

# **Internet Landscape of Japan -- from IXP perspective --**

Katsuyasu Toyama

Chairperson, the APIX association  
COO, JPNAP by Internet Multifeed Co.

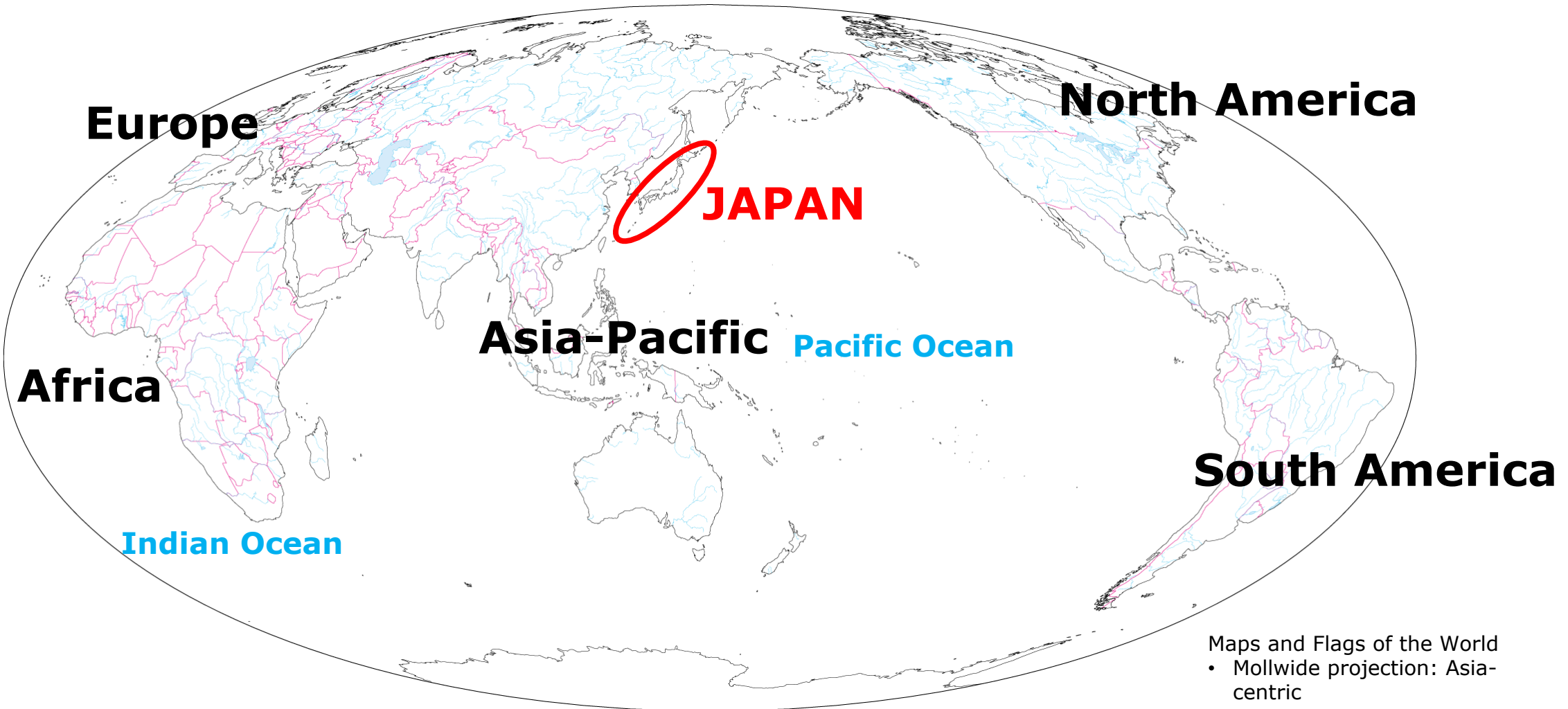
# Self-introduction: Katsuyasu Toyama

- **JPNAP** (2001, 2007-2012, 2015-)
  - COO, Representative Director, and EVP
- Asia Pacific Internet Exchange (**APIX**) association
  - Chairperson (2010-2017, 2019-)
- **Peering Asia**
  - Peering Asia WG member (2017- )
- NTT Communications
  - SVP of Internet and Mobile Services (2012-2015)
  - AS2914(GIN), AS4713(OCN)



