



Business Briefing

Note for readers of this English translation

This document has been translated from the Japanese original for reference purpose only. In the event of any discrepancy between this English translation and the Japanese original, the Japanese original shall prevail.

March 4, 2020

JOCDN Inc.

Today's Agenda

- Greetings
- Trends in the Video Streaming Market
- Overview of JOCDN's Business

Trends in the Video Streaming Market

Changes in Viewing Styles

■ Across all age groups, TV viewing time has decreased, while time spent online has increased.

Figure 1-1-1-1: Average time spent consuming major forms of media over time (one weekday) for all age groups

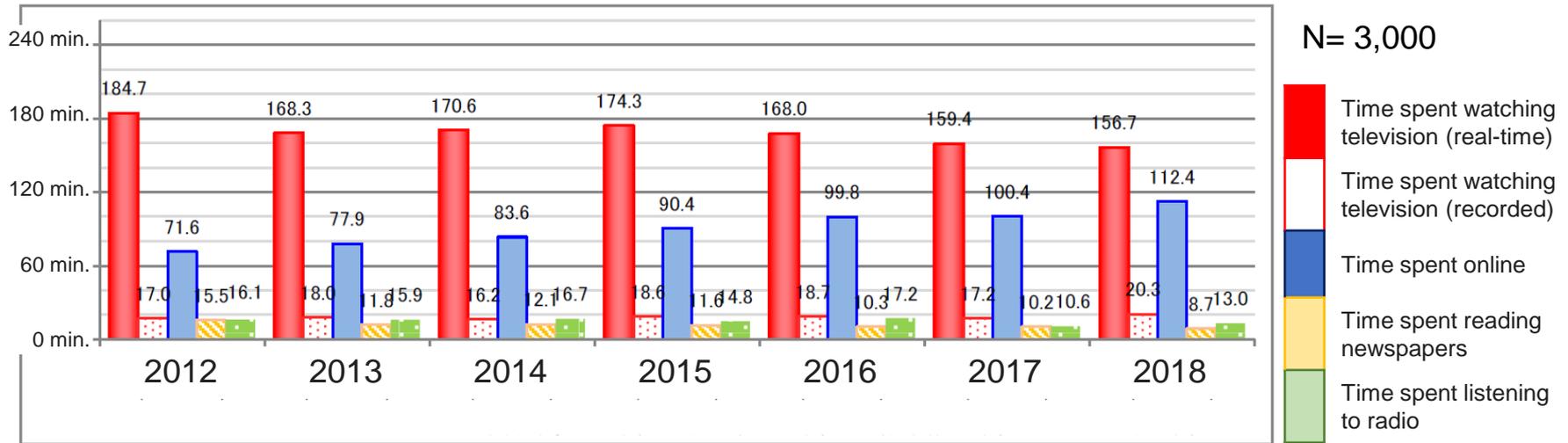
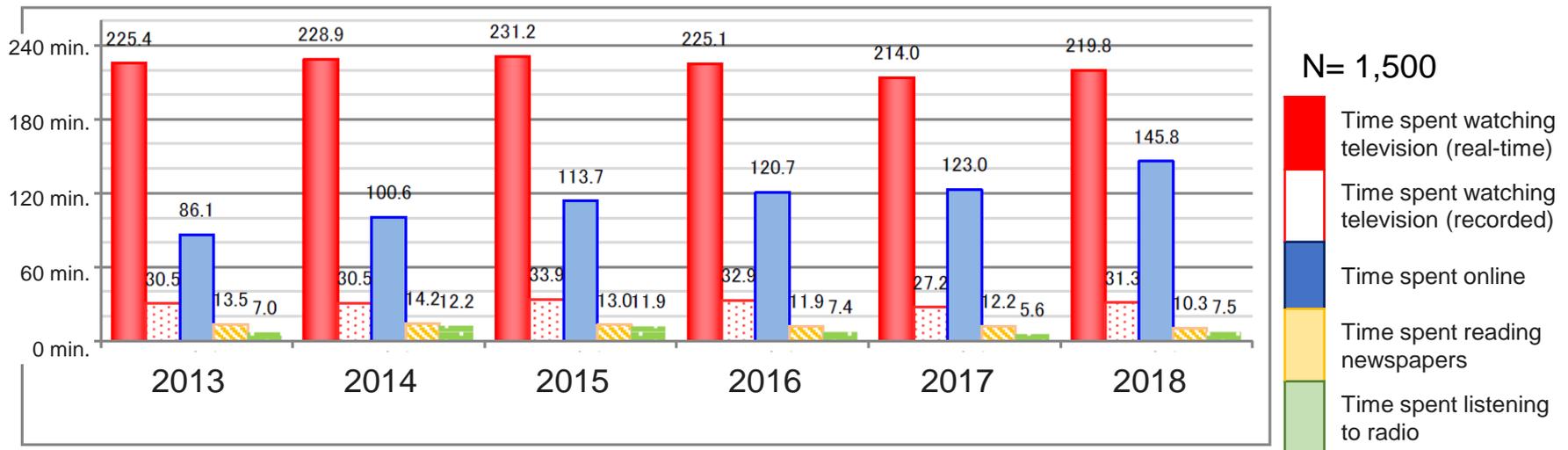


Figure 1-1-1-3: Average time spent consuming major forms of media over time (one holiday) for all age groups



