

# Netflix cooperative approach to efficient content delivery

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04/10/23

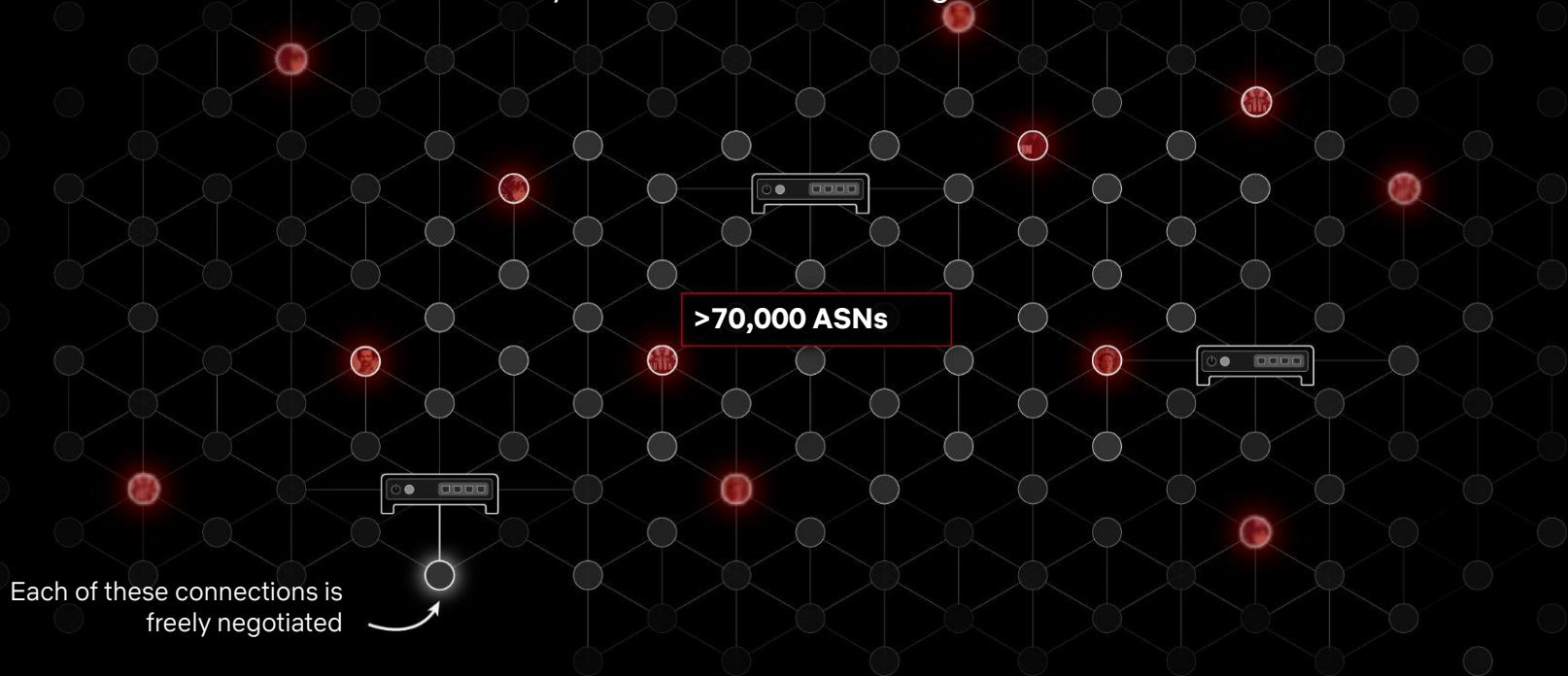


**Internet content providers  
and ISPs are mutually  
dependent**



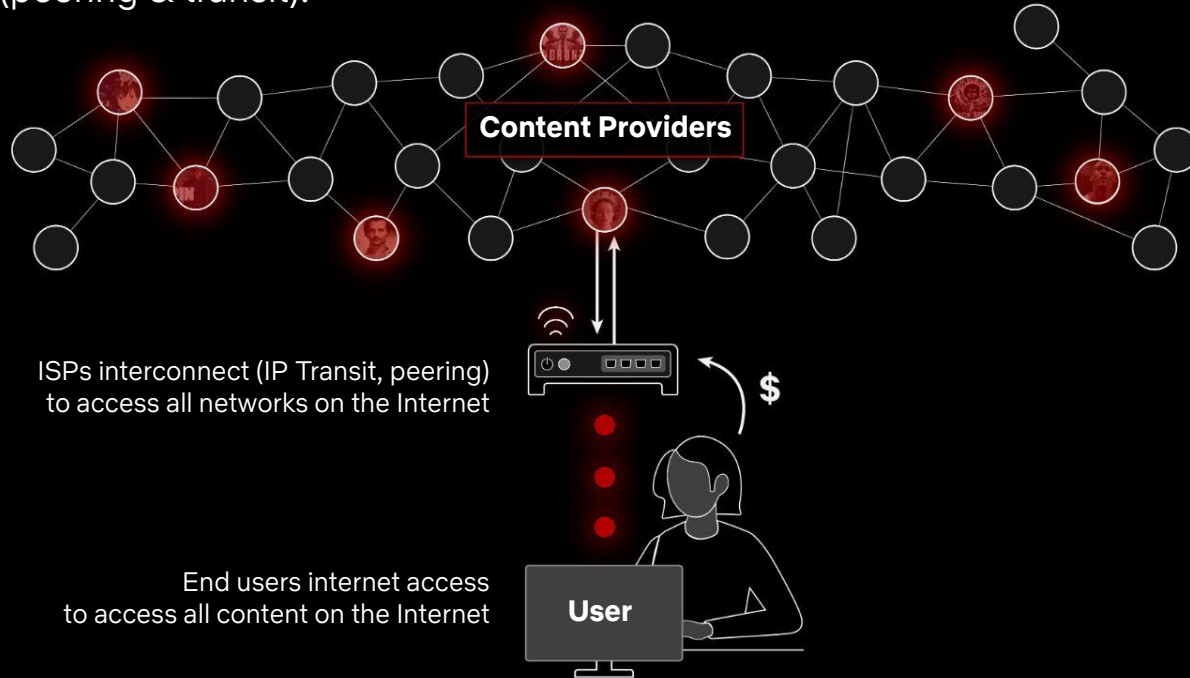
# The Internet is very vast

The Open Internet is made of tens of thousands of individual networks (Autonomous Systems), that are all interconnected. 99.9% of these connections (“peering”) are settlement-free - there are too many to contractualize or regulate.



# ISPs satisfy user demand for the Internet

Each user pays an ISP to give them access to *everything* on the Internet, without restriction. The variety of content online brings value to internet connections. ISPs obtain access to content through interconnection (peering & transit).



# How content drives shared value

High-quality content drives demand for broadband. That's why Netflix's big investments have big benefits for Internet Service Providers (ISPs).

Netflix spends billions on high-quality movies and TV series each year



Which drives consumers to purchase faster broadband plans from their ISP

This increases customer demand for video streaming