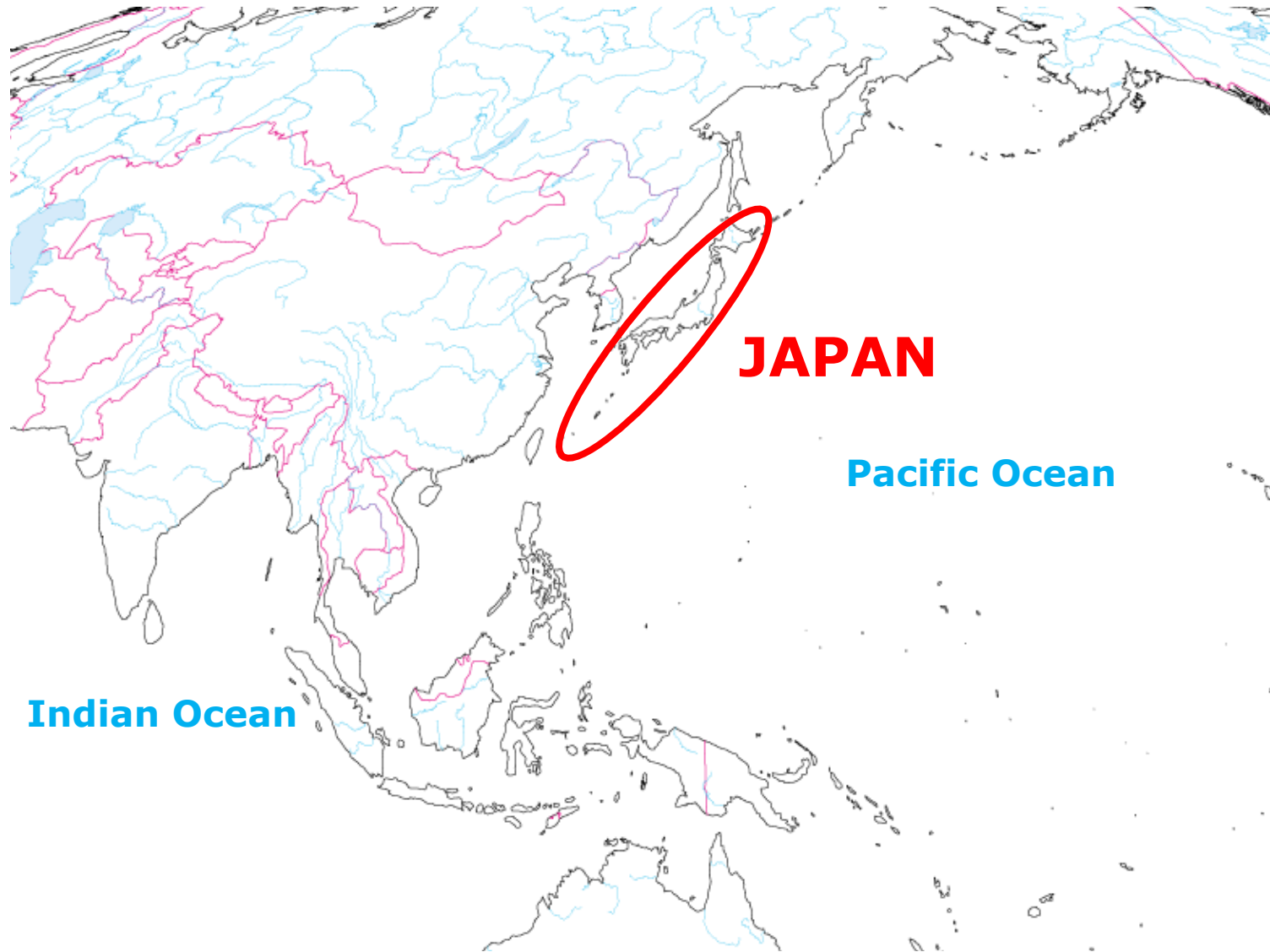
from JANOG52 official photos

# Japan: the location



Maps and Flags of the World  
• Mollwide projection: Asia-  
centric  
[https://www.abysse.co.jp/world-  
e/map/mollwide\\_asi\\_on.html](https://www.abysse.co.jp/world-e/map/mollwide_asi_on.html)

# Japan: the location

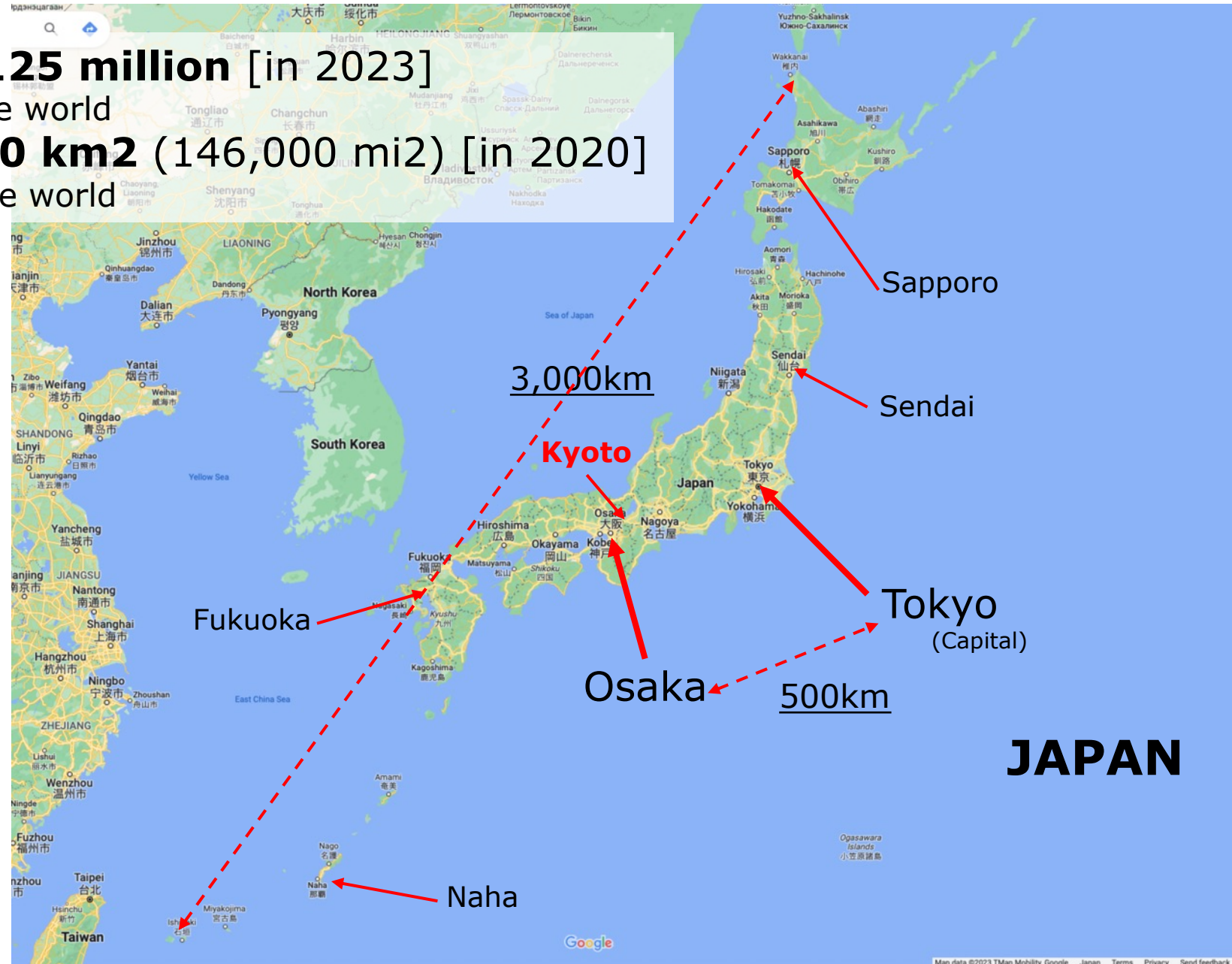


Maps and Flags of the World

- Mollwide projection: Asia-centric

[https://www.abysse.co.jp/world-e/map/mollwide\\_asi\\_on.html](https://www.abysse.co.jp/world-e/map/mollwide_asi_on.html)

- **Population: 125 million** [in 2023]
  - The 12<sup>th</sup> in the world
- **Area: 378,000 km<sup>2</sup> (146,000 mi<sup>2</sup>)** [in 2020]
  - The 62<sup>nd</sup> in the world