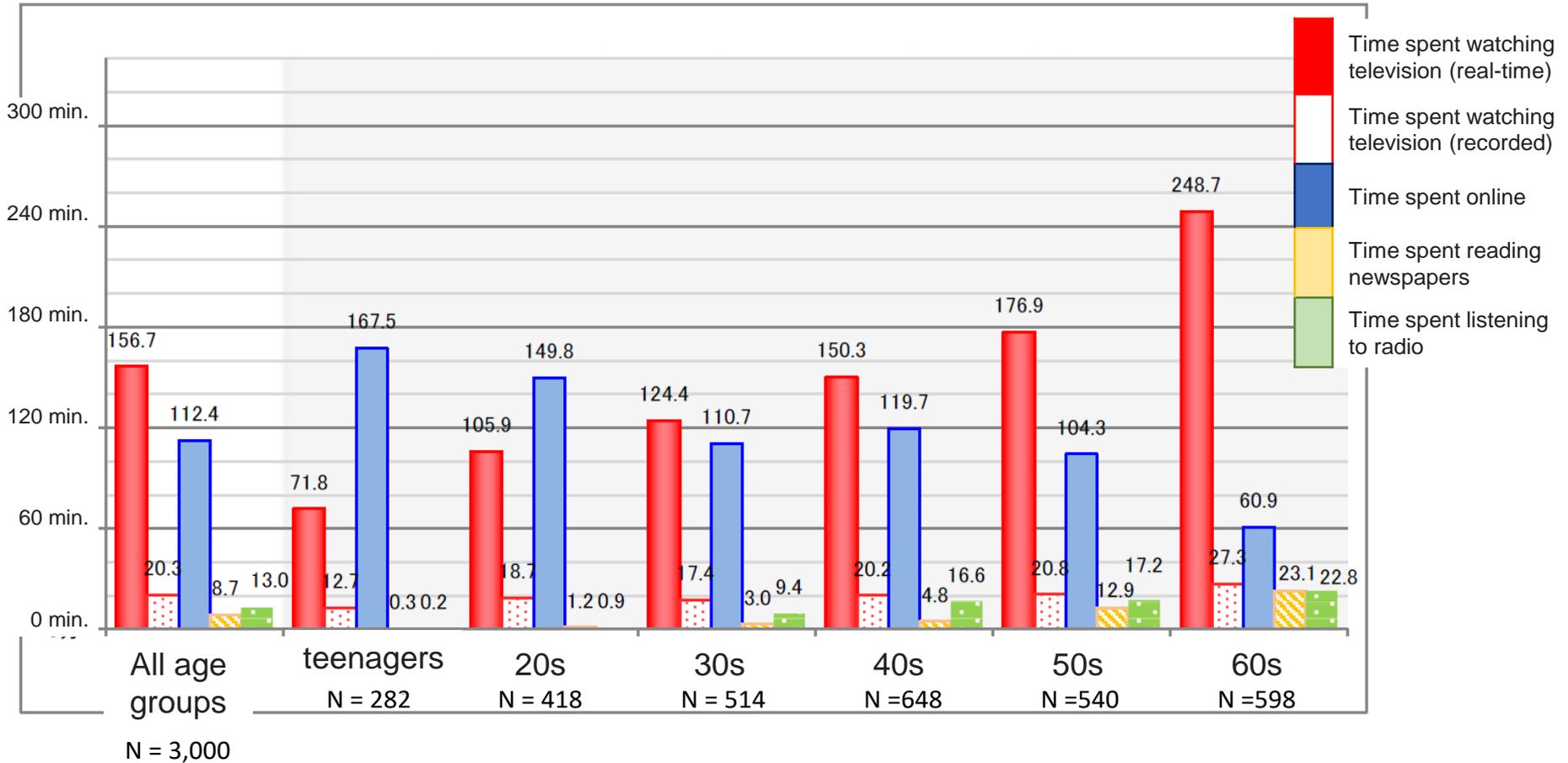
Excerpt from 2018 Research Report on Telecommunications Media Usage Times and Information Behavior

Changes in Viewing Styles

N= 3,000

■ Younger people are spending less time watching television and more time online.

Figure 1-1-1-5: **2018** Average time spent consuming major forms of media (one weekday) for all ages and by age group

