

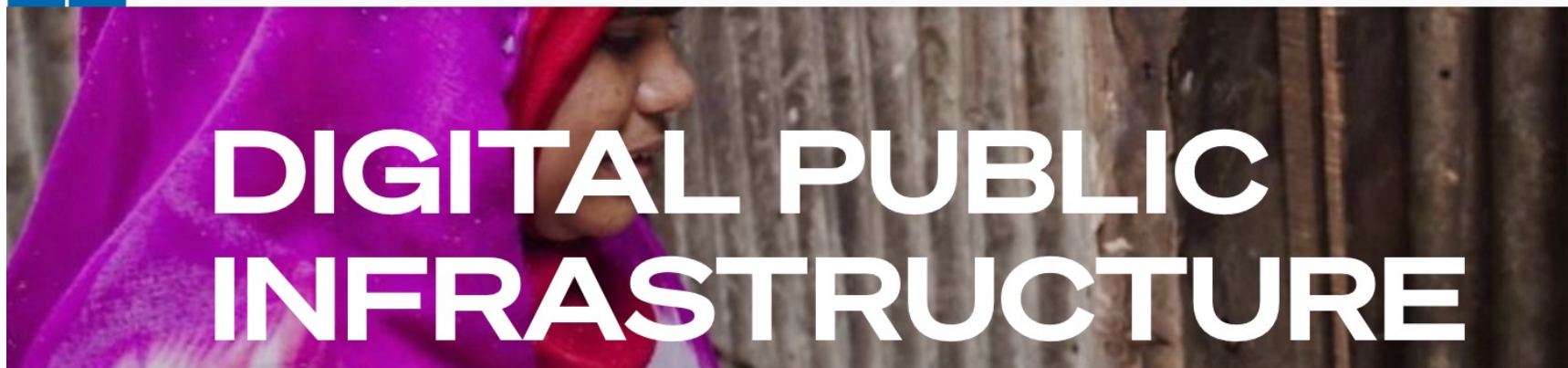


Digital

OUR APPROACH

OUR IMPACT

OUR PRODUCTS



**United Nations**

Office for Digital and Emerging Technologies

Home

HLAB on Artificial Intelligence

Roadmap for Digital Cooperation

Global Digital Compact

Digital Public Infrastructure

Home » Digital Public Infrastructure



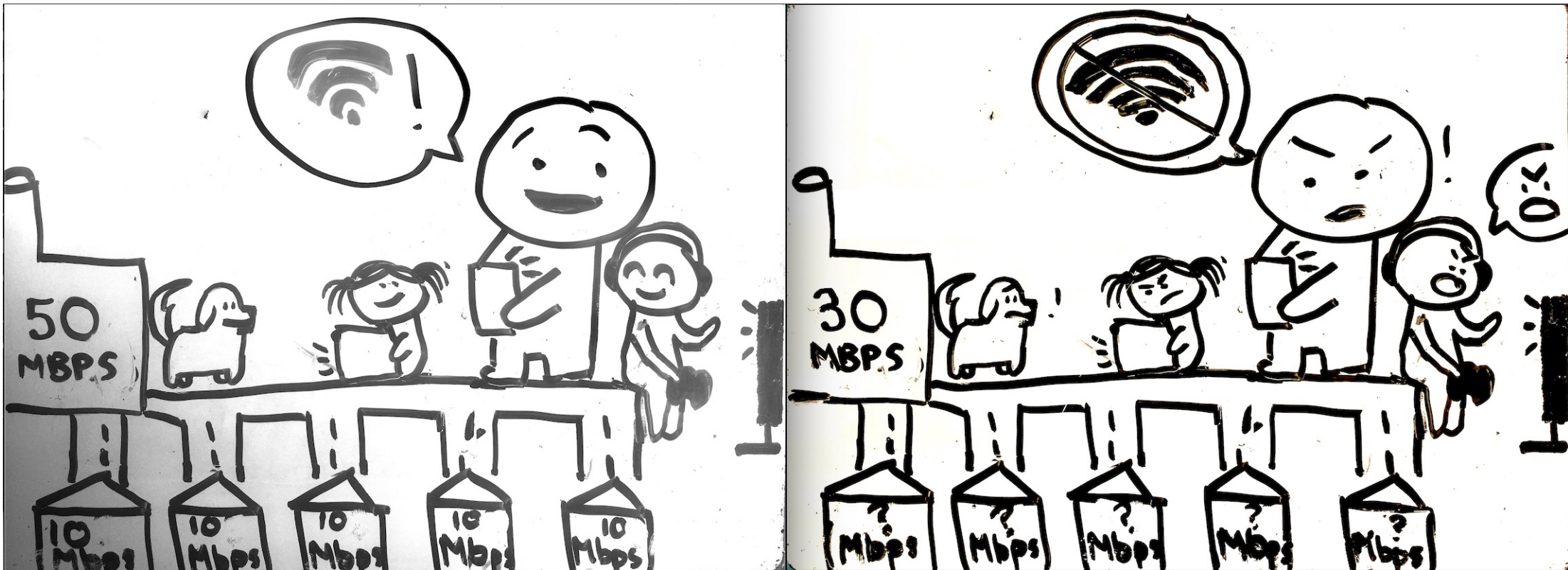
## **Destiny of Internet for Innovation & Democracy:**

**“Everyone has chance to spread his or her messages to everyone else without having to worry about costs and risks of data delivery.”**

**“Unity at center protects diversity at edges”**

**“Fight for NN is fight to continue information revolution and progress or to regress to the world of telephony or postage”**

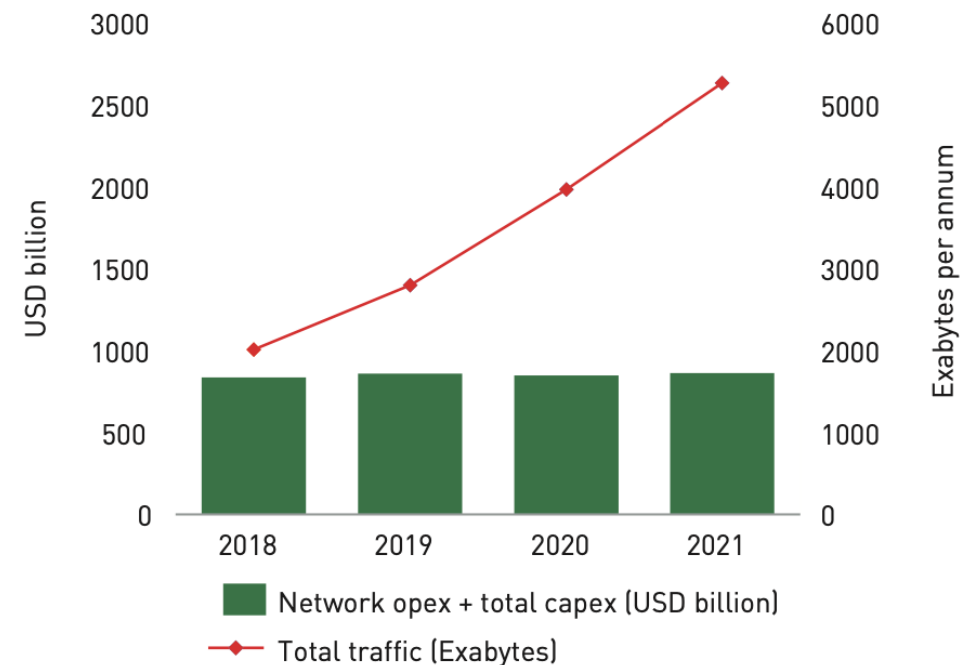
# Traffic Causes Congestion?



# Truth: Abundance of Network Capacity for the Connected World!

- BEREC: no congestion upstream. Thanks to CDNs and also ISPs. Congestion is in the last mile.
- Korea: only 40-50% of the peak capacity used during pandemic (1/2 of pop live in 5% of country, half live in high rise apartments)
- Now, the last mile is exactly where ISPs should be responsible for.