**JAPAN**

# The Internet in Japan

- History
  - 1984 Started in academia (UUCP-based)
    - Keio University, Tokyo Institute of Technology, and Tokyo University
  - 1988 Connected via Internet Protocol (IP)
  - 1993 Commercial business started
    - AT&T Jerns and Internet Initiative (IIJ)
- In 2023
  - A few hundreds of Internet Service Providers (ISPs)
  - 4 mobile network operators (MNOs)
  - 4 (commercial) internet exchanges (IXPs)

	Company	Service name
1	Softbank	Softbank Hikari
2	NTT resonant	OCN
3	NTT docomo	Docomo Hikari
4	Sony Network Communications	So-net
5	Biglobe	Biglobe
6	Optage	eo Hikari
7	KDDI	au Hikari
8	Nifty	@Nifty

### Top 8 Internet Service Providers (ISPs) on FTTH

	Company	Service name
1	NTT Docomo	docomo
2	KDDI	au
3	Softbank	Softbank Mobile
4	Rakuten Mobile	Rakuten Mobile

### Mobile Network Operators (MNOs)

	Company	Year to start
1	JPIX	1997
2	JPNAP	2001
3	BBIX	2002
4	Equinix	2007

### Internet Exchanges (IXPs)

Multi-Media Research Institute: [https://www.m2ri.jp/e/Press Release:](https://www.m2ri.jp/e/Press%20Release/)  
<https://www.m2ri.jp/release/detail.html?id=579> on 8 Jun 2023 (in Japanese)

# Internet Penetration

- Internet usage rate (Individuals): **82.9%** [1]
- Nation-wide development rate of optical fibers: **99.3%** [1]
- Number of broadband subscribers: **43.8 million** [2]
  - ISP (FTTH): 36.6 million
  - CATV (HFC+FTTH): 6.5 million
- Mobile broadband subscribers (4G/5G): **184 million** [2]

[1] White paper 2022, Information and Communications in Japan by MIC

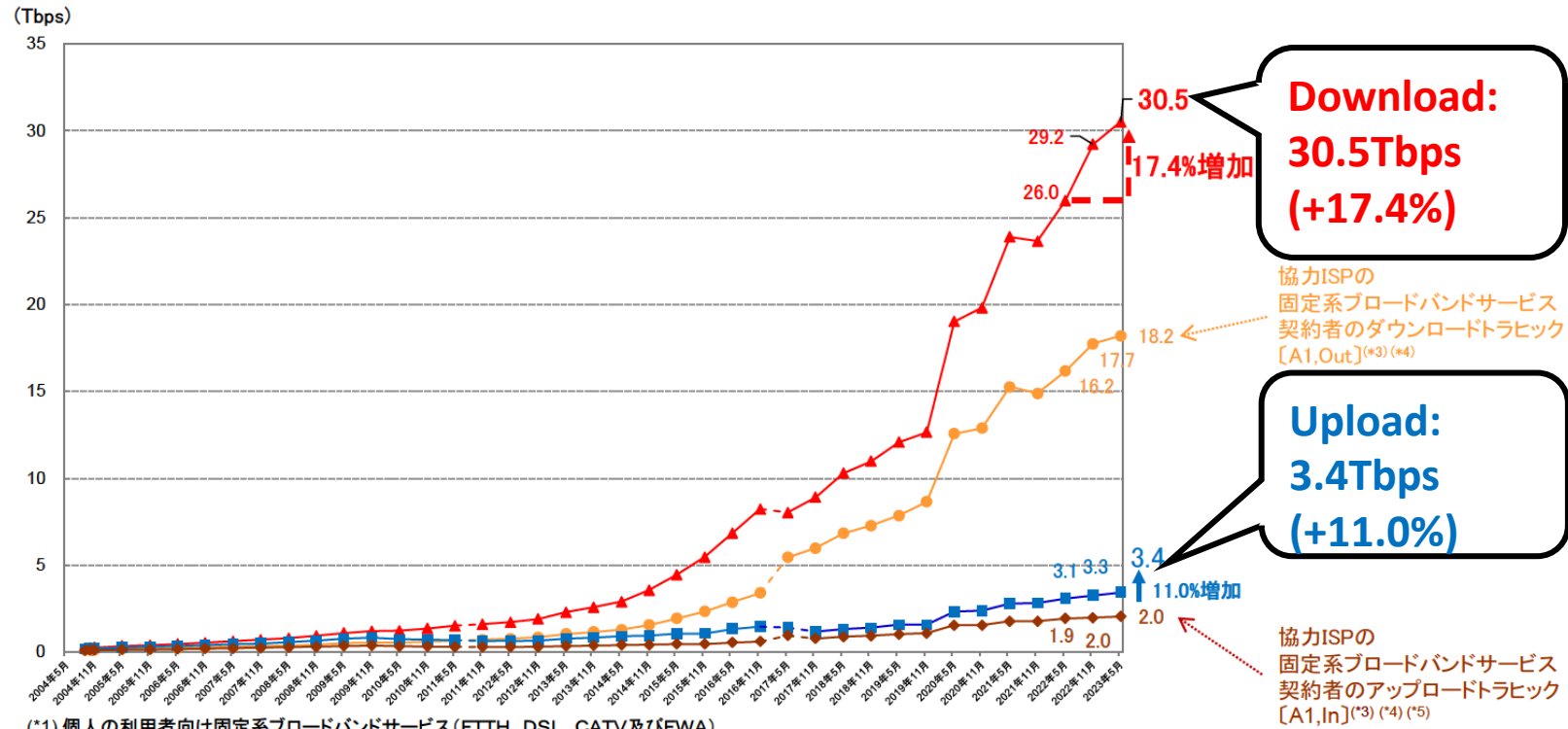
[2] Press release by MIC:

[https://www.soumu.go.jp/menu\\_news/s-news/01kiban04\\_02000220.html](https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000220.html)