# Netflix content drives shared value for operators

**pepephone**

**NO DEJES ESCAPAR TUS PELÍCULAS Y SERIES FAVORITAS**

Fibra **400Mb + 25GB** Móvil **25GB**  
acumulables

**+ NETFLIX**

**42'90**  
€/mes



**M**

**Sofá, mantita y maratón de Netflix**

Disfruta del puente con las series que todo el mundo adora. Ahora, para ti:

**15% dto.**  
 durante 5 meses

Llama al 1004 o acércate a una Tienda Movistar

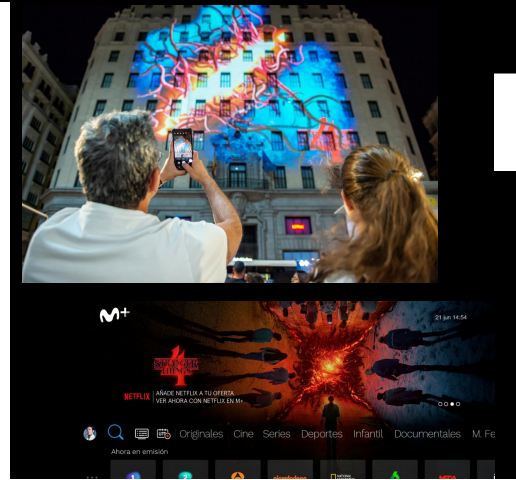


**El juego del calamar:**  
 Un éxito sin precedentes.

Mejora tu experiencia de contenido



Descuento del 15% aplicado sobre el precio del contenido si se contrata el servicio hasta el 30/09/2021. Dependiendo de la configuración de tu contrato de acceso a Internet, el descuento se aplicará en el momento de la compra de la suscripción de Netflix. No aplica a modalidades de TV. Precio máximo de promoción: 0,00 euros/mes.



orange

Mobiles et forfaits    Internet    Packs Internet + Mo

**Netflix sur la TV d'Orange**

JM Alvarez-Pallete @jmalvpal

#TelefonicaMeetsNetflix

Just had a call with @reedhastings, the CEO of @Netflix. I think @Telefonica customers are going to love this announcement, right Reed? :)



REED HASTINGS  
NETFLIX CEO

JOSÉ MARÍA ÁLVAREZ-PALLETE  
TELEFÓNICA CHAIRMAN

439,1 k vues    Wow Reed... ¡Bonito distráiz!