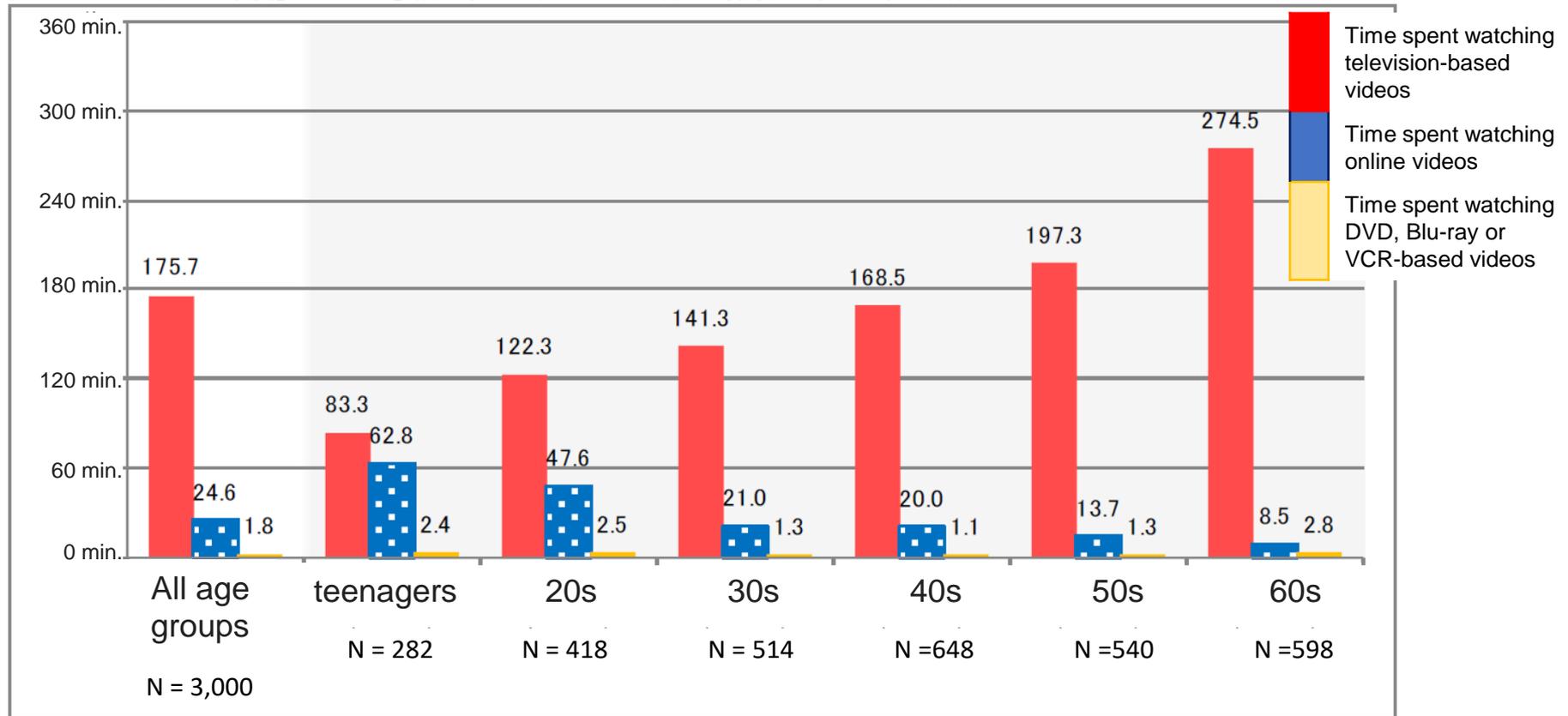


Changes in Viewing Styles

N= 3,000

- Online usage by younger people includes time spent using social media, etc. in addition to time spent watching video online.

Figure 2-2-1: 2018 Average time spend consuming video-based media (one weekday) for all ages and by age group



Changes in Viewing Styles

- Recognition of on-demand video streaming services has increased, and usage rates have risen.

Figure 5-3-1: 2018 Usage rates for video sharing and streaming services (all ages and by age group)

| | On-demand video sharing services | Livestreaming video sharing services | On-demand broadcast television program streaming services | On-demand video streaming services | Paid multi-channel broadcast services | Internet-based radio broadcast services | No use of any |
|----------------------------|----------------------------------|--------------------------------------|-----------------------------------------------------------|------------------------------------|---------------------------------------|-----------------------------------------|---------------|
| All age groups (N = 1,500) | 71.8% | 10.5% | 12.1% | 16.2% | 17.1% | 11.3% | 21.3% |
| Teenagers (N=141) | 87.9% | 31.9% | 12.1% | 14.9% | 8.5% | 6.4% | 10.6% |
| 20s (N=209) | 90.9% | 24.9% | 16.3% | 29.2% | 13.9% | 11.0% | 6.7% |
| 30s (N=257) | 84.4% | 5.4% | 11.7% | 17.1% | 14.0% | 8.9% | 10.5% |
| 40s (N=324) | 78.4% | 6.8% | 12.7% | 19.4% | 17.9% | 14.8% | 17.0% |
| 50s (N=270) | 67.8% | 5.6% | 14.1% | 15.6% | 23.3% | 15.9% | 20.4% |
| 60s (N=299) | 36.5% | 3.0% | 7.4% | 4.0% | 19.4% | 7.7% | 51.5% |

(Reference) 2018 Usage Rates for Video Sharing and Streaming Services (all ages and by age group)

| | On-demand video sharing services | Livestreaming video sharing services | On-demand broadcast television program streaming services | On-demand video streaming services | Paid multi-channel broadcast services | Internet-based radio broadcast services | No use of any |
|----------------------------|----------------------------------|--------------------------------------|-----------------------------------------------------------|------------------------------------|---------------------------------------|-----------------------------------------|---------------|
| All age groups (N = 1,500) | 68.5% | 10.1% | 7.5% | 11.3% | 16.8% | 9.9% | 24.7% |
| Teenagers (N=139) | 95.0% | 24.5% | 8.6% | 12.9% | 12.9% | 7.9% | 5.0% |
| 20s (N=216) | 91.2% | 25.9% | 6.0% | 16.2% | 18.5% | 12.5% | 7.4% |
| 30s (N=262) | 84.7% | 8.0% | 5.0% | 15.6% | 10.7% | 10.3% | 11.8% |
| 40s (N=321) | 73.2% | 6.9% | 8.7% | 11.8% | 15.0% | 11.5% | 21.2% |
| 50s (N=258) | 60.9% | 5.0% | 9.3% | 11.6% | 21.7% | 12.8% | 29.1% |
| 60s (N=304) | 28.0% | 2.0% | 7.6% | 2.6% | 20.4% | 4.3% | 56.9% |