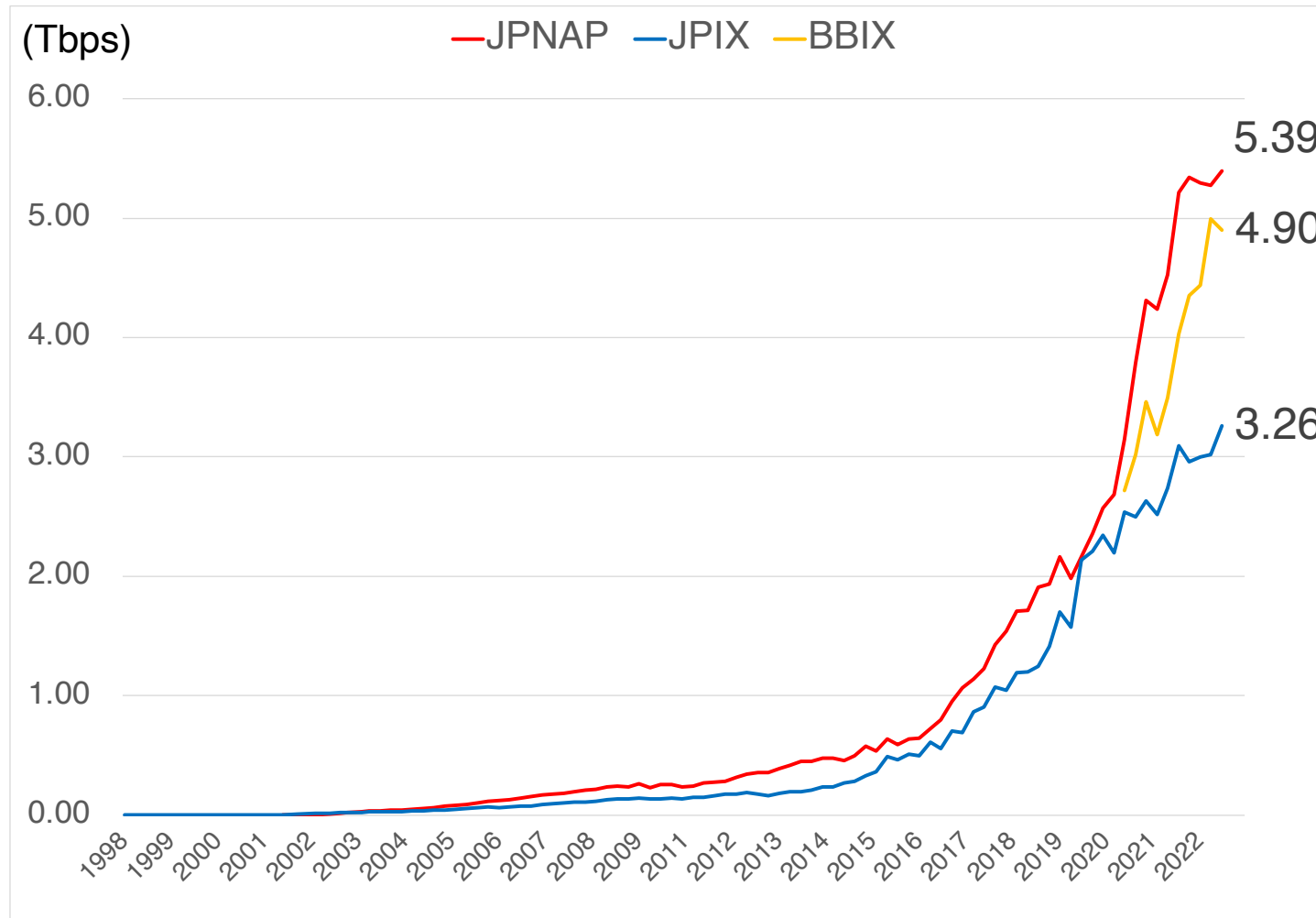
# Estimated broadband Internet traffic in May 2023

- Download: **30.5Tbps, 17.4%** increase (YoY)
- Upload: **3.4Tbps, 11.0%** increase (YoY)



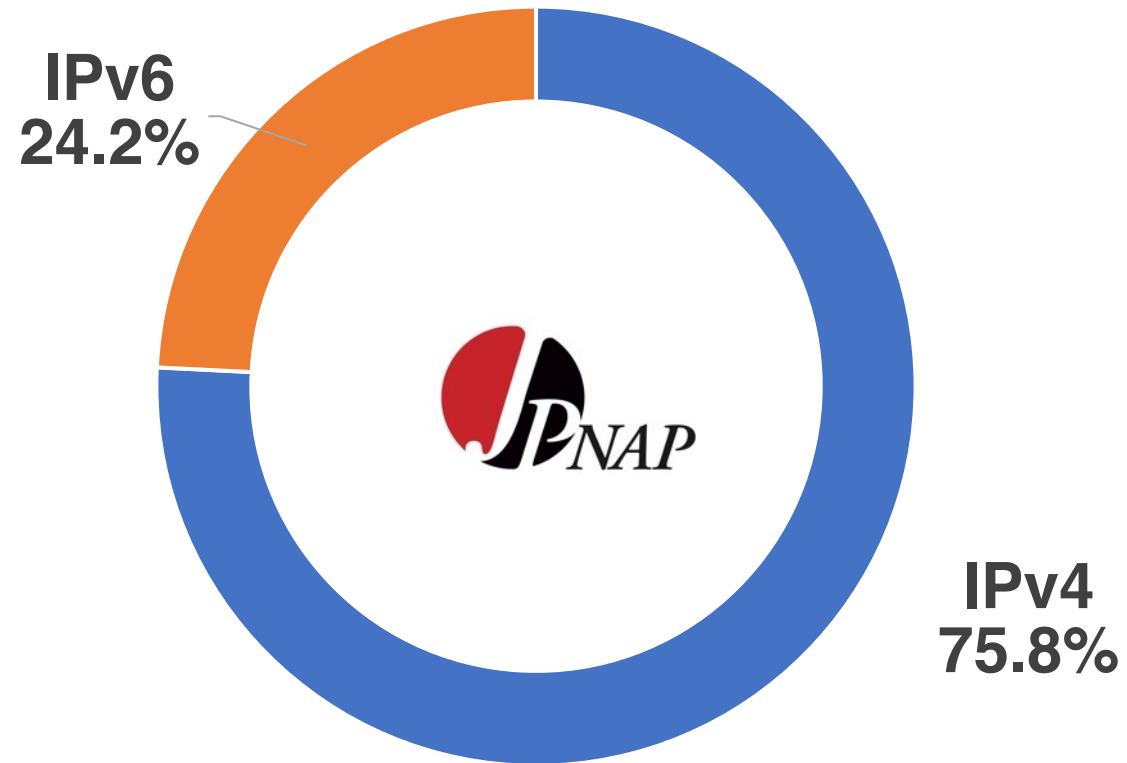
(\*1) 個人の利用者向け固定系ブロードバンドサービス (FTTH、DSL、CATV及びFWA)  
 (\*2) 一部の法人契約者を含む