#TelefonicaMeetsNetflix

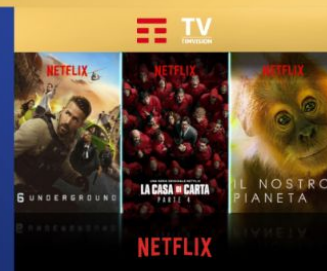
De Telefonía

Scegli **TIM SUPER FIBRA**

Fibra, Modem TIM e TIMVISION PLUS

+ Chiamate illimitate verso tutti SOLO ONLINE

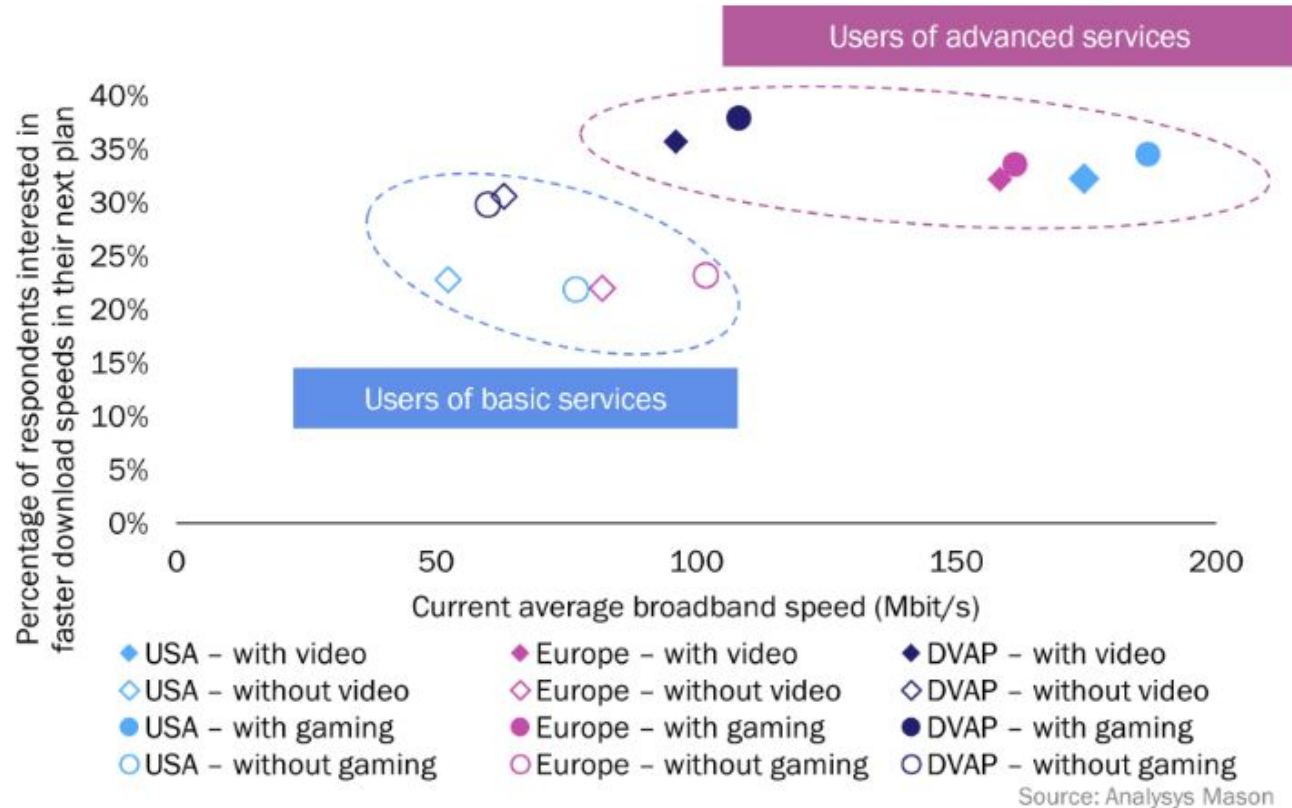
con tutto l'intrattenimento di **Mondo Netflix**



