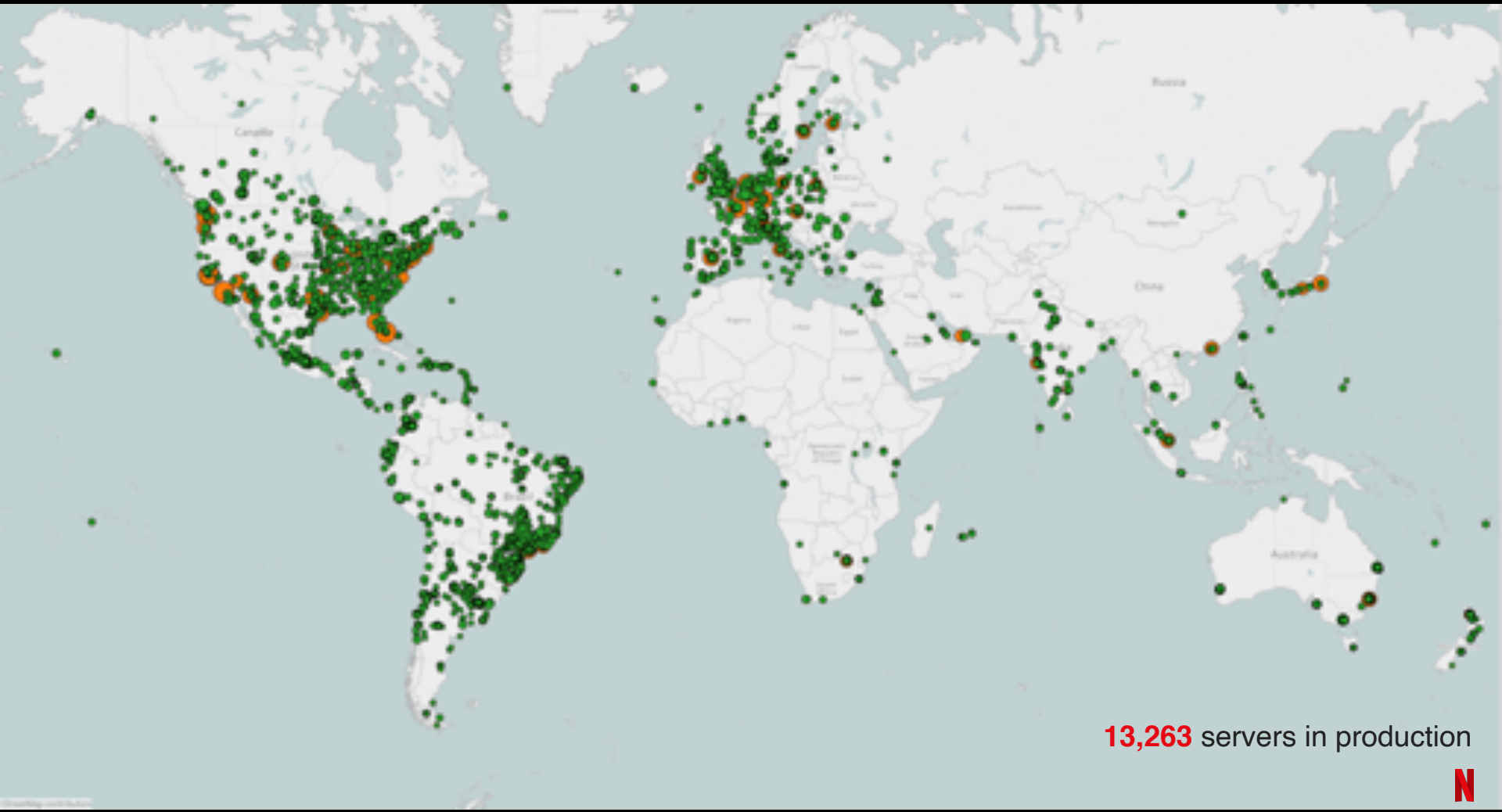


Off-peak cache fill means no need for additional

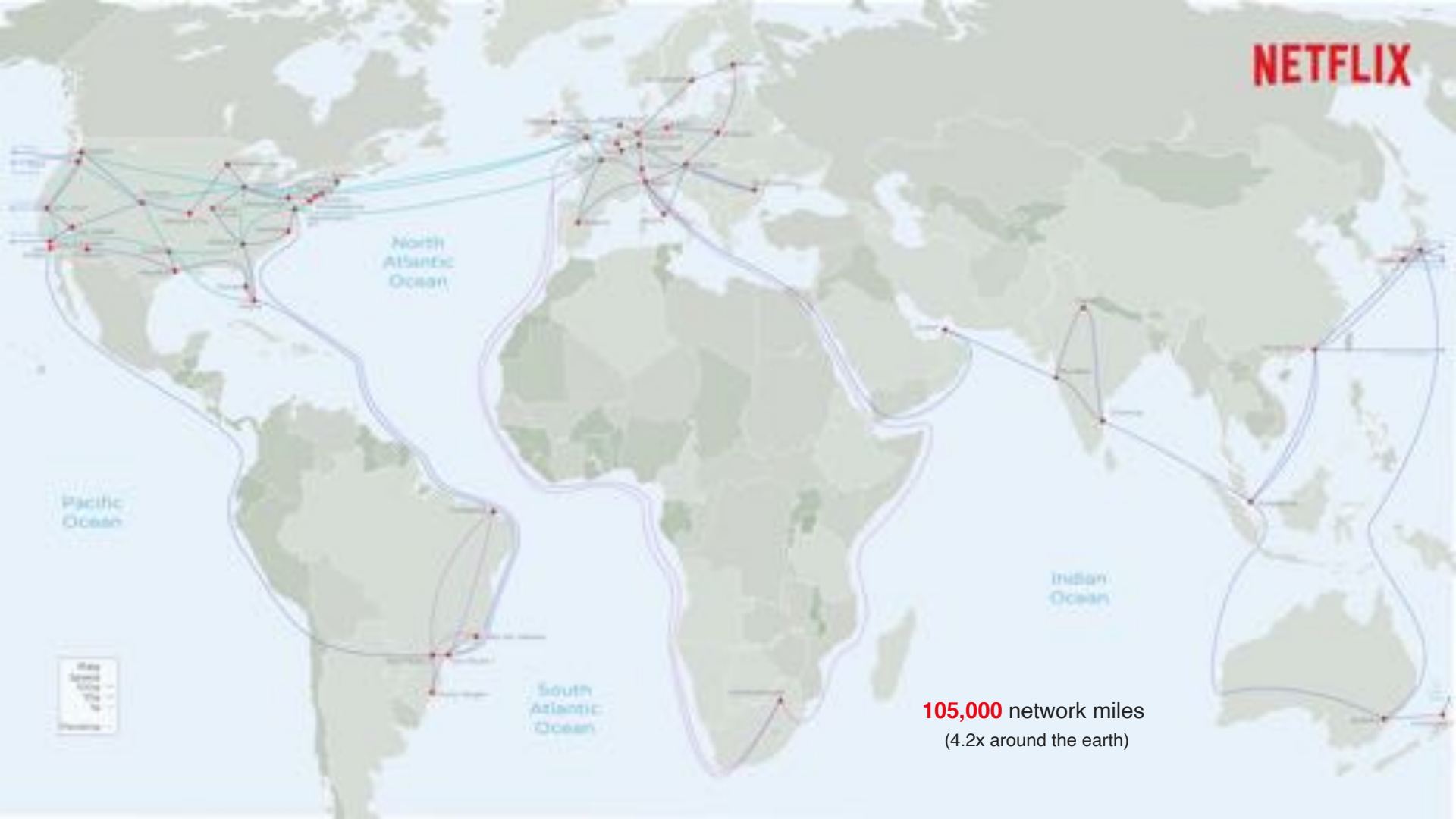
N

85 internet exchange locations in **26** countries

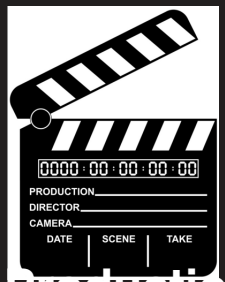
3,546 ISP locations in **140** countries


13,263 servers in production

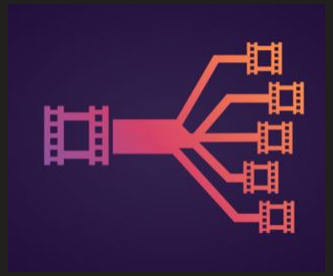

c003.sfo001.google
Stanford - Forsythe Hall


NETFLIX
North Atlantic Ocean
Pacific Ocean
Indian Ocean
South Atlantic Ocean
105,000 network miles
(4.2x around the earth)