**FIGURE 0.2:** GROWTH IN TRAFFIC DELIVERED OVER FIXED AND MOBILE ACCESS NETWORKS, AND EVOLUTION OF NETWORK-RELATED TELECOM OPERATOR COSTS FROM 2018 TO 2021  
[SOURCE: ANALYSYS MASON RESEARCH, ANALYSYS MASON, 2022]





**Anyone can be hit by fire. So, let's help each other.**

**→ Anyone can be a sender of traffic, let's not charge each other.**

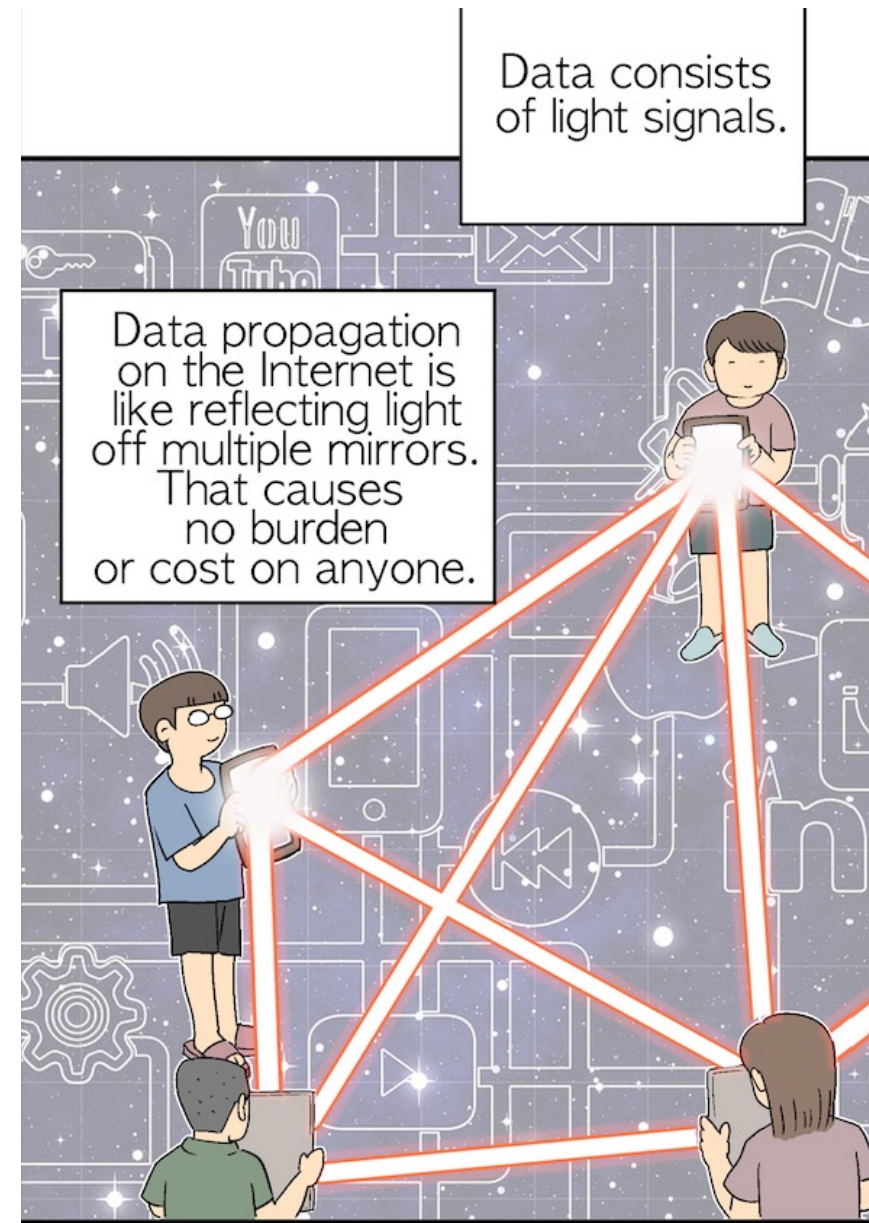
**→ End result:**

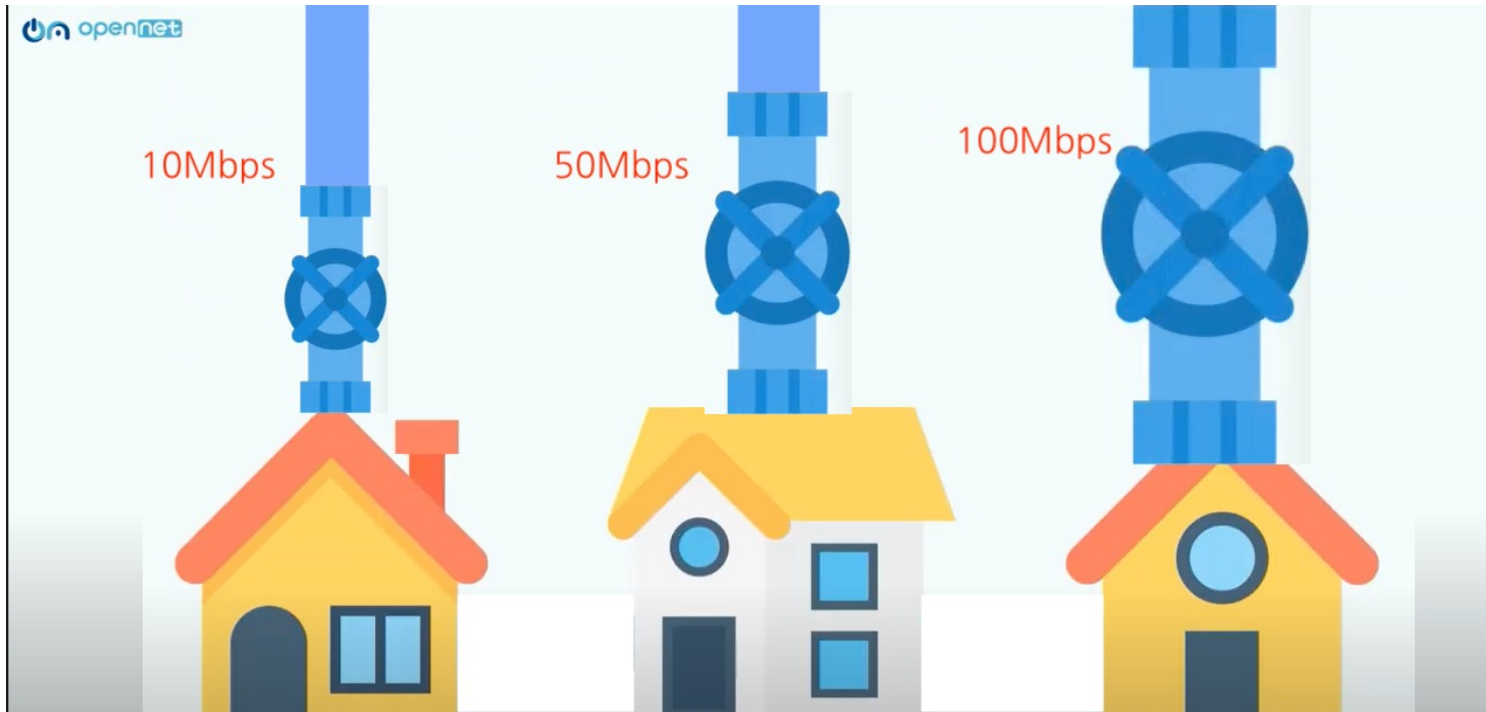
**Everyone pays to**

**Connect,**

**So No One pays to**

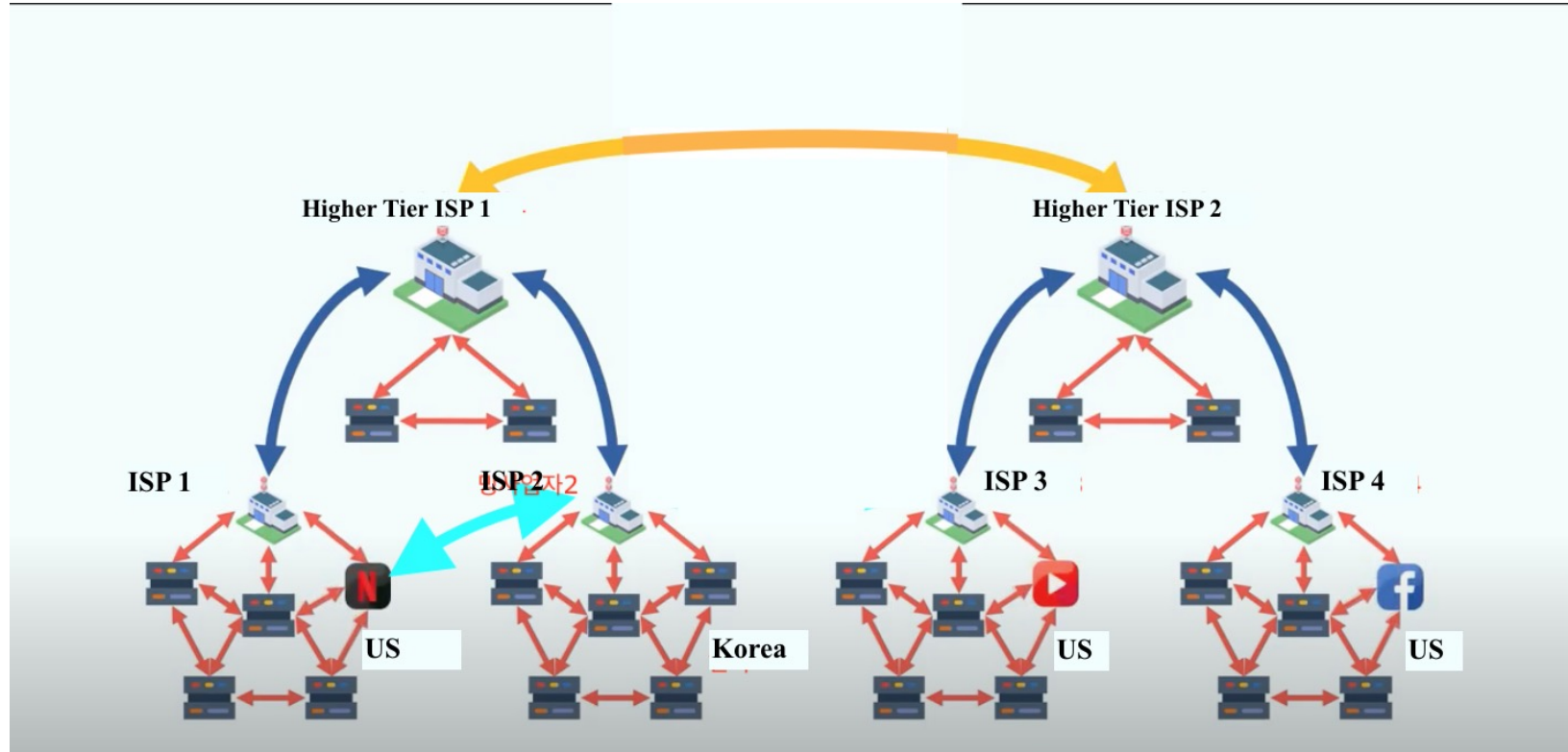
**Send or Receive!**





No matter how much you use, you pay exactly the same monthly fee

# How Internet works: “Internet” as a service



Red line: ISPs selling “internet” to end users (CAPs and individuals) - TRANSIT

Dark Blue line: Local ISPs need to buy their own internet access -TRANSIT

Light Blue line: Not a connection to the internet but only with each other – PEERING

# How to pay for delivery cost?

- B will want to charge to A for “sending”, and C to B, and X to C.
- In the real world, multiple unrelated ISPs in the middle carry to their neighbors: e.g., COX → COGENT → AMAZON
- Sender pay will destroy internet with transaction cost of charging one another.

```
traceroute to opennetkorea.org (15.164.239.189), 64 hops max, 52 byte packets
 1 192.168.1.1 (192.168.1.1) 4.842 ms 4.402 ms 3.480 ms
 2 10.81.186.1 (10.81.186.1) 13.924 ms 13.330 ms 12.087 ms
 3 100.120.105.176 (100.120.105.176) 12.966 ms 14.425 ms 12.940 ms
 4 100.120.104.0 (100.120.104.0) 20.501 ms 15.731 ms 15.129 ms
 5 * langbprj01-ae1.rd.la.cox.net (68.1.1.13) 11.843 ms 15.215 ms
 6 lax-b23-link.ip.twelve99.net (62.115.13.102) 10.316 ms 15.617 ms 15.727 ms
 7 * * *
 8 be3359.ccr42.lax01.atlas.cogentco.com (154.54.3.69) 25.719 ms