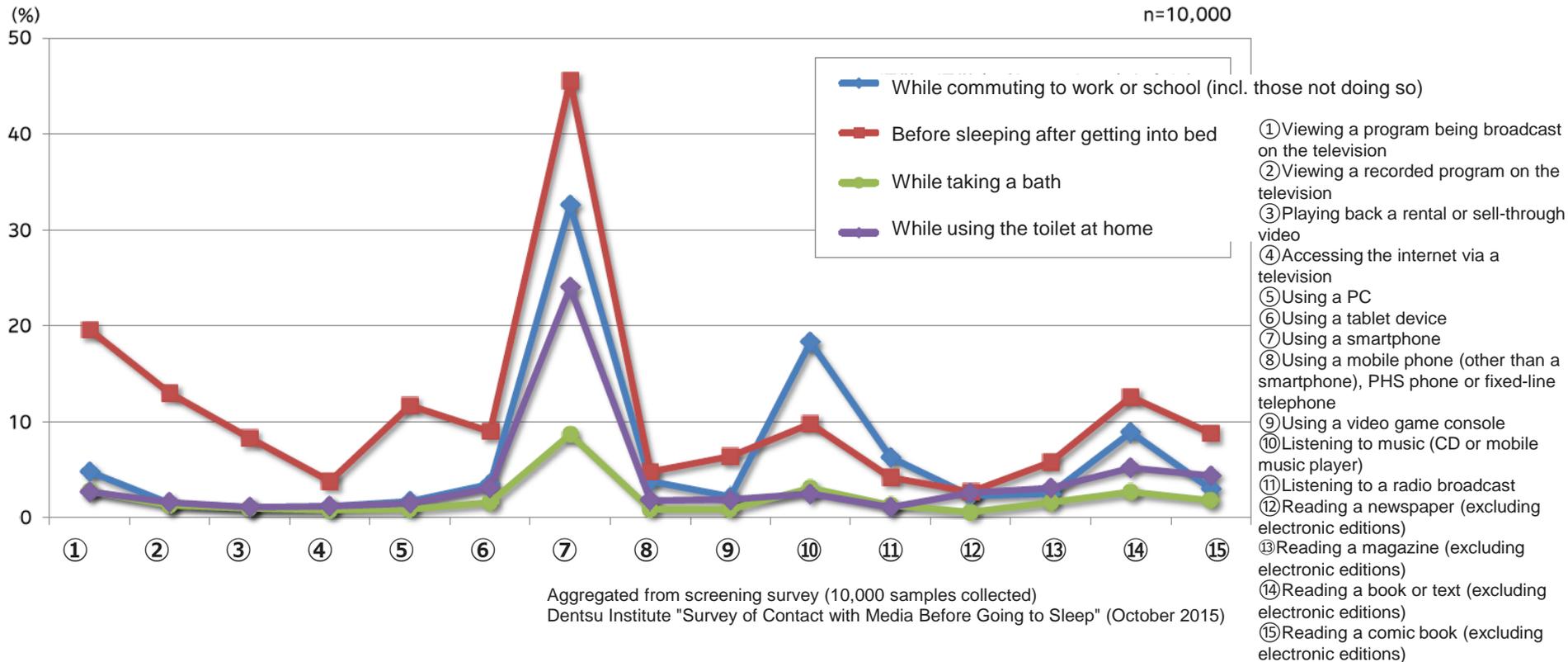
- Examples of livestreaming video sharing services include Niconico Douga and TwitCasting
- Examples of on-demand broadcast television program streaming services include the services provided by NHK and key commercial TV stations such as NHK On Demand, Fuji TV On Demand and TVer.
- Examples of on-demand video streaming services include GYAO!, acTVila, Hulu, Netflix and Hikari TV.

Trends in Device and Media Contact

The spread of media contact situations due to the widespread adoption of smartphone



We have seen an expansion of opportunities for contact with media, such as while commuting to work or school and before sleeping. Regular and habitual media contact (by situation for all individuals)



Excerpt from explanatory material on discussion points surrounding consumer video viewing at the third meeting of the Study Committee on the Promotion of Broadcast Content Production and Distribution, Information and Communications Policy Committee, Information and Communications Council

Change in the Television Ownership Rate

Groups that do not own a television have expanded among younger households



- Ten percent of young households (single person / young couple) in which the head of the household is aged 29 or younger do not own a television
- Additionally, the ownership rate for smartphones with one-seg or full-seg television receivers is also small (high market share of iPhone)

| | March 2005 | | March 2014 | | March 2015 | | March 2016 | |
|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|
| | Const ituent Ratio | Penet ration Rate |
| Total Households | | 98.9% | | 94.3% | | 95.7% | | 96.3% |
| Aged 29 & younger | 5.1% | 97.1% | 1.9% | 90.3% | 1.8% | 84.7% | 1.6% | 90.6% |
| Aged 30 - 59 | 44.7% | 99.0% | 37.0% | 93.2% | 37.3% | 94.6% | 36.5% | 95.9% |
| Aged 60 and older | 50.2% | 98.9% | 61.1% | 94.8% | 60.9% | 96.5% | 61.8% | 96.6% |

Aggregated from yearly editions of the "Consumer Behavior Survey" conducted by the Cabinet Office

News Concerning Video Streaming Business Operators

■ Number of paid Netflix subscribers in Q4 2019 beats expectations to rise to 8.8 million (January 22, 2020)

<https://jp.techcrunch.com/2020/01/22/2020-01-21-netflix-q4-earnings-3/>

■ YouTube recognition rate more than 90%, usage rate over 60% according to DOCOMO Mobile Society Research Institute survey on video services (January 16, 2020)