# Traffic trend of 3 major IXPs in Japan



- Traffic data is collected by INTERNET MULTIFEED CO. from the web sites of each IXP
  - Traffic data of JPIX has been published since 1997, and JPNAP since 2001
  - BBIX started to publish traffic data since 2021 (Equinix does not publish so far)

# IPv6/IPv4 ratio at JPNAP

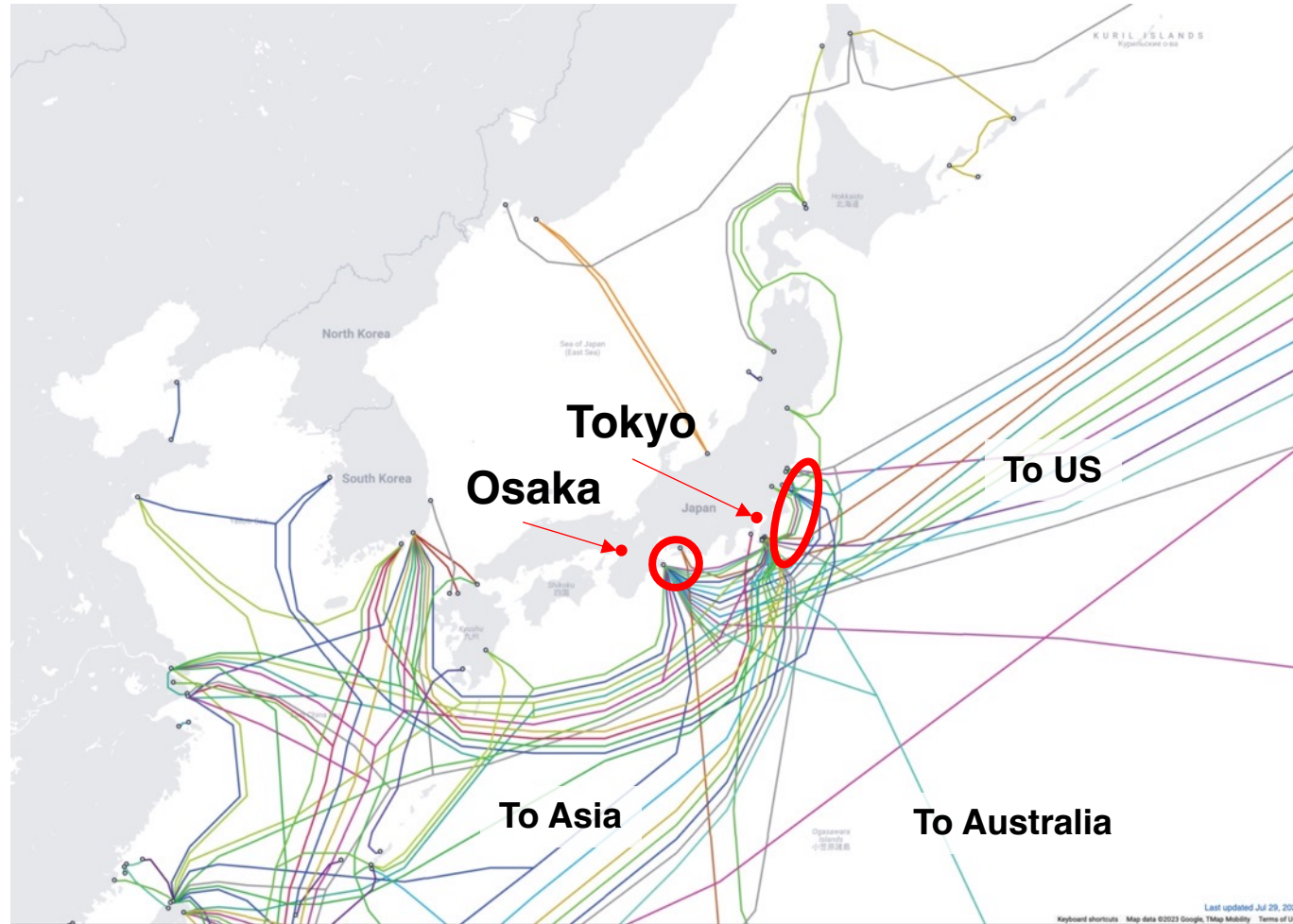


Comparing average bit/s

# Internet topologies



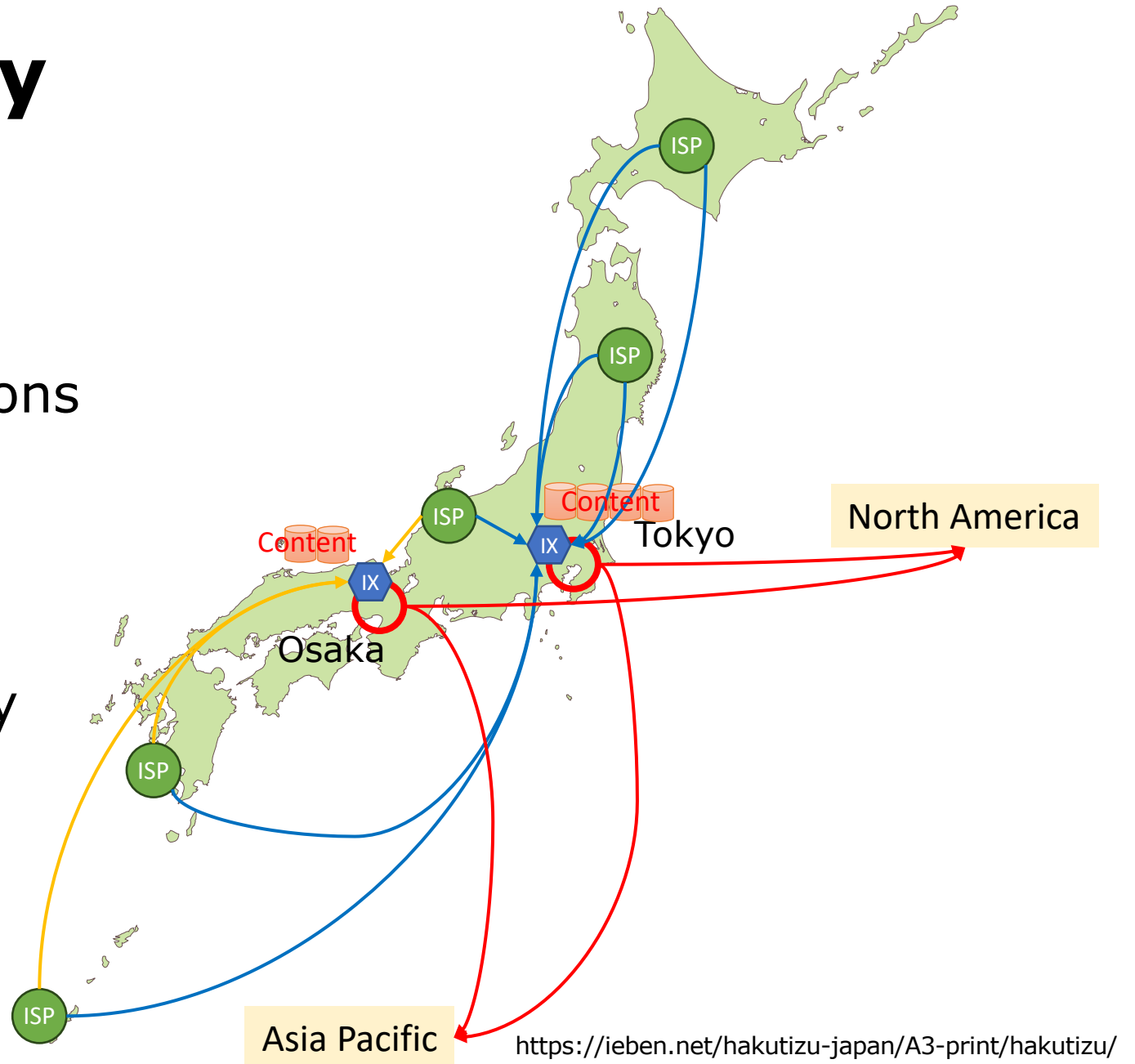
# Submarine cable systems and their landing areas



<https://www.submarinecablemap.com>

# Internet topology

- Tokyo & Osaka
  - Interconnection points
  - Gateways to other regions