   be3243.ccr41.lax01.atlas.cogentco.com (154.54.27.117) 16.318 ms 11.323 ms
 9 be3360.ccr41.lax04.atlas.cogentco.com (154.54.25.150) 21.993 ms 16.058 ms 16.642 ms
10 be2894.ccr72.tyo01.atlas.cogentco.com (154.54.1.22) 117.683 ms 117.439 ms 116.911 ms
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 52.93.248.202 (52.93.248.202) 148.258 ms
   52.93.248.196 (52.93.248.196) 147.559 ms
   52.93.248.208 (52.93.248.208) 149.313 ms
17 52.93.248.209 (52.93.248.209) 148.707 ms
   52.93.248.207 (52.93.248.207) 151.283 ms
   52.93.248.197 (52.93.248.197) 151.277 ms
18 54.239.123.9 (54.239.123.9) 151.635 ms
   54.239.123.53 (54.239.123.53) 152.959 ms
   54.239.122.243 (54.239.122.243) 149.338 ms
19 52.93.247.14 (52.93.247.14) 147.409 ms
   54.239.122.22 (54.239.122.22) 151.469 ms
   54.239.122.28 (54.239.122.28) 148.167 ms
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 ec2-15-164-239-189.ap-northeast-2.compute.amazonaws.com (15.164.239.189) 150.844 ms 146.507
ms 148.056 ms
```



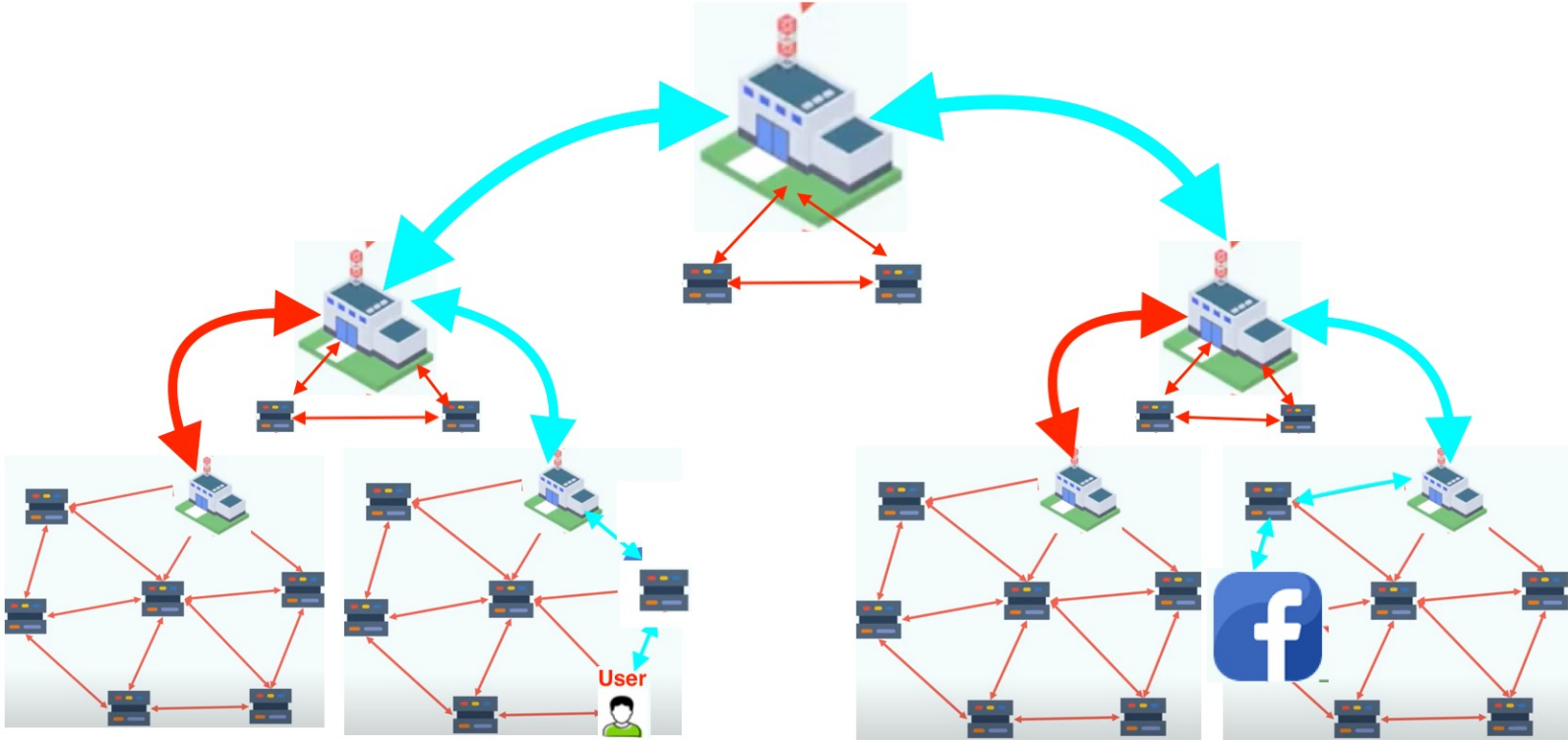
# Digital Trade Norms

- GATS Annex on Telecommunications – “access to telecommunication network” - mandatory on all parties. Applicable if the choke hold on market access is network access. \*
- 1998 Agreement on Basic Telecommunication Services – 69 countries’ agreement to regulate “anti-competitive practices” of major carriers, which often relate to interconnection \* → Telmex refusal to connect case
- RTA/PTA/DTAs – zero-tariff on digital goods, mutual recognition of electronic signatures, source code protection, e.g, and carrying the Annex and the 1998 Agreement
- GATS liberalizing commitments: *US Gambling* case – all online services will be evaluated like offline versions. If committed to opening gambling, cannot block online gambling unless XIV exception applies -