<https://www.itmedia.co.jp/mobile/articles/2001/16/news098.html>

■ Disney+ tops 10 million subscribers on opening day (November 14, 2019)

<https://www.nikkei.com/article/DGXMZO52147340U9A111C1000000/>

■ KDDI and TV Asahi establish joint venture to develop new video streaming service (December 13, 2019)

<https://www.itmedia.co.jp/news/articles/1912/12/news137.html>

■ AbemaTV sales show rapid expansion, rising 1.8 times to 11.1 billion yen while billing revenue grows against backdrop of WAU expansion (October 30, 2019)

<https://gamebiz.jp/?p=252080>

■ Video views and monthly active users break monthly records: TVer announces user statistics for July - September 2019 (October 23, 2019)

<https://www.screens-lab.jp/article/20620>

Major Video Streaming Services

Foreign-Affiliated

NETFLIX



Disney
DELUXE



Independent



GYAO!



Telecom Carrier-
Connected



ビデオパス



dTVチャンネル

Broadcast
Station-
Connected



NHK
オンデマンド

TVer

AbemaTM

Major Video Streaming Services

Video is core business

Foreign-Affiliated

NETFLIX



Independent



GYAO!



Broadcast Station-
Connected



Abema™

Video is an incentive



Telecom Carrier-
Connected

dTV



dTVチャンネル

Examples of Streaming Services Offered by Broadcasters

■ NHK On Demand

- 2.66 million subscribers
- Monthly billing and pay-as-you-go billing models
- Service allows users to catch up on NHK programs they missed and watch past programs

■ TVer

- 22 million app downloads
- Advertising model
- Service allows users to catch up on commercial TV programs they missed

■ NHK Plus

- Launched April 1 (trial launch from March 1)
- Provided to subscribers
- Offers simultaneous streaming and streaming of missed TV programs as a supplement to broadcasts

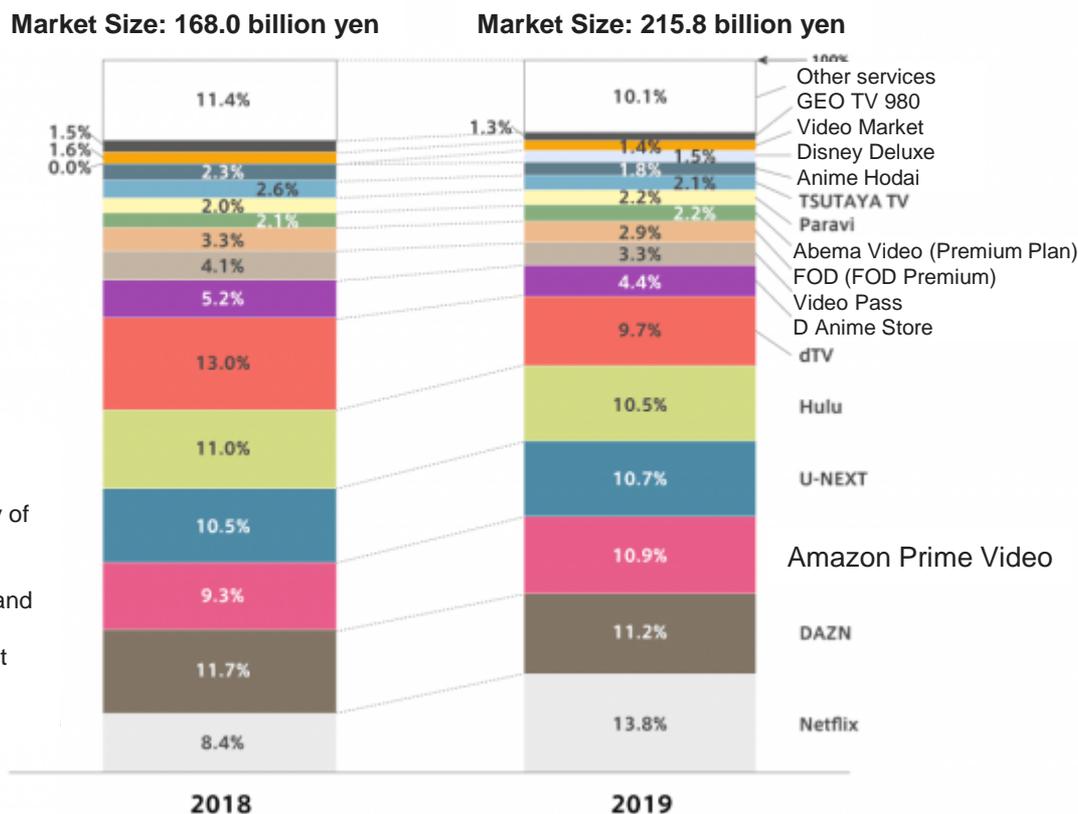
Examples of simultaneous streaming events held this year

- Senbatsu LIVE!
- Virtual High School Baseball
- Rugby World Cup
- New Year Ekiden Relay Race
- Hakone Ekiden Relay Race
- High School Soccer
- High School Rugby
- Technical demonstration of simultaneous streaming of a broadcast in the same time slot by the five private broadcasters in Tokyo

Market Size and Shares of the Main Video Streaming Services

- In 2019, the market for subscription-based video streaming services was estimated to be worth 215.8 billion yen.
- Of this amount, CDN service usage fees are estimated to account for around 10 billion yen (5%).