  - Redundancy
- Concern
  - ISPs in east rely heavily on Tokyo, while ISPs in west/middle connect to both

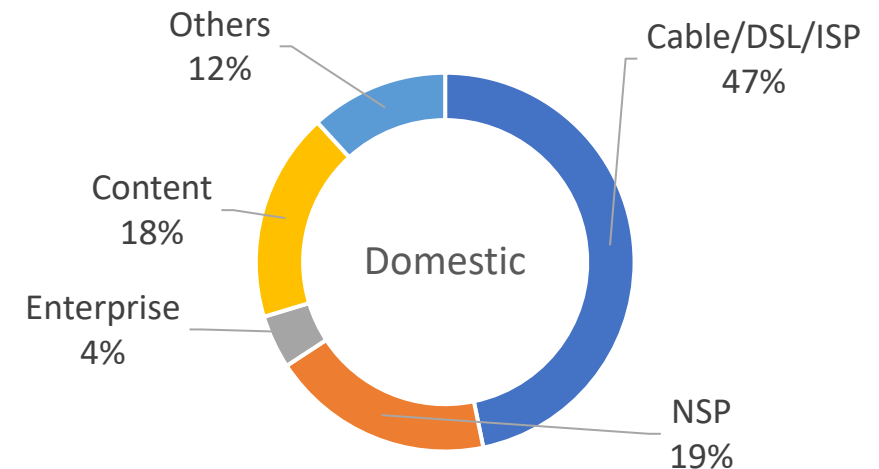
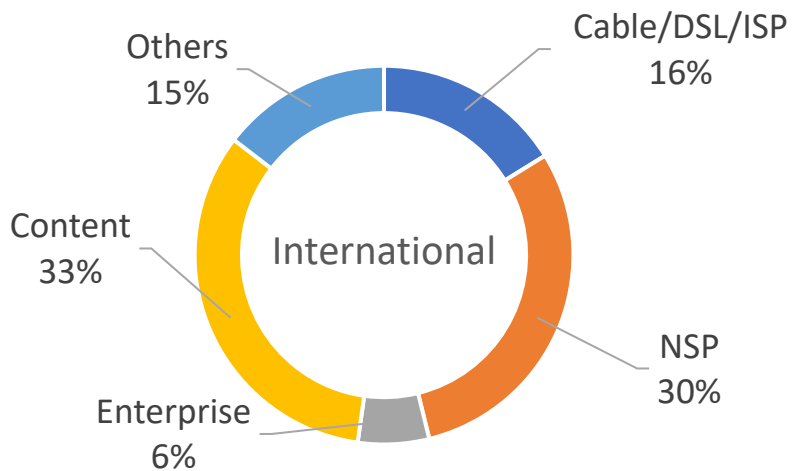
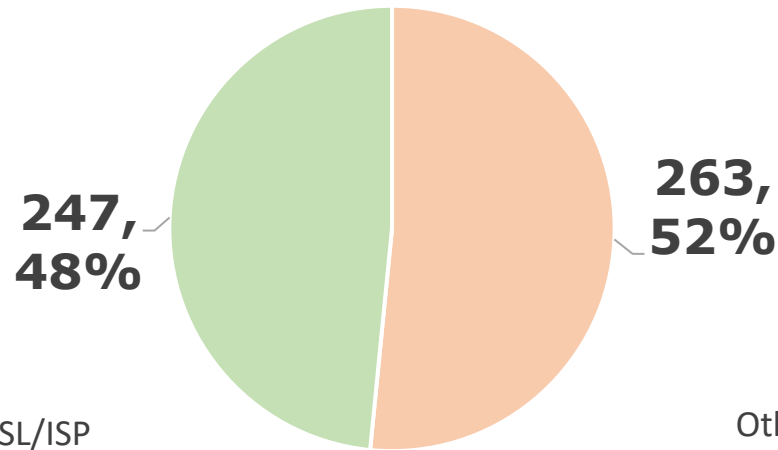


# ASN ratio: domestic vs international

- **510 unique ASNs** are connected to BBIX/Equinix-JP/JPIX/JPNAP
  - referred to PeeringDB (29 Aug 2023)

## International

## Domestic



# Peering policy

- Big ISPs are selective, some are very restrictive
- Small/Medium ISPs (eyeballs) are open
- Content, Cloud, and CDN are open
  - sometimes they behave like selective so that they could control traffic