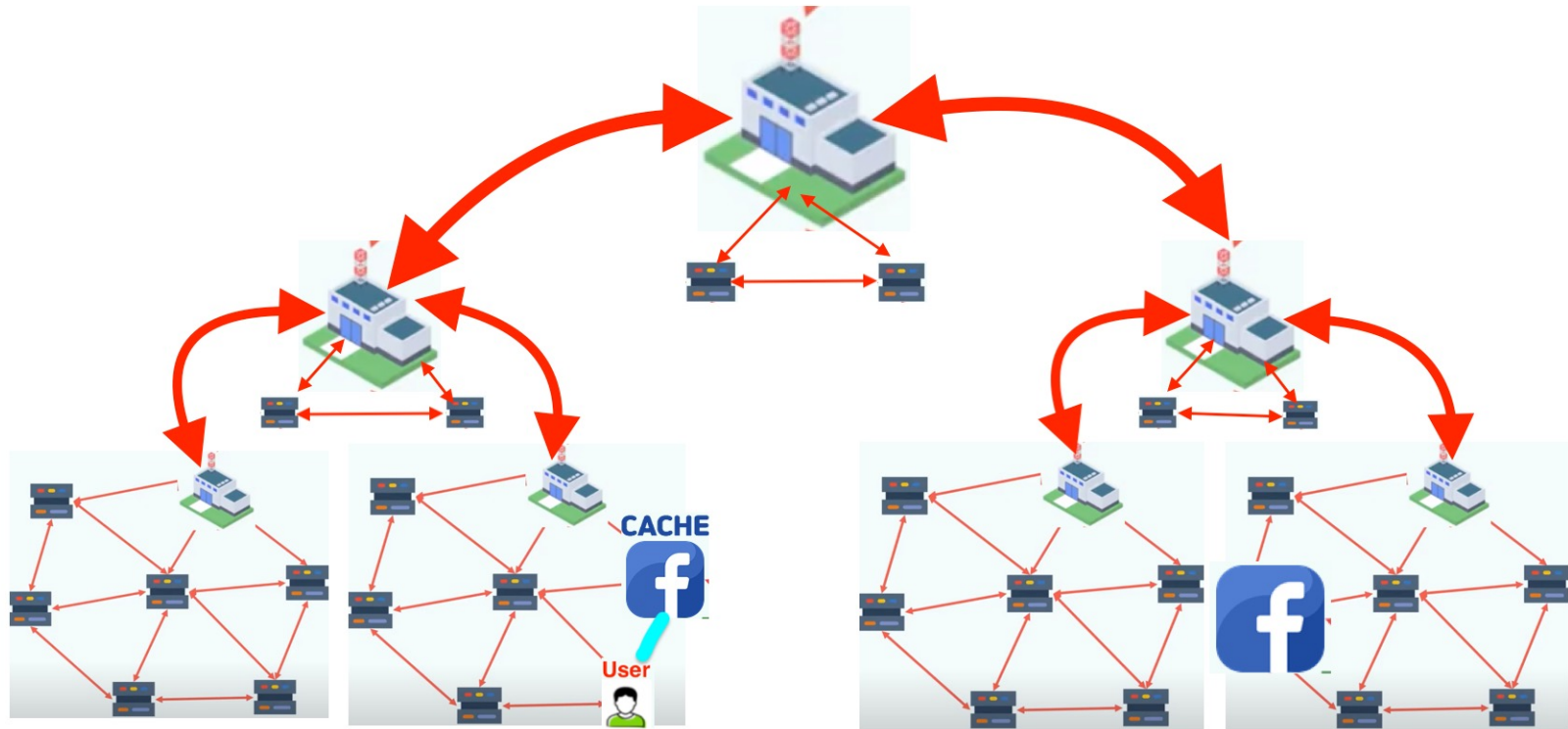
# FCC 2010 Open Internet Order

[B]roadband providers may have incentives to increase revenues **by charging edge providers, who already pay for their own connections to the Internet, for access or prioritized access to end users.** Although broadband providers have not historically imposed such fees, they have argued they should be permitted to do so. A broadband provider could force edge providers to pay inefficiently high fees because that broadband provider is typically an edge provider's only option for reaching a particular end user. Thus broadband providers have the ability to act as gatekeepers. Federal Communication Commission, Preserving the Open Internet, FCC 10-201, December 2010, para. 24

# Without shortcut connection



With shortcut connection (peering), e.g.,  
cache server



Save money for ISPs, cost money for Big Techs, e.g., subsea cable,  
private CDN → Big techs already paying for internet access

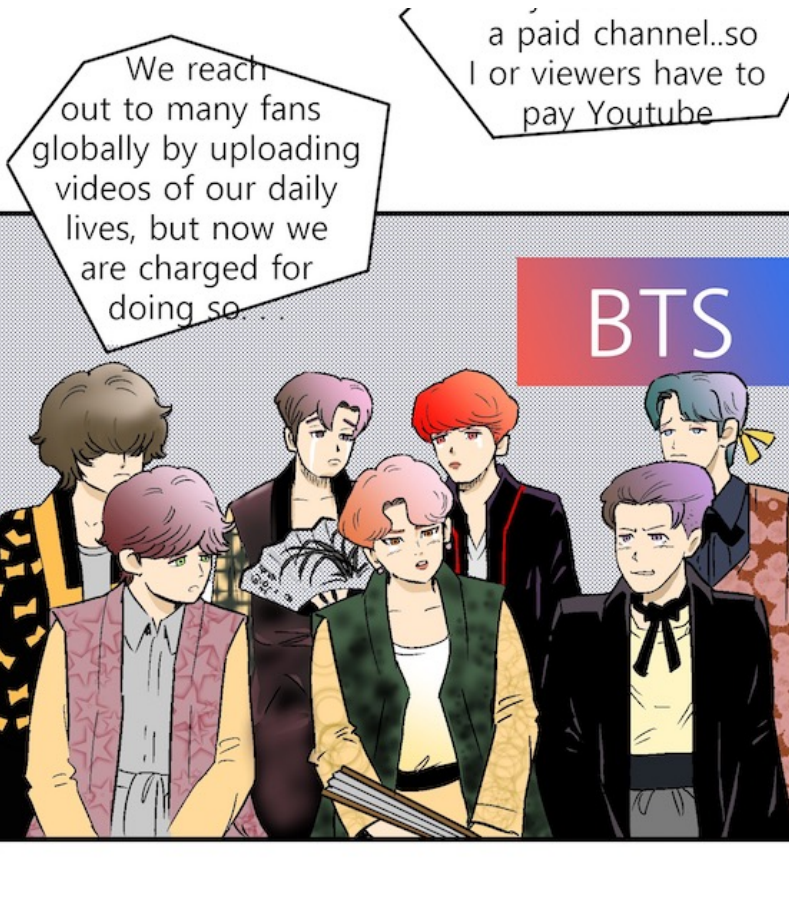
# FCC 2010 Open Internet Order

A person engaged in the provision of fixed broadband Internet access service, insofar as such person is so engaged, shall not block lawful content, applications, services, or non-harmful devices, subject to reasonable network management.”