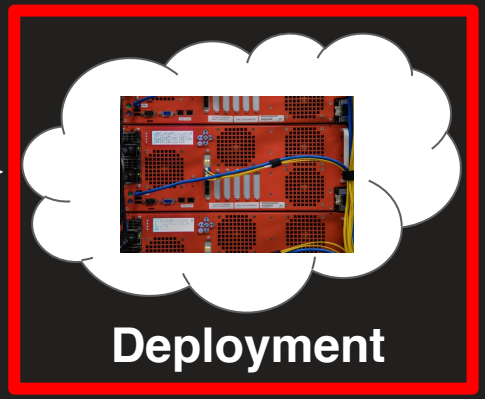
The building blocks of the Netflix streaming experience



Production



Encoding

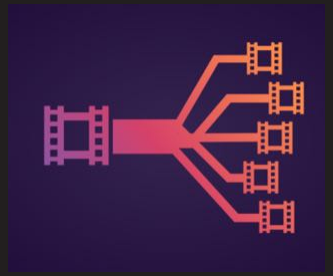


Deployment

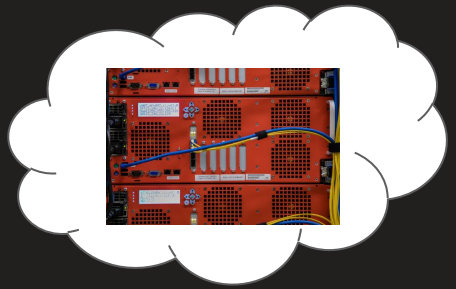
Streaming

The building blocks of the Netflix streaming experience

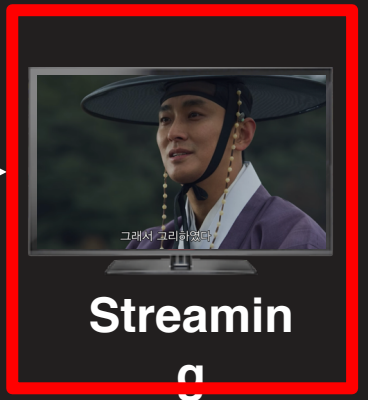
Production