# Recent topics in Japan

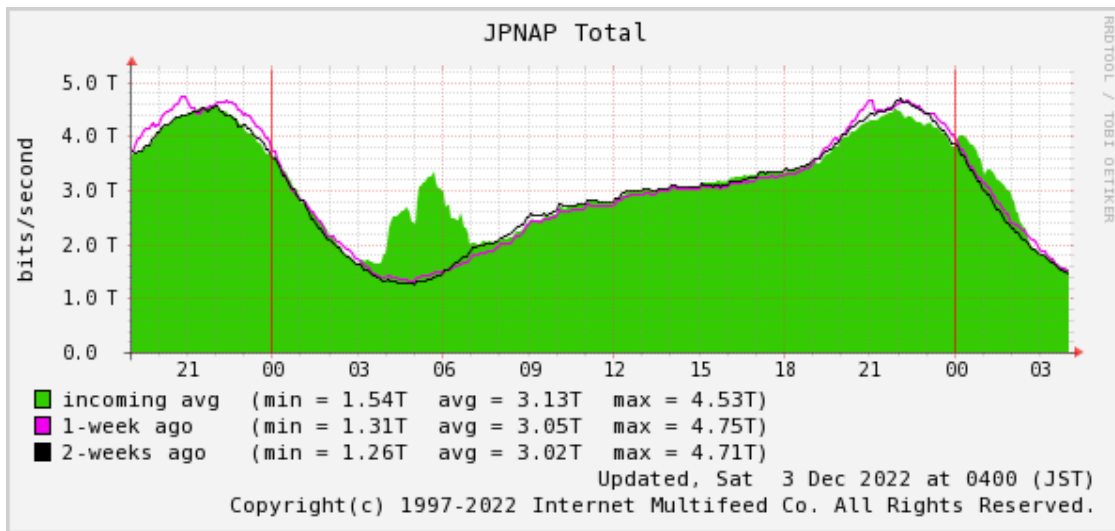
- The rise of the live streaming traffic
- The third hub of Japan is growing

# The rise of the live streaming

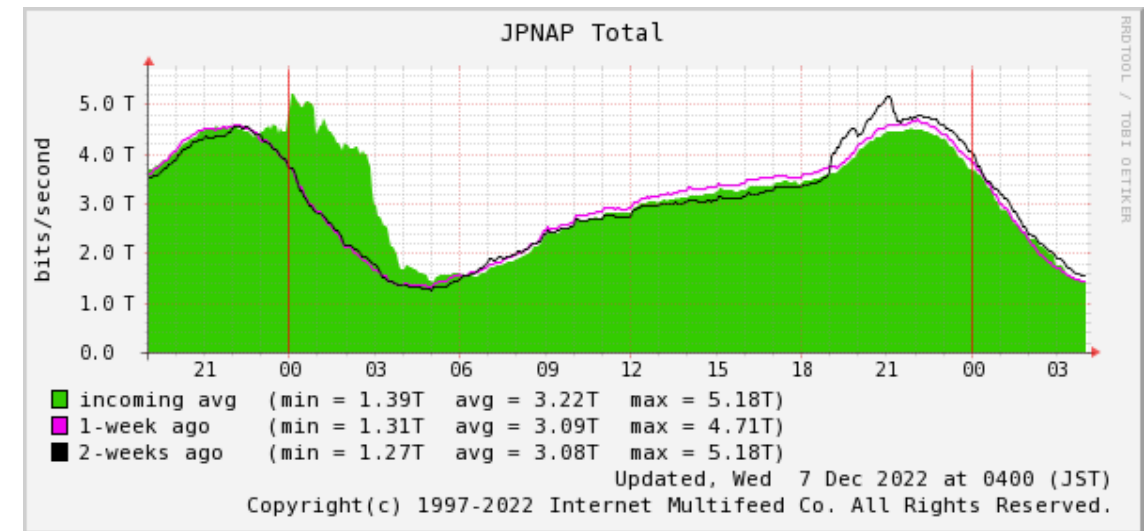
- Until recently, big live events were broadcast only on TV
- Some events began to stream via Internet
- A turning point was World Cup soccer game 2022

# The rise of the live streaming

## World cup soccer games 2022

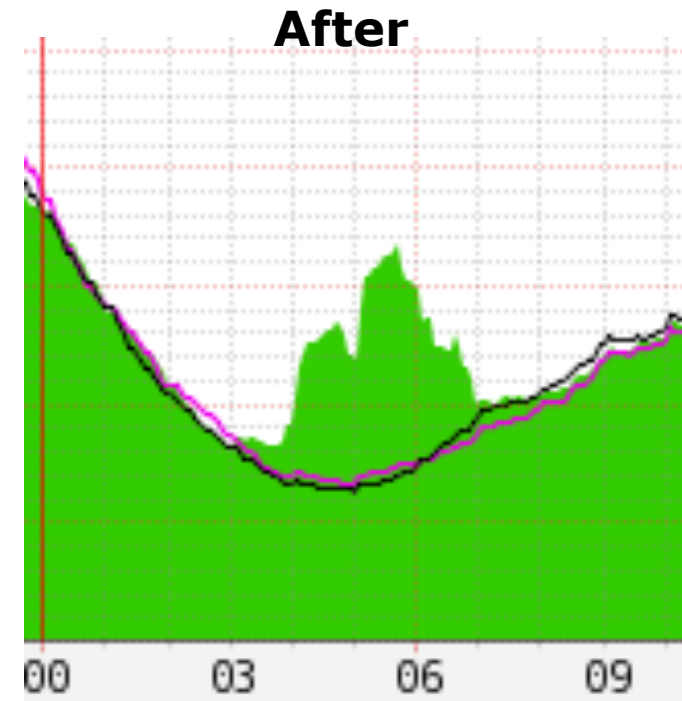
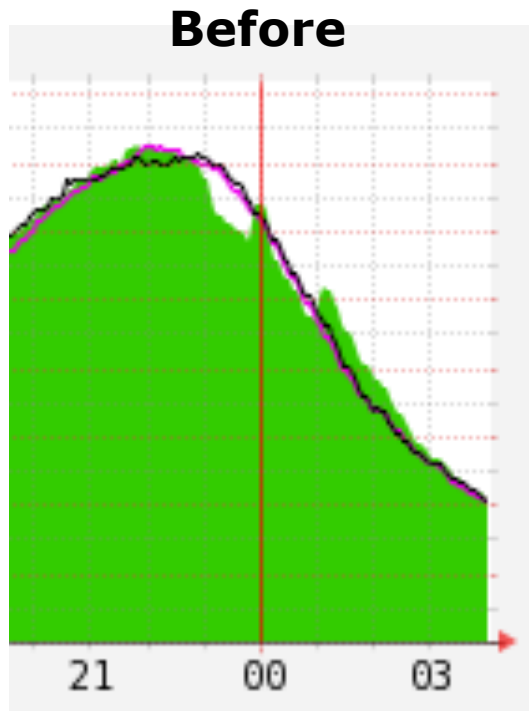