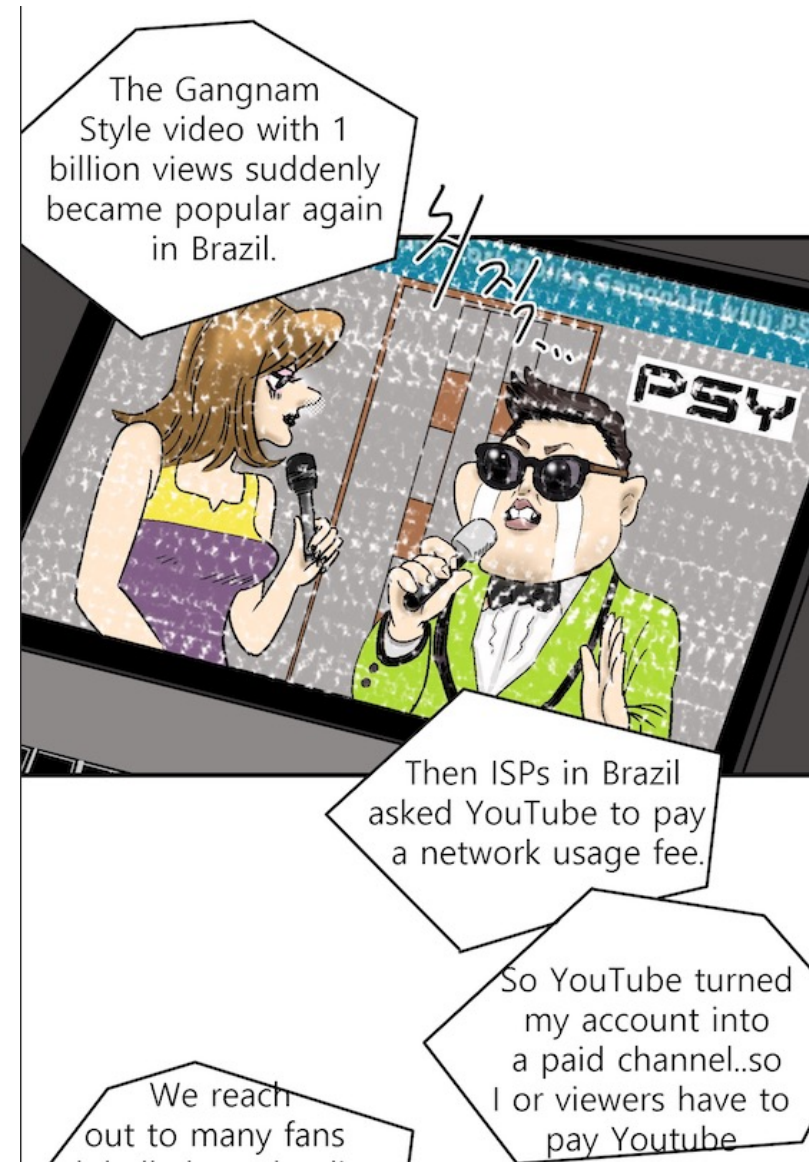
Some concerns have been expressed that broadband providers may seek to charge edge providers simply for delivering traffic to or carrying traffic from the broadband provider’s end-user customers. To the extent that a content, application, or service provider could avoid being blocked only by paying a fee, charging such a fee would not be permissible under these rules.(footnote 76)

**76: We do not intend our rules to affect existing arrangements for network interconnection, including existing paid peering arrangements**

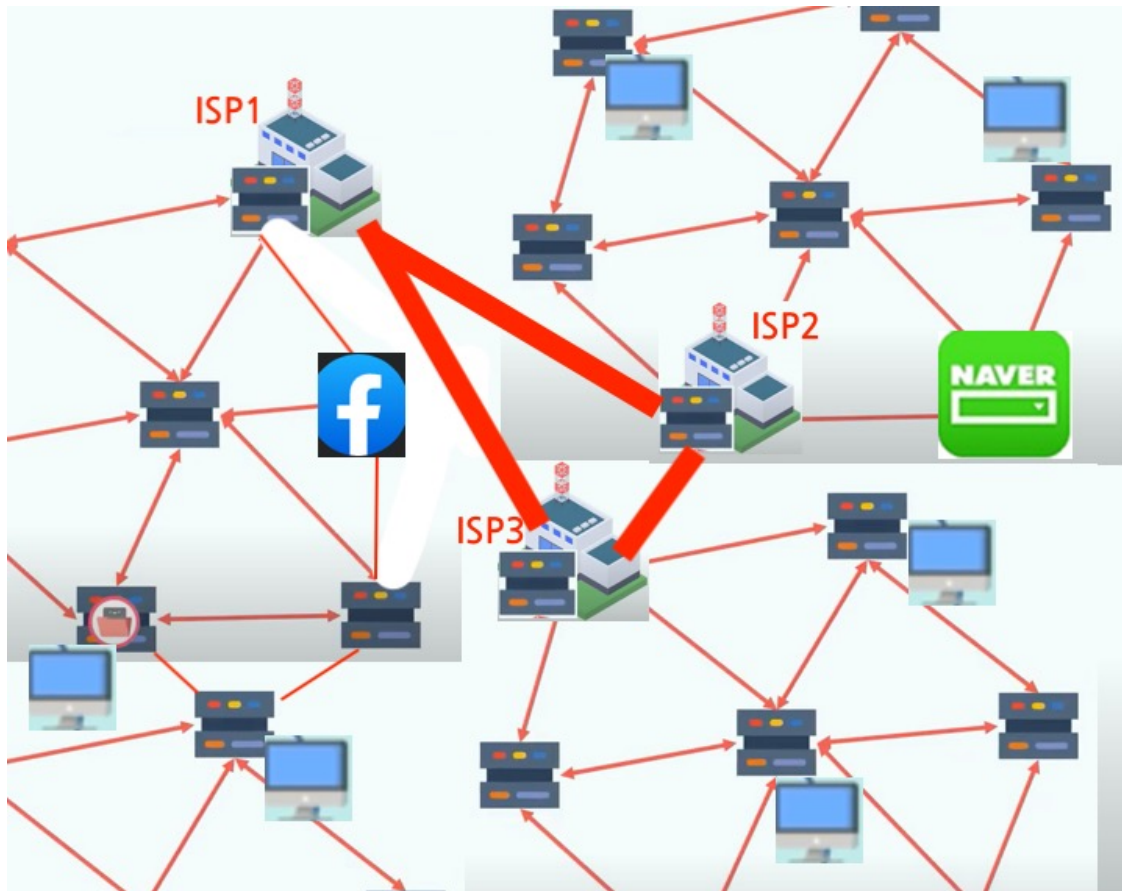
# Effect of sender pay rule



Korea-eyeball-heavy content becoming burdensome to carry → investment in K-contents reduced



# Sender Pay Rule Removes Competition among Big ISPs



# Transit prices in 2017

## Seoul 1 Mbps per USD 3.77

<https://www.unescap.org/sites/default/files/Breaking%20the%20barriers%20of%20Broadband%20in%20Asia-Pacific%2C%20LIRNEasia.pdf> (December 2017)

- 8.3 times Paris
- 6.2 times London
- 4.8 times New York
- 4.3 times LA
- 2.1 times Singapore
- 1.7 times Tokyo





# 2021 IP Transit Fees: Seoul

- 8 times London
- 10 times Frankfurt

TeleGeography's annual bandwidth pricing review from 2021, especially slide 17, available here: <https://blog.telegeography.com/2021-global-pricing-trends-in-20-minutes>.

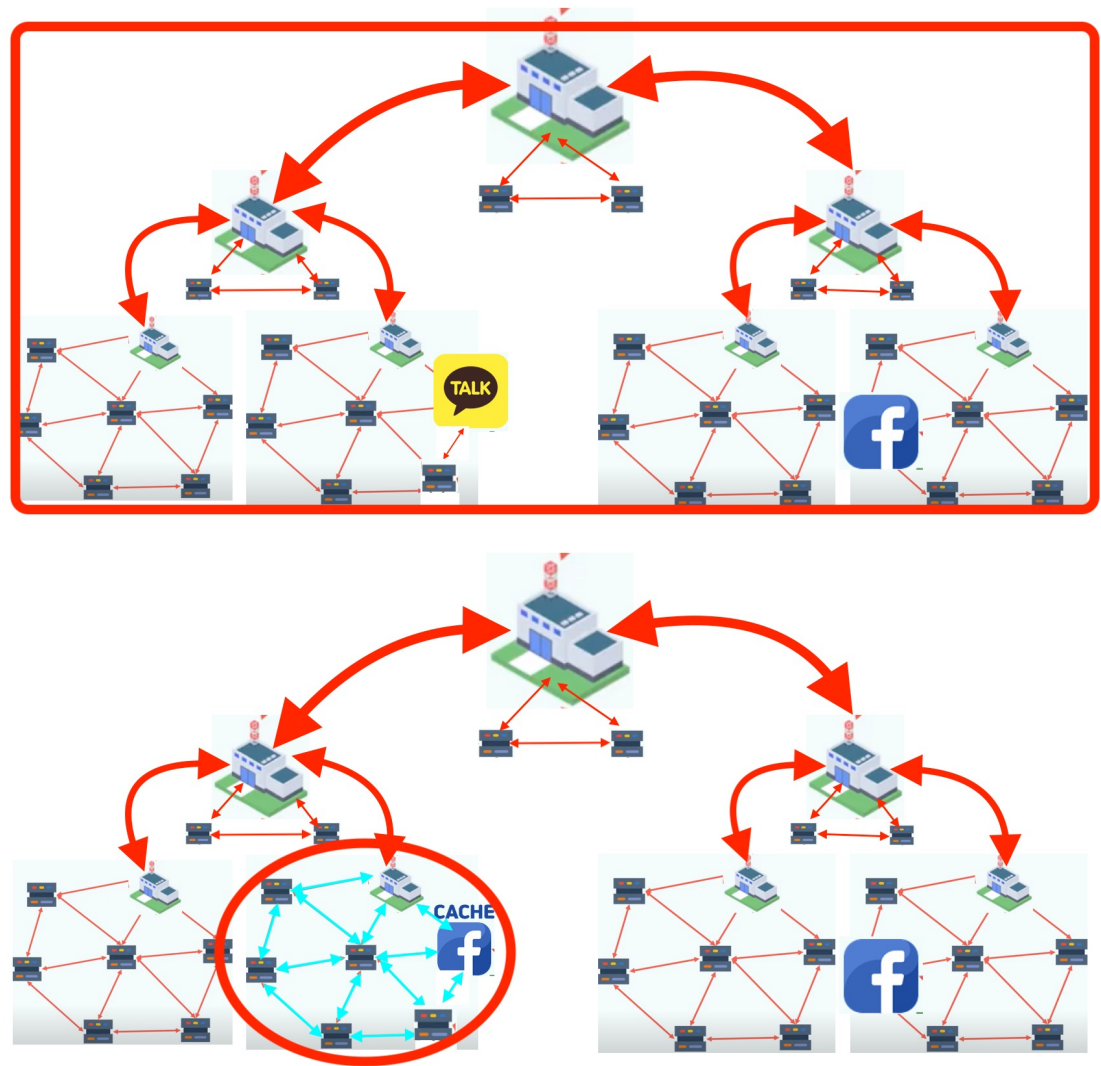
## <https://blog.telegeography.com/2021-global-pricing-trends-in-20-minutes> Similar IP transit prices on both sides of the Atlantic