To Vodafone TV καλωσορίζει το **NETFLIX**



**Figure 2:** Correlation between the use of advanced services and broadband speeds, developed Asia-Pacific (DVAP), Europe and the USA, 2021



**How Netflix cooperates  
with ISPs for **efficient  
content delivery****

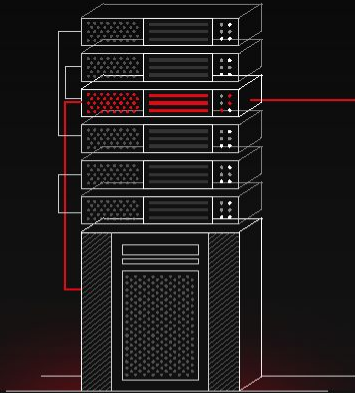




# The long haul

## SINGLE SOURCE

When a user requested video Content, it was served from a single location



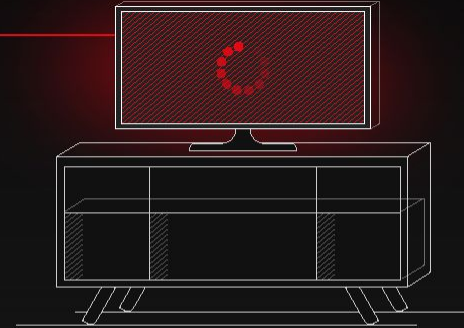
## CONGESTED DELIVERY

This server may have been a huge geographical distance from the user and traffic growth would mean expanding this long distance capacity



## HUGE EXPENSE

Securing global connectivity would come at a high cost to ISPs (Internet Service Providers) who would have to purchase or build these backhaul connections



**Long way round**  
Data would be forced to travel through many routers and networks

**Traffic jams**  
Each router could be congested by high traffic volumes

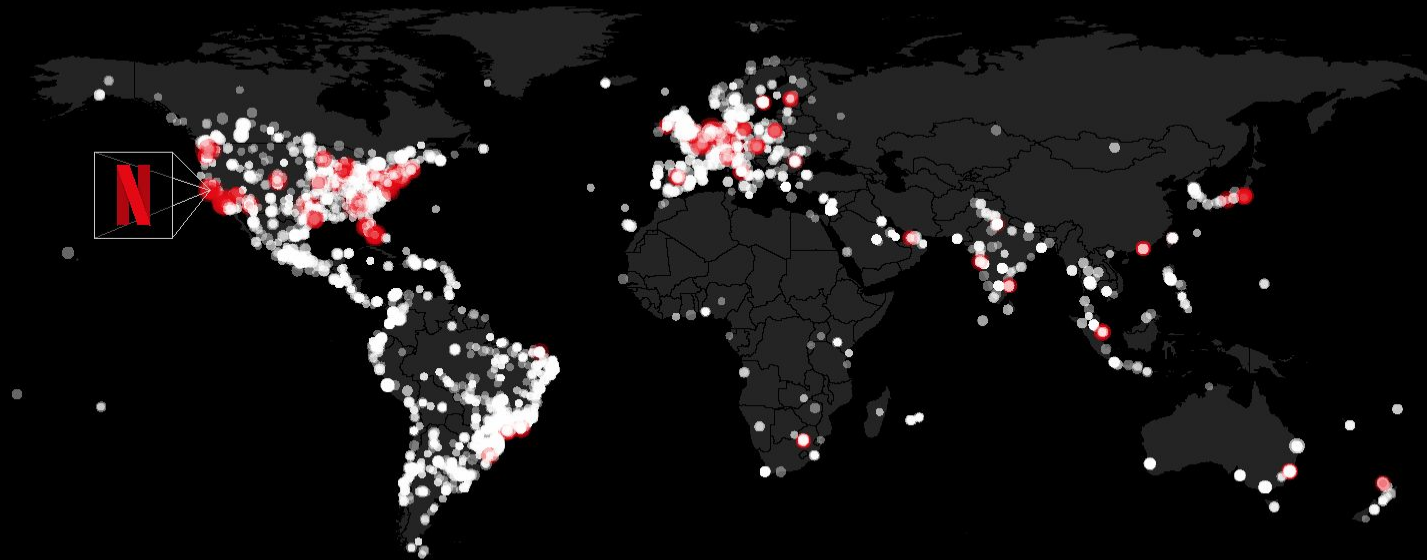
**Lost in transit**  
Congestion would lead to 'packet loss', causing quality to degrade