- Dec 3, 2022
  - World cup soccer game
    - Japan vs Spain



- Dec 6, 2022
  - World cup soccer game
    - Japan vs Croatia

# The rise of the live streaming



- Jun 28, 2018
  - World cup soccer game
    - Japan vs Poland
  - Live was broadcasted on TV
    - Traffic decreased by 0.5Tbps

- Dec 3, 2022
  - World cup soccer game
    - Japan vs Spain
  - Live streaming on the internet
    - Traffic increased by 1.7Tbps

# The rise of the live streaming

- Unique approach of Japan
  - “CONNECT” council
    - ISPs and Content providers/CDNs are regularly sharing the information
- Should special care about an event stream, which
  - is very popular
  - is free
  - doesn't require registration

# Recent topics

- The rise of the live streaming traffic
- The third hub of Japan is growing

# The third hub of Japan is growing

- Usually, it is very difficult to make another hub city other than Tokyo and Osaka

# The third hub of Japan is growing

- Fukuoka
  - A major city of Kyushu Island
- Three commercial Internet exchanges were built there around 2021

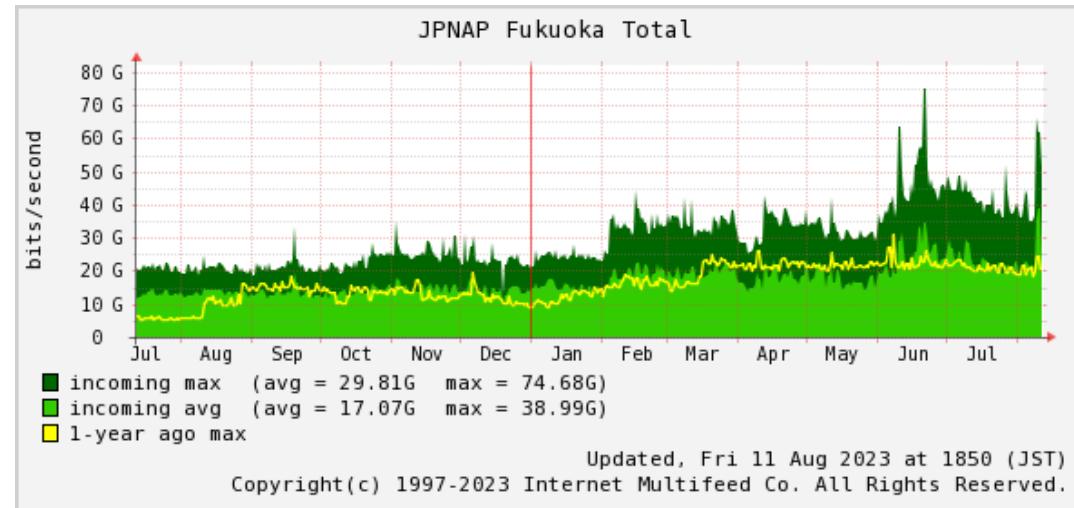


Google Map



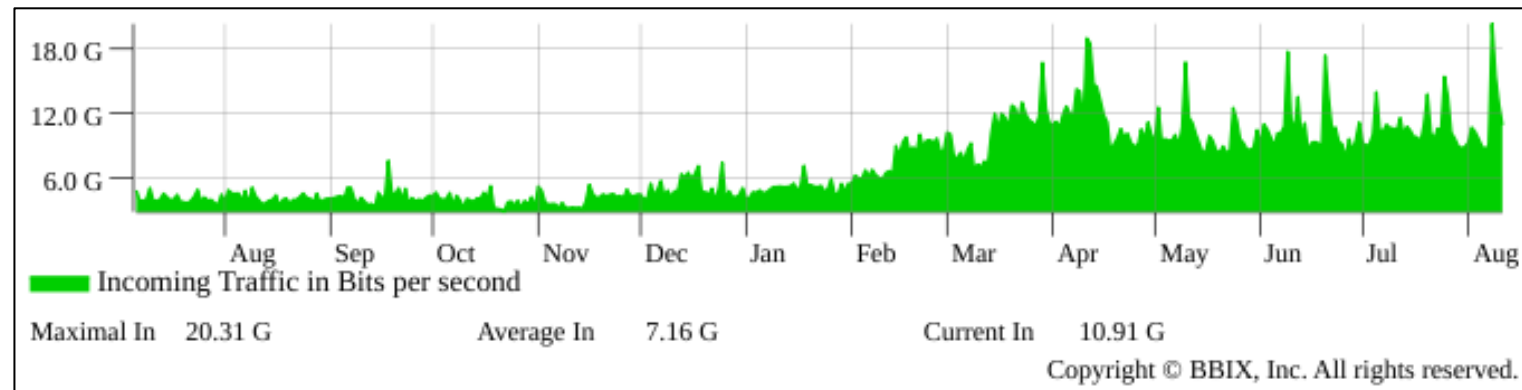
# The third hub of Japan is growing

JPNAP Fukuoka



<https://www.jpnap.net/en/ix/traffic.html#jpnap-fukuoka-traffic>

BBIX Fukuoka



<https://www.bbix.net/en/service/ix/traffic-graph/> (Fukuka-zone)

# The key success factors

- There are substantial number of eyeballs (ISP or CATV) in Kyushu Island
- CDN providers or their cache servers could be invited
- The access lines to Fukuoka become cheaper than before

# One last comment

- Japanese people involved in Internet operations and business collaborate and self-regulate well.
- These characteristics, along with high aspirations, are working well to make the Internet better for all users.
- My hope is that these values will remain within our community and be extended to economies across the Asia Pacific region, and ultimately, the world.

**Thank you very much!**  
**ありがとうございます**  
**(Arigato gozaimasu)**

**Any questions and comments?**