## <https://blog.telegeography.com/2021-global-pricing-trends-in-20-minutes> Secondary markets retain a premium for IP transit, too



# Transit v Peering



# KOR-US Digital Trade Disputes

- Digital Trade Barrier according to US National Trade Estimate Report: “network usage fee” law (+ location-based data export ban)
- Proponents: “Domestic CPs are already paying it. Some foreign CPs are paying also. Only big techs are not paying. We need to make it equal.”
- Opponents: “Settlement free peering is the world standard. Foreign CPs are paying only because of the oligopoly of the big 3 ISPs.”
- From net neutrality perspective (i.e., removing the gatekeepers and the toll charges), the opponents prevail. But what if NN is questioned? What if we do want to charge people/companies at the expense of reversing the information revolution?
- How about under international economic law?

# KORUS violations!

- 14.2.1 (Telecom Annex) access to network - discriminatory
- 14.2.5 (Telecom Annex) no condition on access other than for network management
- 14.5 (1998 Telecom Ag) strengthens big 3 ISPs' oligopoly and self-preferencing
- 15.7 (network neutrality)

# Two-sided Market Theory & Nature of Internet

- CSO: “Network usage fee is charging twice. ISPs already charge end users for making available contents, and cannot charge content providers for that”
- ISP: “ISPs can charge twice bc of 2-sided Market”
- Answer: **ISPs cannot. ISPs already charged twice when they “sold Internet” both to CPs and Users. Internet is two-way connectivity. CP sending to users is the same as users downloading from CP. Current internet already takes care of the data delivery cost.** Network usage fee charges separate fee on top of that. It is the **3<sup>rd</sup> charge.**
- Two-sided market theory works only when one ISP can serve both sides. On Internet, no single ISP can do that. Korean ISP may have power to charge only Korean users/CPs, and American ISP has power to charge only American users/CPs. ISPs must work together to provide internet.

# **On the “receiver-pays” principle**

**Doh-Shin Jeon\***

**Jean-Jacques Laffont\*\***

**and**

**Jean Tirole\*\*\***

**Conclusion: “Network-based price discrimination creates strong incentives for connectivity breakdowns.”**



**KOREA UNIVERSITY**  
School of Law

[www.opennetkorea.org](http://www.opennetkorea.org)

Kyung Sin "KS" Park

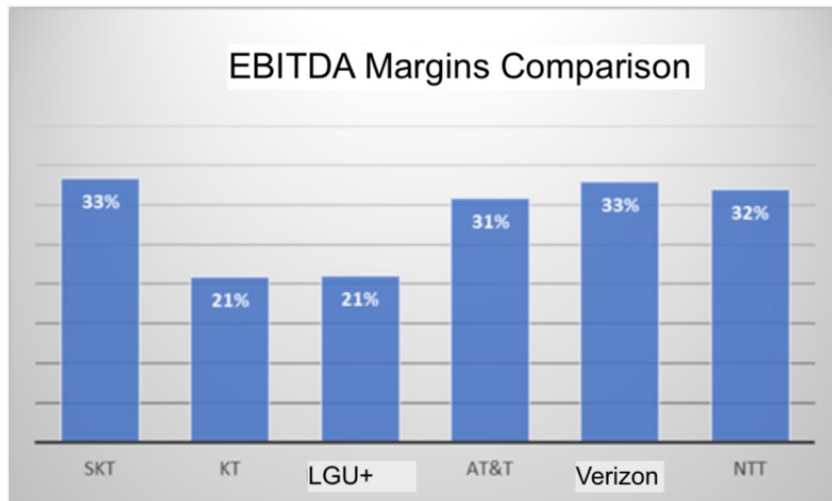
[kyungsinpark@korea.ac.kr](mailto:kyungsinpark@korea.ac.kr)

Professor, Korea University Law School  
Director, Open Net (Korea)

# Profitability of Big 3 ISPs

mobile big3 operating profit rate

	yr13	yr14	yr15	yr16	yr17	yr18	yr19	yr20	yr21	yr22
operating profit (KRW Trillion)	2.95	2.09	3.03	3.86	3.64	2.83	0.33	1.91	1.64	2.69
operating profit rate (%) = operating profit/ revenue	11.0	7.7	11.3	14.5	14.8	12.1	1.4	8.0	6.4	10.1



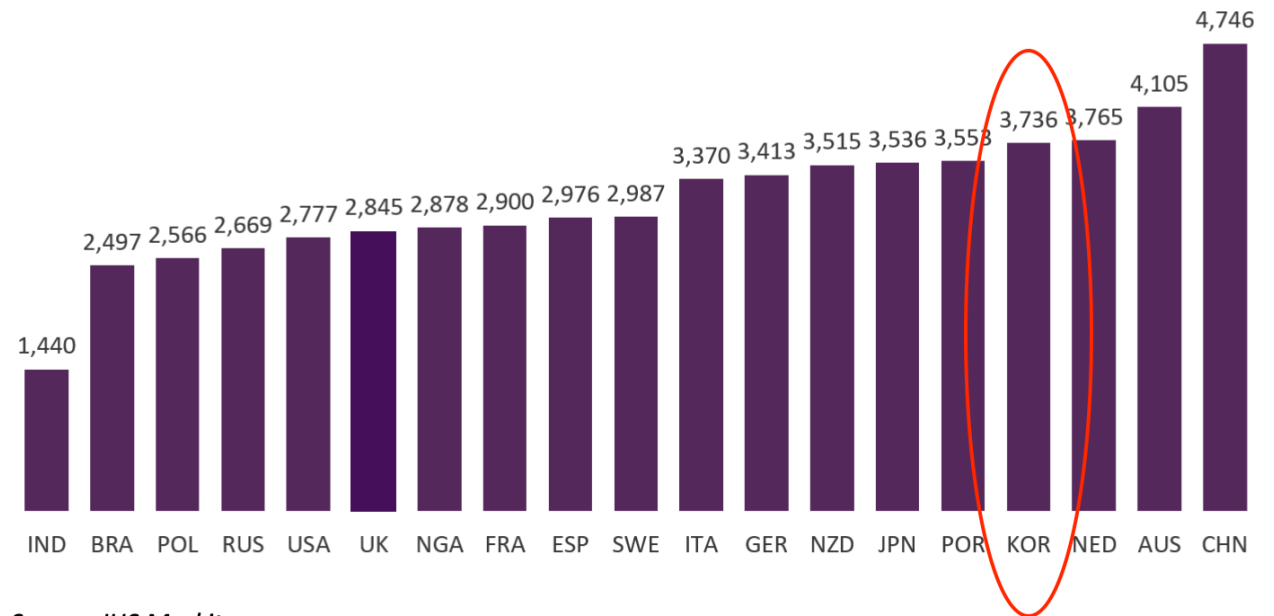
Mobile Big 3 Annual Dividends Yield (단위 : %)

Year	2018년	2019년	2020년	2021년	2022년
SK	3.6	3.7	4.1	5.7	6.8
KT	3.6	4.0	5.3	5.9	5.5
LGU+	2.3	2.8	3.7	3.9	5.5



- Wired internet – HHI: 3600 (revenue) 3200 (# of customers)
- Wireless internet – HHI: revenue/customers both 3600
- Big 3s – wireless 100%, landed 98% (revenue) 95% (# of customers)
- Use of LLU - non-existent in Korea

Figure 39 Mobile market HHI, MNOs (including wholesale and hosted MVNOs): end 2016



Source: IHS Markit

Note: All figures have been rounded to the nearest whole number.