# Bringing content closer

## OPEN CONNECT

Netflix now stores its content close to every member - **no matter where in the world they are, with all networks, big or small.**

Open Connect is Netflix's content delivery network. It's made of more than **6,000 Open Connect Appliances (OCAs) caching locations** spread across **167 countries.**



KEY

**N** Netflix headquarters in California, USA

● Netflix OCAs  
Located within public internet exchange points

● OCAs gifted to ISPs  
(Internet Service Providers)

Number of content caches per server

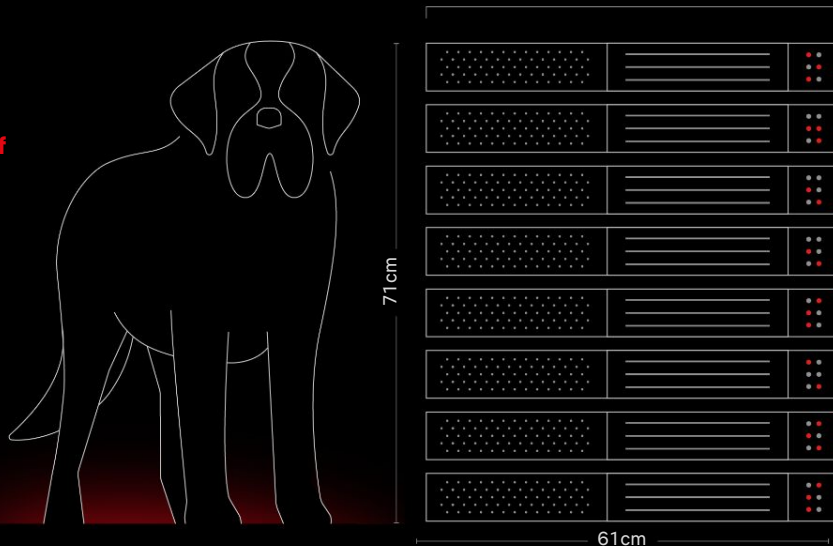


# Small but mighty

Netflix content library has over 7,800 titles in 167 countries. Each Open Connect location is very powerful but surprisingly small and energy efficient.

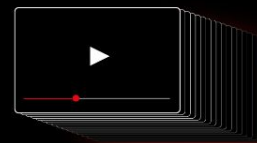
## How small?

A country's **entire Netflix library fits into about half a rack** of servers. A half rack is around the size of a big dog.



## How powerful?

A half rack can serve **200,000 streams** simultaneously.