Change in Market Share of Subscription-based Video Streaming (SVOD) Services



[Source materials]

GEM Partners "Video Streaming / Broadcast / Video Software Market User Analysis Report," Statistics Bureau of the Ministry of Internal Affairs and Communications "Population Estimates," National Institute of Population and Social Security Research "Population Projections for Japan," Ministry of Internal Affairs and Communications "Telecommunication Usage Trend Survey," Digital Content Association of Japan "Video Distribution Market Research Report" and the IR information, press releases and websites of various companies were used for the analysis.

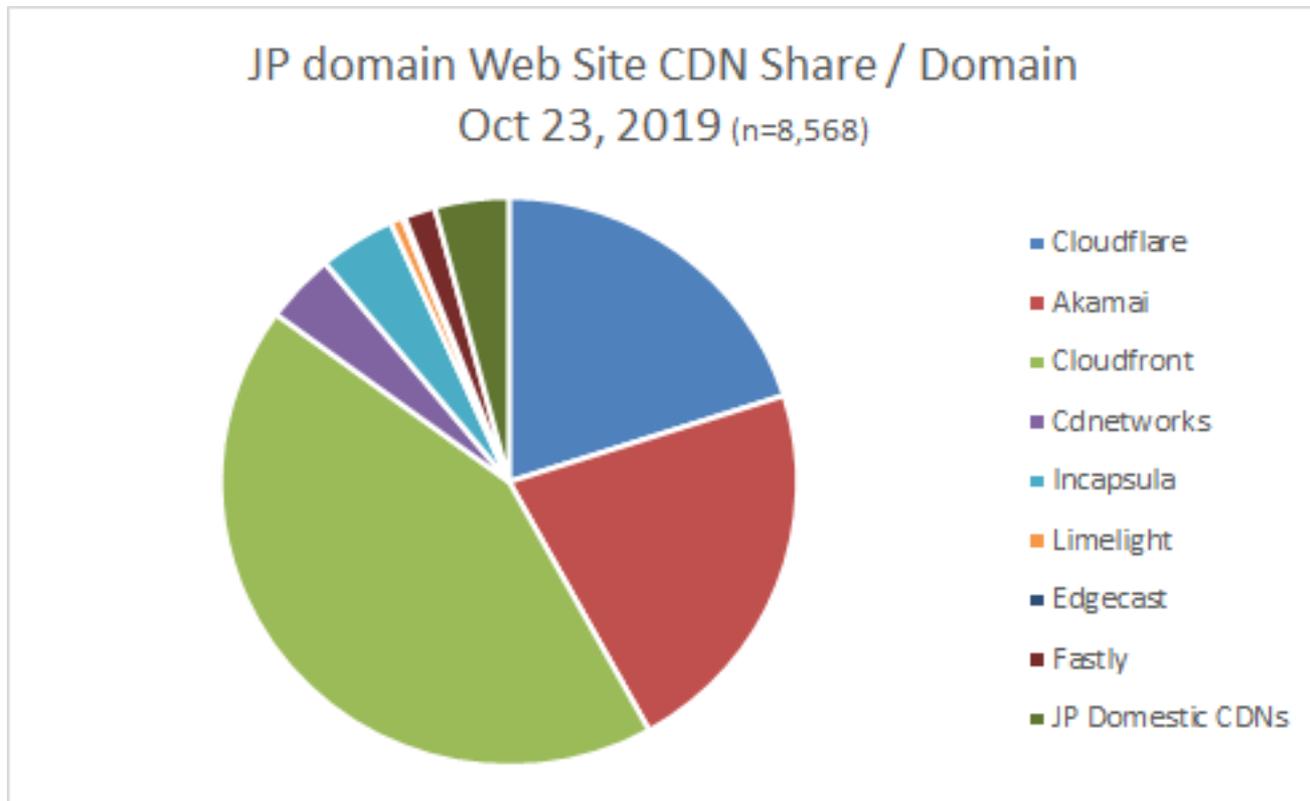
GEM Standard

From "Video On Demand (VOD) Market Five-Year Prediction (2020 - 2024) Report"

Excerpt from February 13, 2020, PRTIMES article: "<Video On Demand (VOD) Market> 22.4% year on year increase in 2019 to 269.2 billion yen, Netflix maintaining leading SVOD market share" <https://prtimes.jp/main/html/rd/p/000000030.000013190.htmls>

CDN Market Trends

- Among domestic Japanese sites, the market share of domestic business operators is around several percent
 - The majority are overseas CDN operators
 - Note that this is the number of sites and not the data volume.