Encoding

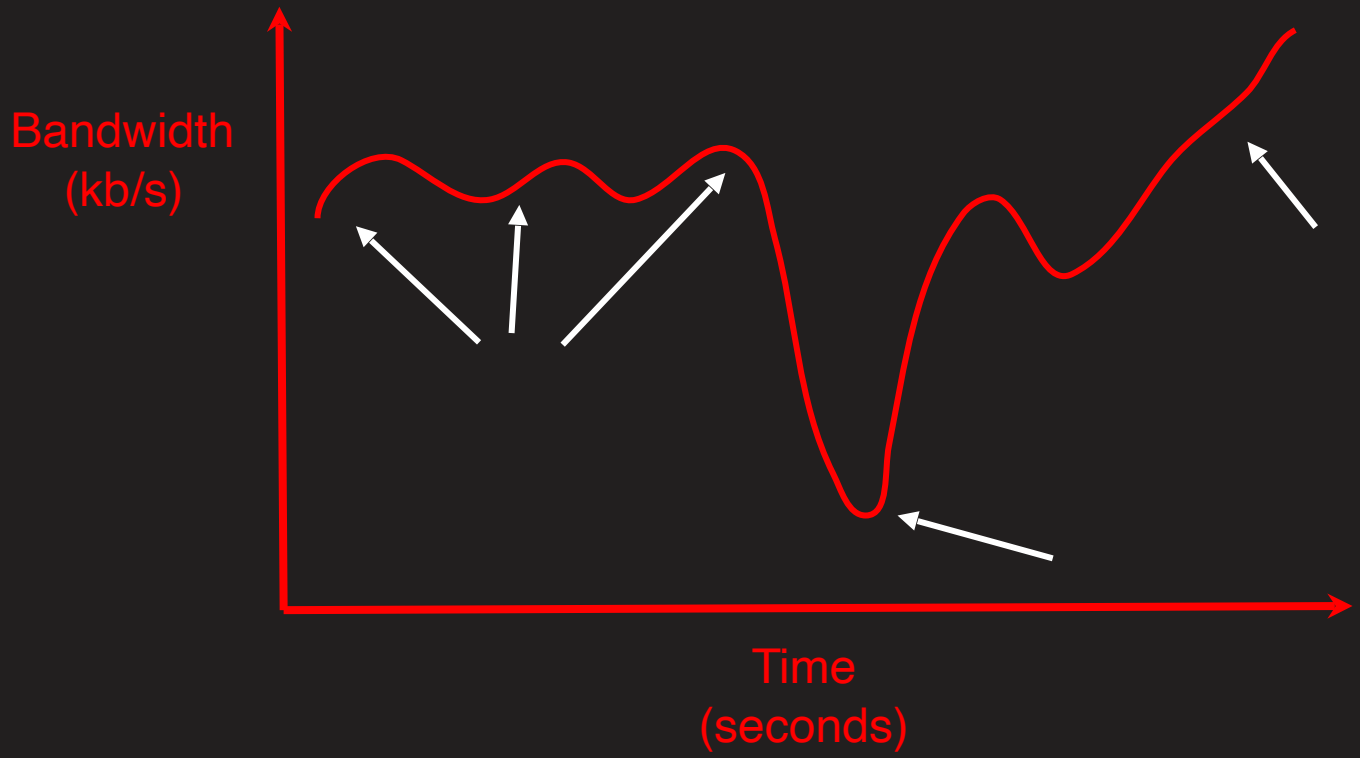


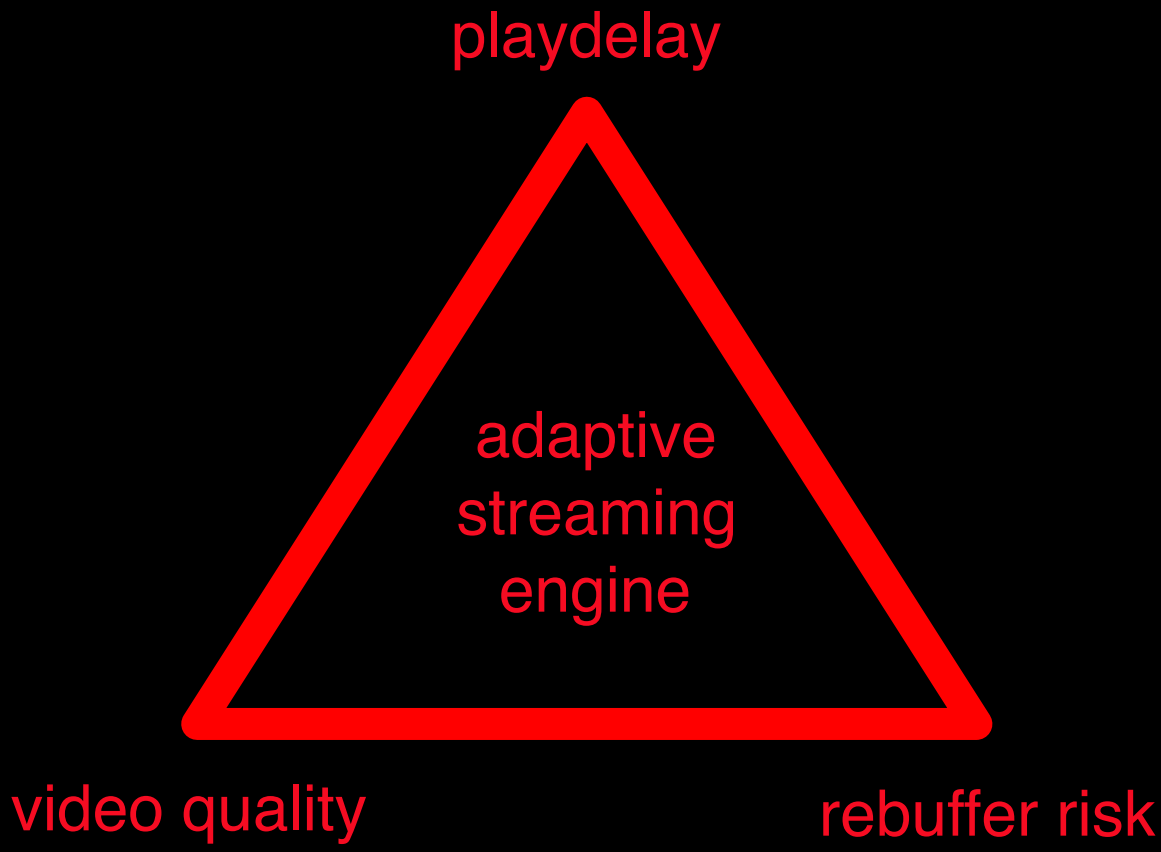
Deployment



Streaming

Network conditions change




playdelay
adaptive
streaming
engine
video quality
rebuffer risk

Adapt video quality based on changing conditions

High quality

Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	...