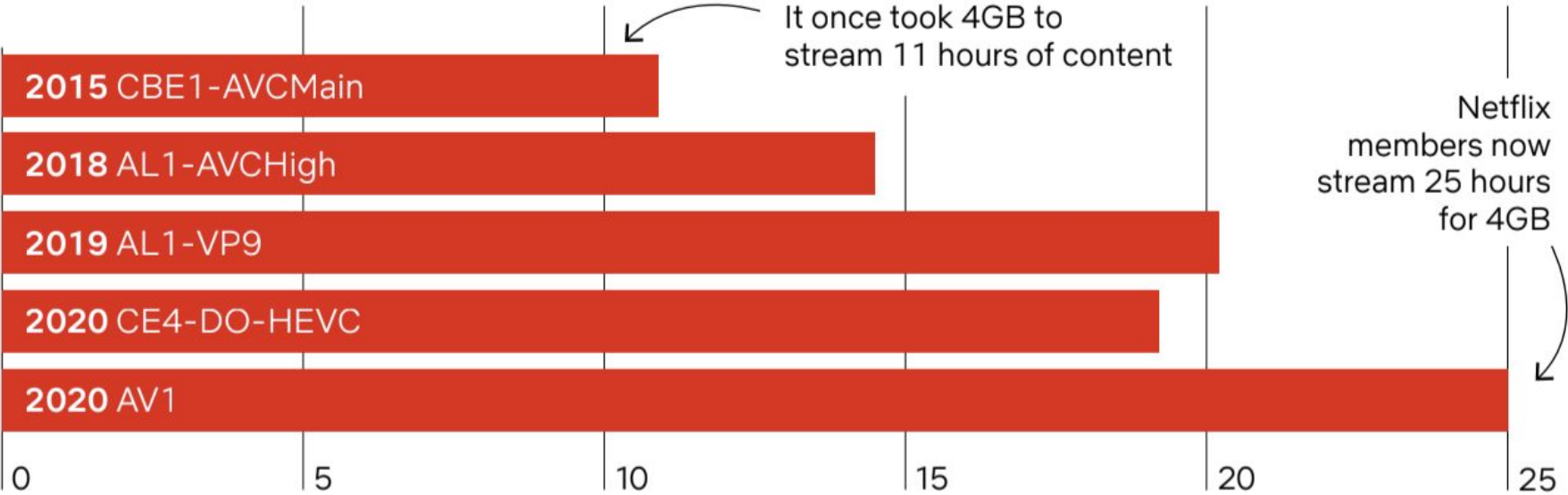


## How efficient?

It takes just **5.6kw** to power a half rack. The same amount of power you'd need to run a small house.



# In the past five years, Netflix's encoding has more than doubled the data efficiency of streaming



Hours of streaming per 4GB of data

JPEG, 69kB

**NETFLIX**



The Adventures of  
**PUSS IN BOOTS**



AVIF, 41kB

**NETFLIX**



The Adventures of  
**PUSS IN BOOTS**



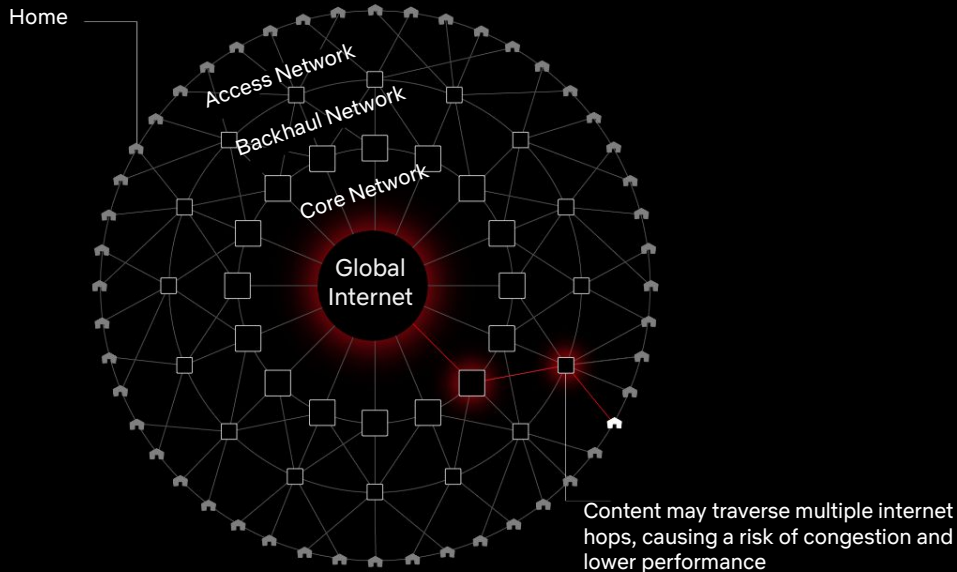
**A growing demand from  
end users can be handled  
sustainably **without**  
**increasing network costs****



# ISPs cost models

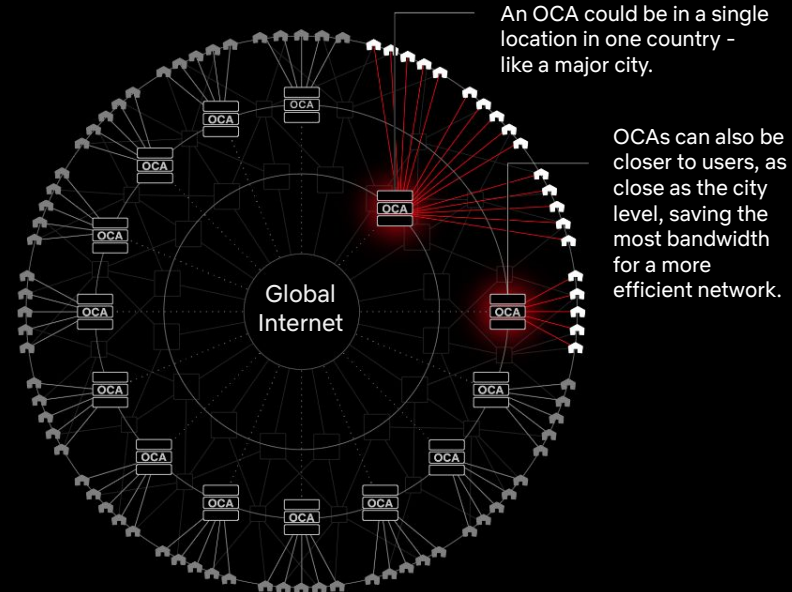
## Access networks

These represent the majority of network costs (around 80–90%). These costs are related to 'last mile' access infrastructure between an 'edge' or 'local' network node and end-user premises (now increasingly fiber-based), and are largely invariant with traffic (fiber) or charged per data bundles (wireless).