# Korea's ISPs do not participate in IXPs

Name	Country	City	Network...
<u>MyIX</u> Malaysia Internet Exchange	MY	Kuala Lumpur	102
<u>DE-CIX Johor Bahru</u> <b>Platinum Sponsor</b> DE-CIX Johor Bahru / JBIX	MY	Johor Bahru	38
<u>MYNAP</u> Malaysia Network Access Point (MYNAF)	MY	Cyberjaya	3

All telco

<u>Maxis Communications Bhd</u> 9534	218.100.44.80 2001:de8:10::f	60G Open
<u>Celcom (M) Berhad</u> 10030	218.100.44.87 2001:de8:10::15	20G Selective
<u>Celcom (M) Berhad</u> 10030	218.100.44.115 2001:de8:10::2e	20G Selective

## HongKong

Name	Network...
<u>HKIX</u> Hong Kong Internet Exchange	277
<u>Equinix Hong Kong</u> Equinix Internet Exchange Hong Ki	173
<u>AMS-IX Hong Kong</u> <b>Silver Sponsor</b> Amsterdam Internet Exchange Hor	52

<u>Telekom Malaysia Berhad (TM)</u> 4788	218.100.44.127 2001:de8:10::3b	10G Selective
<u>Telekom Malaysia Berhad (TM)</u> 4788	218.100.44.182 2001:de8:10::83	30G Selective
<u>Telekom Malaysia Berhad (TM)</u> 4788	218.100.44.227 2001:de8:10::d7	10G Selective
<u>Telekom Malaysia Berhad (TM)</u> 4788	218.100.44.128 2001:de8:10::fd	200M Selective

<u>DiGi Telecommunications</u> Malaysia 4818	218.100.44.70 2001:de8:10::6	100G Open
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<u>TIME DotCom Berhad</u> 9930	218.100.44.112 2001:de8:10::2	100G Selective
<u>TIME DotCom Berhad</u> 9930	218.100.44.195 2001:de8:10::97	20G Selective

<u>U Mobile Sdn. Bhd.</u> 38466	218.100.44.86 2001:de8:10::14	60G Open
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## Japan

Name	Network...
<u>BBIX Tokyo</u> <b>Silver Sponsor</b> BroadBand Internet eXchange Tokyo	227
<u>JPIX TOKYO</u> <b>Silver Sponsor</b> Japan Internet Exchange Tokyo	217
<u>JPNAP Tokyo</u> JPNAP Tokyo	177
<u>Equinix Tokyo</u> Equinix Internet Exchange Tokyo	102
<u>JPIX OSAKA</u> <b>Silver Sponsor</b> Japan Internet Exchange Osaka	79
<u>BBIX Osaka</u> <b>Silver Sponsor</b> BroadBand Internet eXchange Osaka	74
<u>JPNAP Osaka</u> JPNAP Osaka	70

# Peering Internet Exchanges (IX)

Name	Country	City	Network...
<u>KINX</u> Korean Internet Neutral Exchange	KR	Seoul	72
<u>KRIX(sejong)</u> Korea Internet Exchange	KR	Seoul	10
<u>Equinix Seoul</u> Equinix Internet Exchange Seoul	KR	Seoul	2

No telco

# 2011-2012 Korean telcos' first talk of "network usage" fee

- Directed at big domestic content providers such as NAVER, DAUM (later KAKAO)
- Talks of "**free rides**" synchronized with ETNO's proposal of termination fees to ITU
- However, domestic CPs are already paying transit fees to obtain internet access, i.e., there is no free ride.
- Other actions trying to condition delivery on payment:
  - KT - Samsung Smart TV blocking – withdrawn after Korea Communication Commissions intervened
  - KT/SKT - Kakao Talk voice call blocking – withdrawn after Open Net filed a mass lawsuit
  - SKT – zero-rating its own affiliate online shopping mall –implicitly daring other shopping malls to
- Ultimately withdrawn BUT. . .

After lobbying by telcos, Sending Party Network Pays Rule (2016 SPNP)

**If one ISP sends more traffic to another ISP than it receives, that ISP (i.e., sending party network) must pay for the cumulative net traffic SENT to the receiving ISP at the government-set rate.**

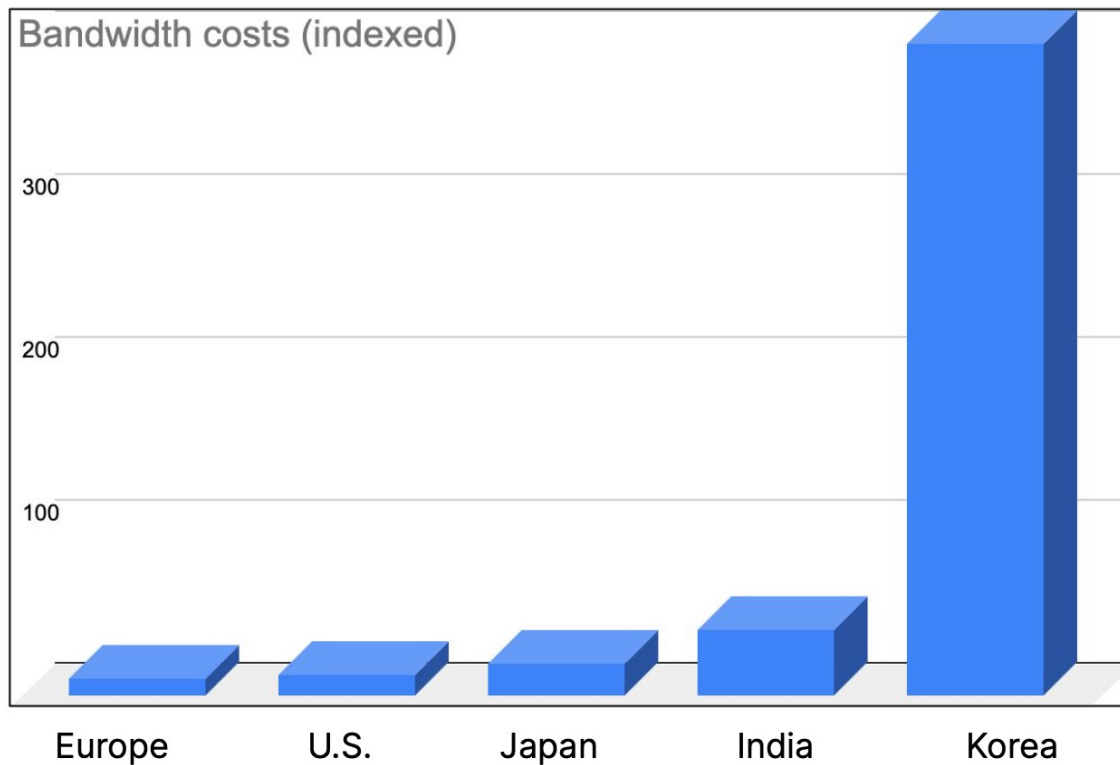
-> remove incentives to host popular CPs on-net → increase transit fees to 8 times Paris, 10 times Frankfurt, 5-6 times NY/LA

## Impact of existing SPNP:

- Local video services drop out of competition because high internet access fees prohibit high quality video
  - In 2017, **Afreeca TV** (biggest MCN other than Youtube) paying internet access fees equal to their profit ; 2021 **Watcha** (domestic video service) paying 10% of revenue as internet access fees; 2019-2021 **COVID-19 apps** not being able to meet demand because of high internet access fees
  - No 'unicorn' in past decade since NAVER and Kakao
  - Foreign CPs peering are charged equally high
- **Twitch** pulling out of Korea market, many contents served to Korea from outside → **Latency**