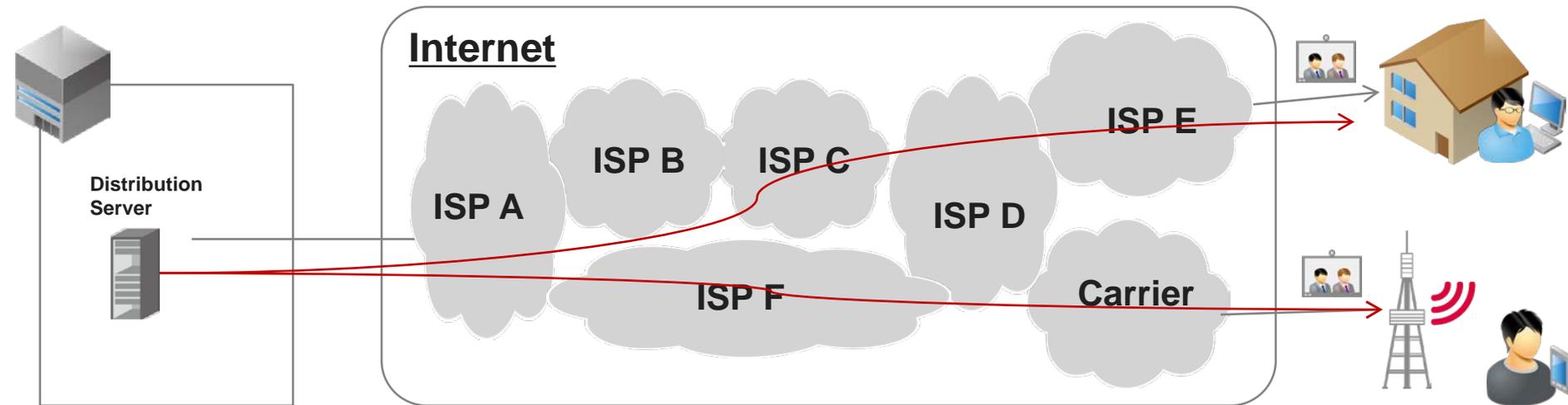


Excerpt from Domestic CDN Share (October 2019) on J-Stream CDN Information Site
<https://tech.jstream.jp/blog/cdn/cdn-share-oct2019/>

What is a CDN?

A communication route between regular distribution servers and end users

The Internet is a collection of networks operated by various businesses. Communications between distribution servers and end users take place via those networks. Delays and other communications issues are dependent on the operators of the networks that make up the communications route.



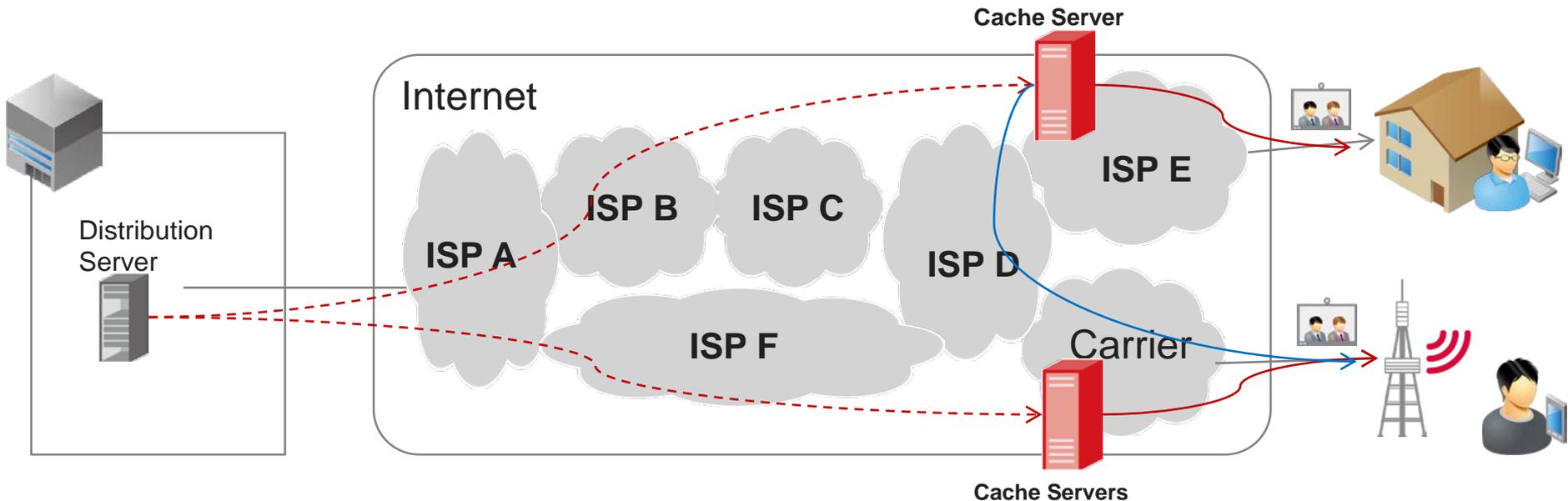
What is a CDN?

CDN Communications Route

CDN is created by installing a cache server in a network as close as possible to end user clients in an effort to shorten communication distances.

End users communicate not with the distribution server but with the cache server.

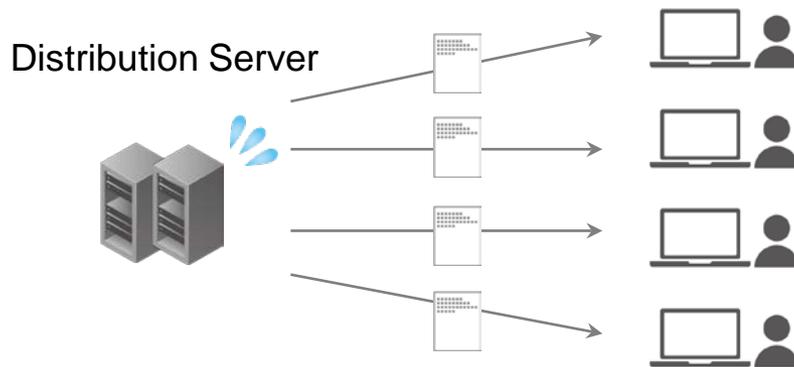
A cache server receives requests from end user clients, and if the requested data is already cached, it delivers that data, and if no, it obtains the data from the distribution server.