## Core and Backhaul

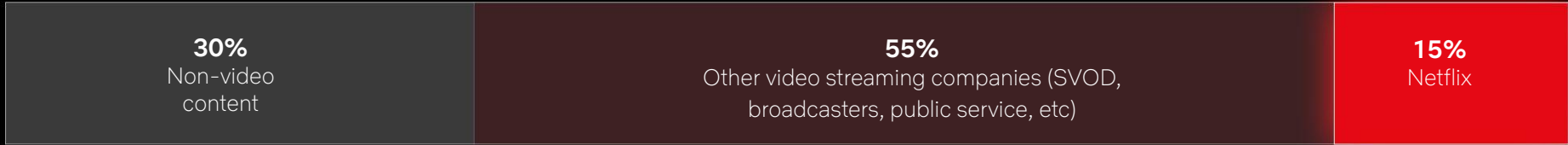
These costs are expected to remain stable over time (on an annualised basis) as a result of economies of scale, decreasing equipment and link costs for high-capacity links and the continued delivery of traffic through caches located deep in the ISP's network.



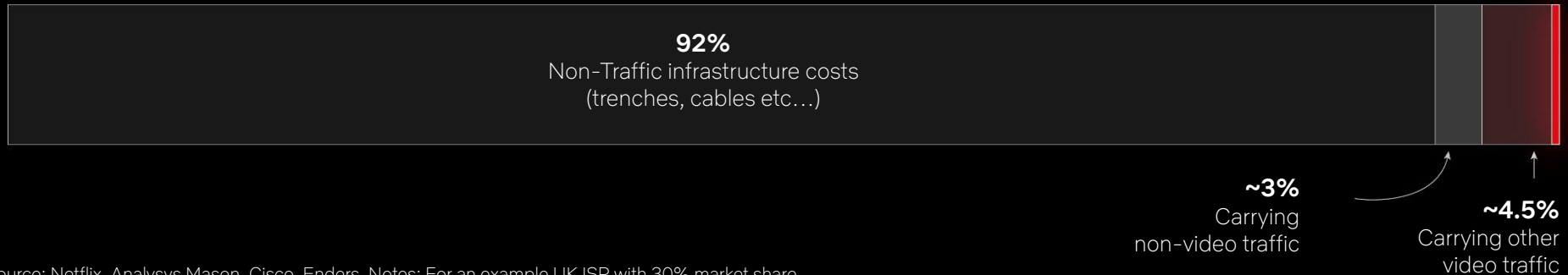
# The small costs of carrying Netflix content

ISPs network costs are largely insensitive to traffic levels. A growing demand from end users can be handled sustainably without increasing network costs over time