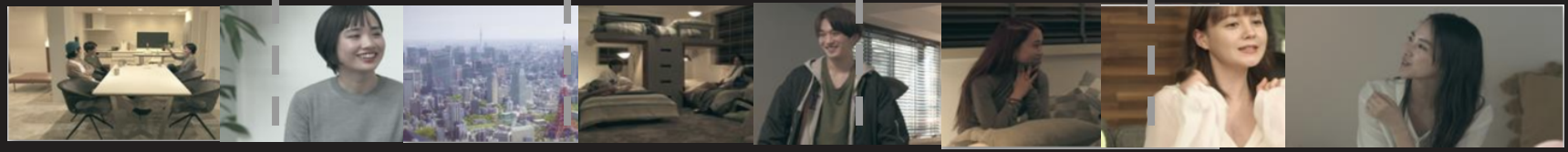
Mid quality

Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	...

Low quality

Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	...

Time



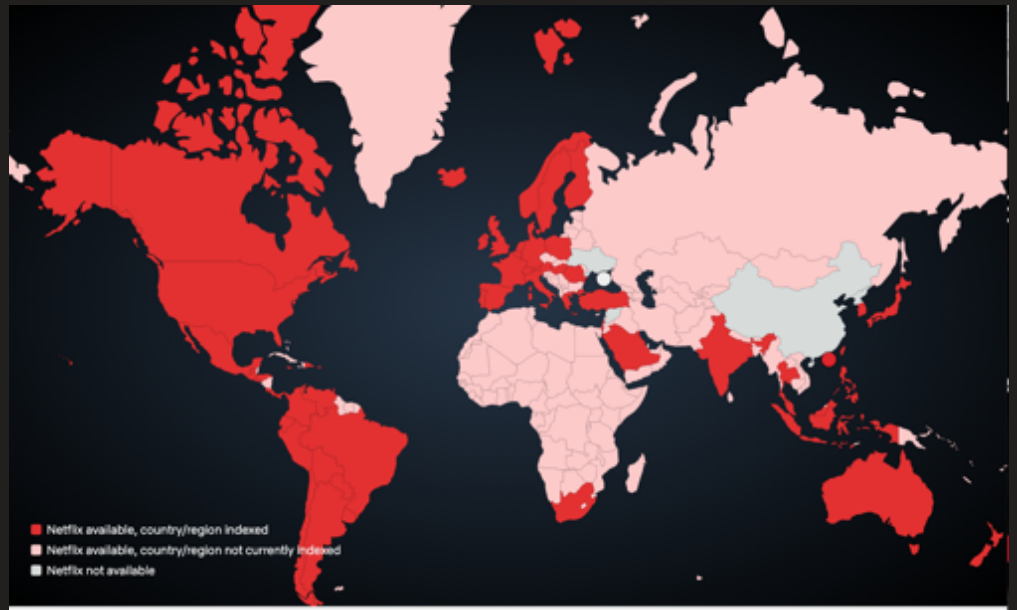
Adapt video quality based on changing conditions

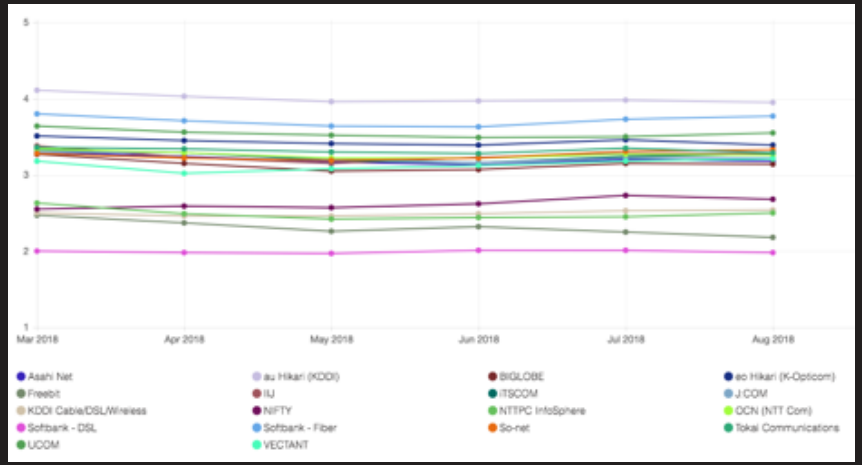
Adapt video quality based on changing conditions