# Cloudflare's position

## Relative costs of bandwidth in different jurisdictions



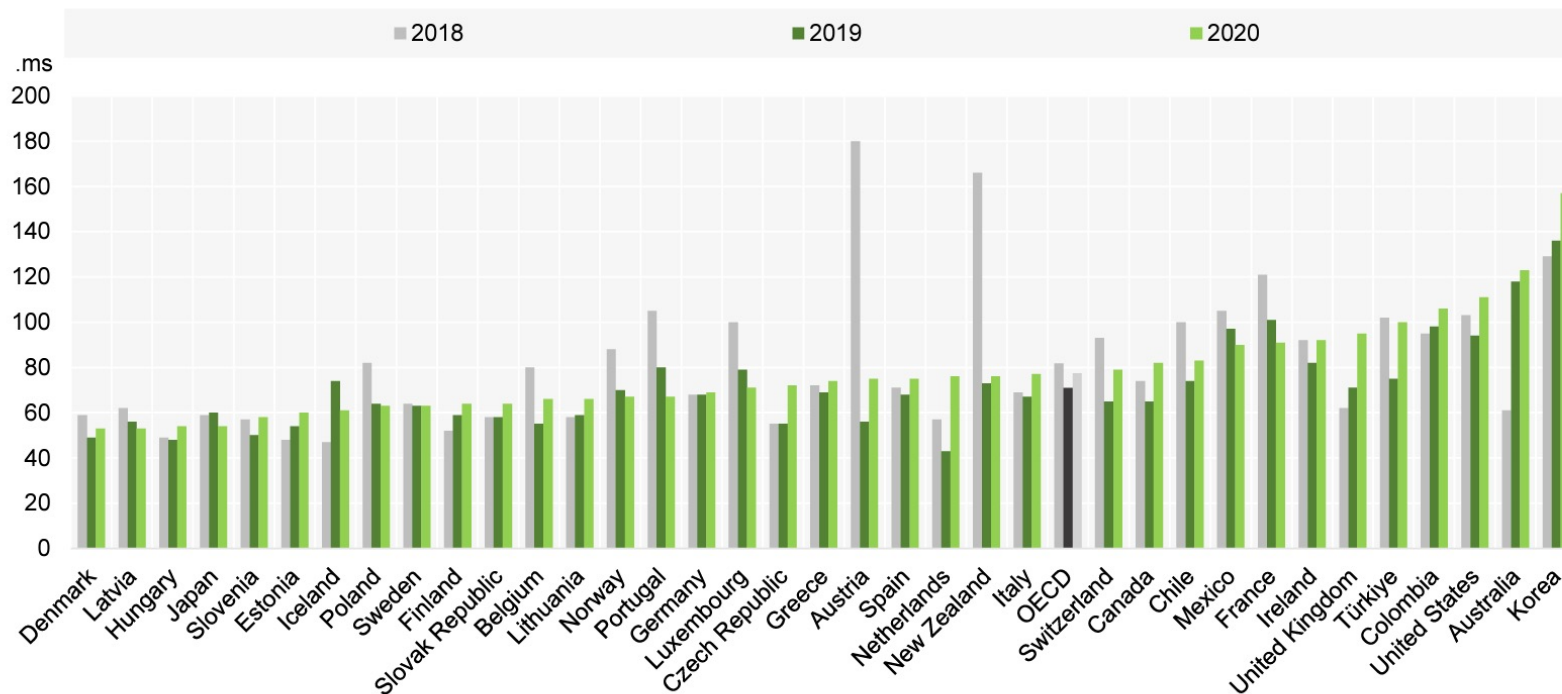
**Unlike other jurisdictions, bandwidth costs in Korea have not gone down.**

- Bandwidth costs **have not dropped in 6 years.**

**Bandwidth costs have an effect.**

- South Korea is the **only major world economy** where a substantial amount of Internet traffic is **served from outside** the country.

Figure 16. SpeedChecker data on overall\* average latency experienced by users in OECD countries measured towards Cloudflare's CDN, 2019-20



Notes: \*Overall measurement includes both foreign and local Points of Presence (POPs), and thus may differ from domestic (local) latency rates measured by OECD member countries. Slovak Republic and Slovenia do not have a local POPs in Cloudflare. See [Cloudflare network map](#). SpeedChecker latency measurements across countries may vary according to the location of POPs and the ratio of local POPs within the country.

Source: SpeedChecker

# It Gets Only Worse: 2020 “CP Service stabilization” Law and 2022 Network usage fee” bill

- Progression

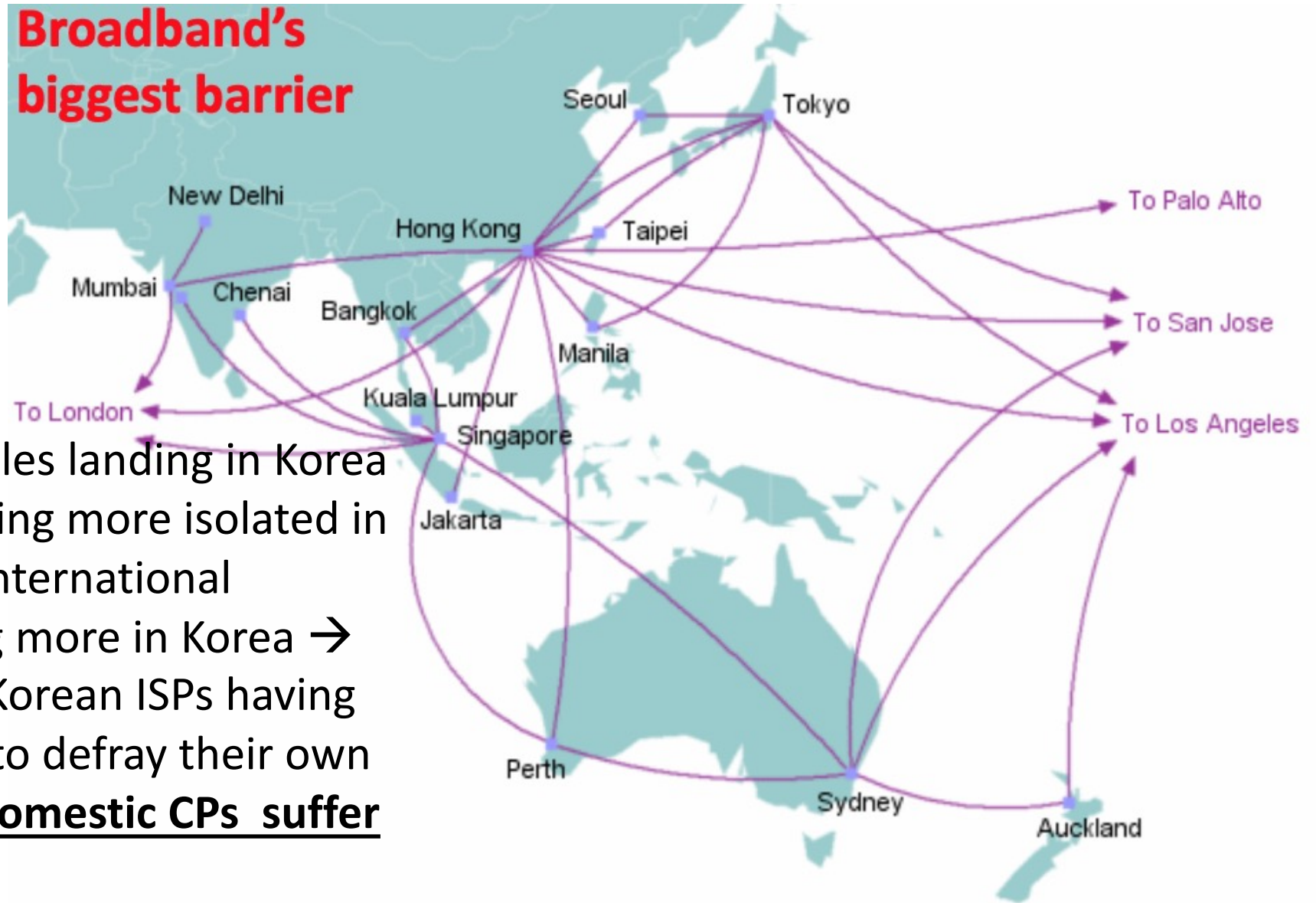
- 2016 SPNP: legally applicable only to ISPs but cause internet access fees on CPs to increase market-wise.

→ 2020 CP Service Stabilization: hold CPs responsible for maintaining connection (**when ISPs are the ones charging for connection!**)

→ 2022 “network usage fee” bills: legally force CPs to pay for data delivery



## Broadband's biggest barrier



Impact: Less cables landing in Korea  
→ Korea becoming more isolated in topography → International carriers charging more in Korea → vicious cycle of Korean ISPs having to charge more to defray their own transit fees → **Domestic CPs suffer even more.**

# Netflix v SKB

- SKB 1: Give me money because your traffic accounts for 15-20% of all our traffic.
- Netflix: Does it cost you anything? Netflix takes up 5 Mbps. You already provide at average 200 Mbps, allowing 40 different apps run simultaneously.
- Suit: Netflix: “Please declare I don’t owe SKB anything”
- Court: “Network is not free.” “Cannot force another to accept your data” → Netflix lost? No. “can pay in kind by CDN”

# References

- [International human rights orgs send letter to President Moon: Stop 'paid prioritization' bill](#)
- [Korea's Challenge to the Standard Internet Interconnection Model](#)
- [\*\*\[WEBTOON 1\] Rise of Guardian of Net Neutrality\*\*](#)  
[\*\*\[WEBTOON 2\] Return of the Guardian of Net Neutrality\*\*](#)
- [\[Video\] Net Neutrality Explained v.1: How Internet Works](#)
- [\[Video\] Net Neutrality Explained 2: Why Internet is not charged](#)
- [\[Video\] Net Neutrality Explained v3: How Charging Senders can be unfair](#)