## Traffic carried by ISPs at peak time



## Cost to ISPs

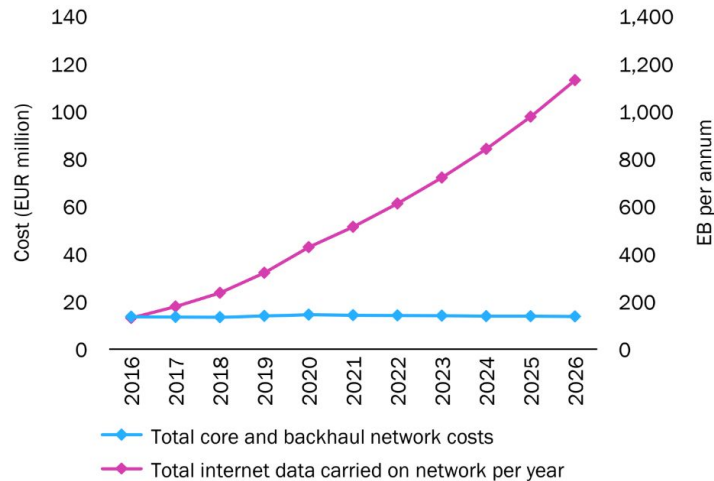




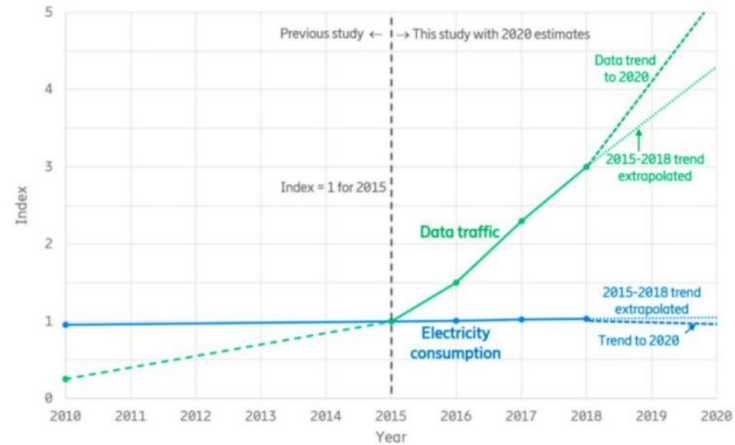
# Concerns over traffic costs are exaggerated

Bottom-up cost modeling exercises conclude that **ISPs network costs are broadly unrelated to network usage** (instead network costs grow proportionate to the number of subscribers), and that technological efficiencies (declining per-unit costs, CDNs) offset usage growth.

Annualised traffic vs. traffic-dependent network costs, for an efficient ISP, UK, caches in all metro nodes

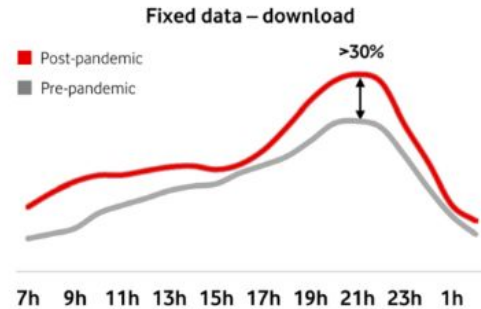
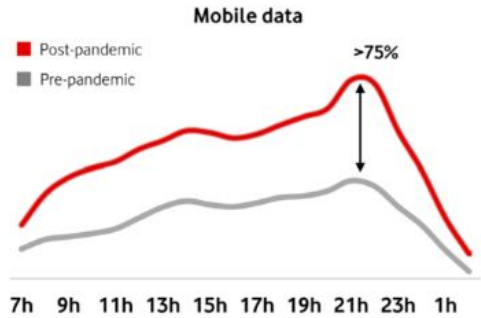


Electricity consumption and data traffic for the reporting ETNO operators of 2015–2018 (indexed 2015 = 1)



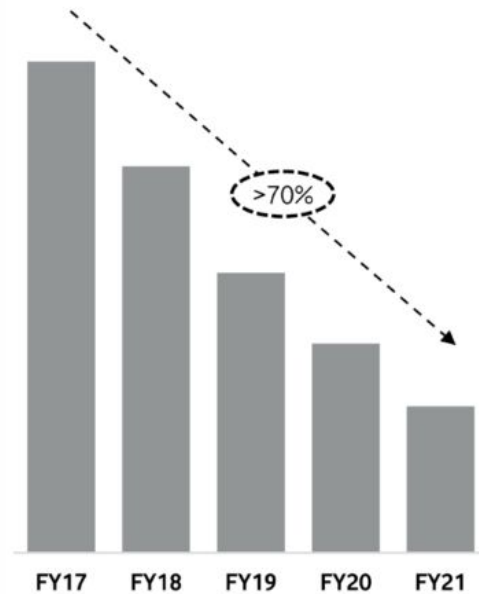
Source: [Analysys Mason](#), [Malmodin](#), [BEREC](#), [Ofcom](#) ....

## Peak demand has increased



## As Cost per GB has fallen faster

### Cost per GB



Source: <https://investors.vodafone.com/sites/vodafone-ir/files/2021-06/vodafone-technology-investor-briefing-presentation.pdf>, pages 12 and 38

**Conclusion: an efficient,  
Open Internet with  
common incentives**



# Conclusions

- **Internet Content Providers and ISPs are mutually dependent.** Investments in content and services benefits user demand for ISPs services.
- **Netflix cooperates with ISPs for efficient content delivery** and interconnections through content localization, and advanced encoding techniques.
- A growing demand from end users can be handled sustainably **without increasing network costs.**

**Thank you**