Resulting experience

tips and tricks

Ctrl+Alt+Shift+D





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AMERICAS +

ASIA-PACIFIC +

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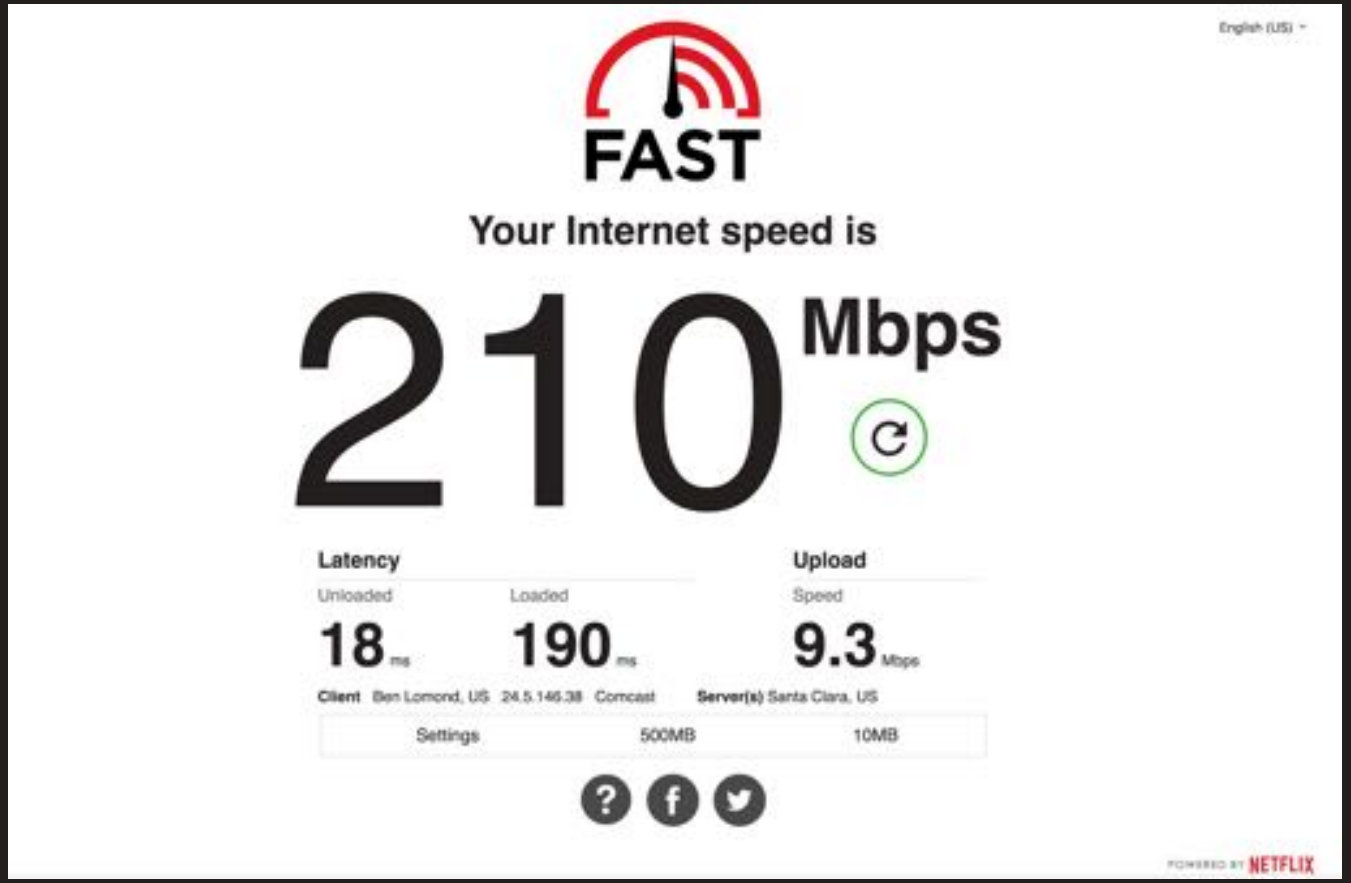
English (US)
FAST
Your Internet speed is
210 Mbps
Latency
Unloaded
18 ms
Loaded
190 ms
Upload
Speed
9.3 Mbps
Client Ben Lomond, US 24.5.146.38 Comcast
Server(s) Santa Clara, US
Settings
500MB
10MB
POWERED BY NETFLIX

questions?


고맙습니다!
Thank you!