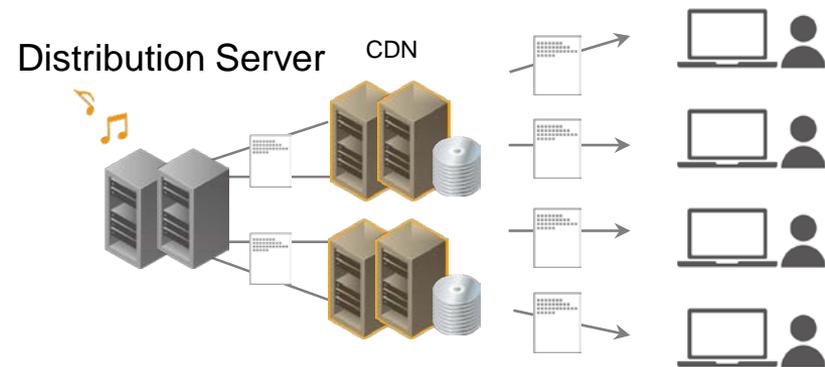
What is a CDN?

CDNs are mechanisms that help reduce data transmission volumes for both end users and the equipment operated by businesses.

<Without a CDN>



<With a CDN>

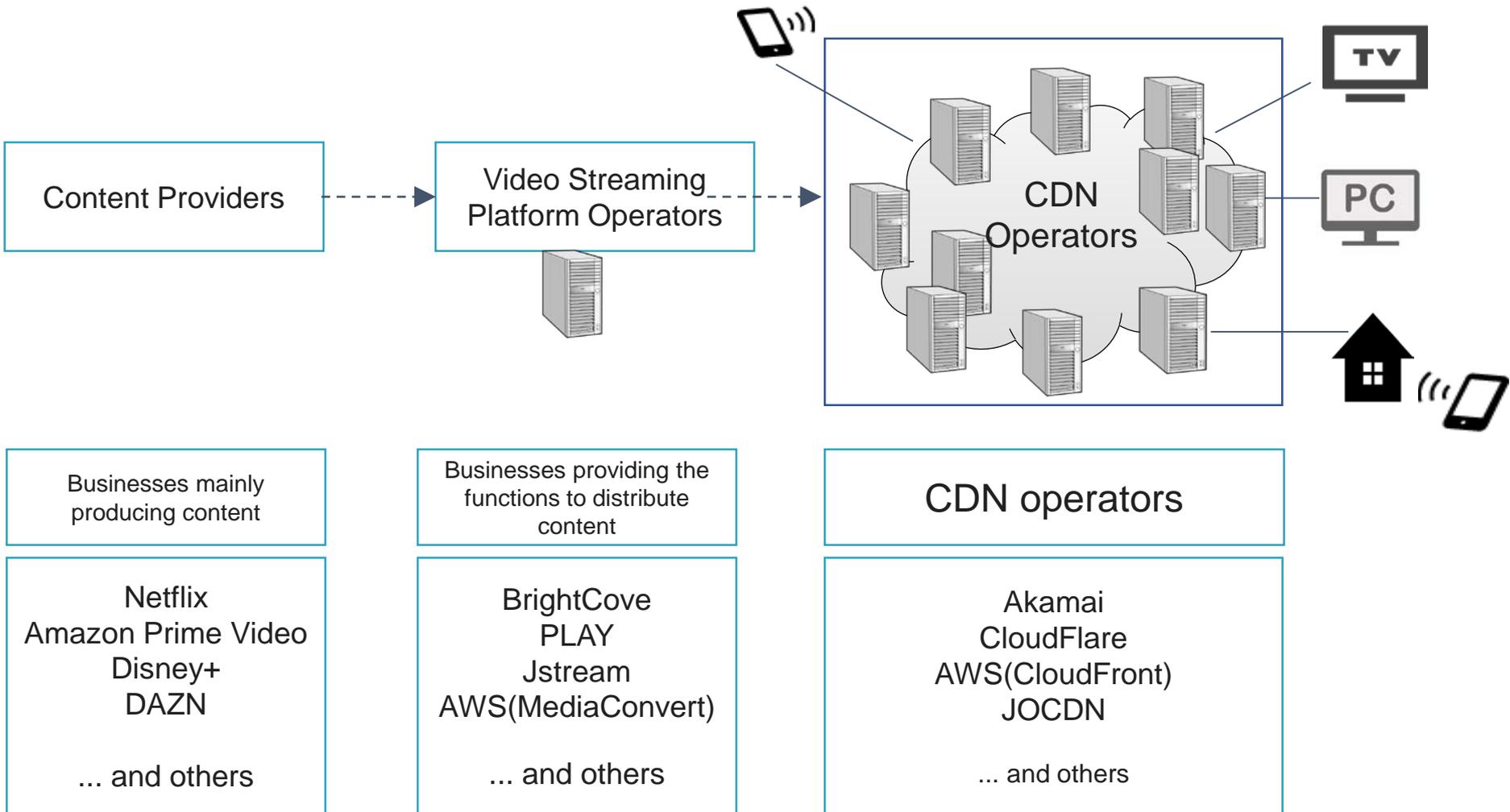


By caching streaming content and delivering it to users, a CDN [reduces the load](#) on distribution servers and enables the [high-speed delivery](#) of content.

For example, CDNs are used in cases such as:

- Websites undergoing high loads over a short period of time (disaster information, weather forecasts, traffic information, news, etc.)
- High traffic websites
- Video streaming that involves large volumes of data
- Large-scale livestreaming

The Flow of Video Streaming



JOCDN Business Overview

JOCDN Company Profile

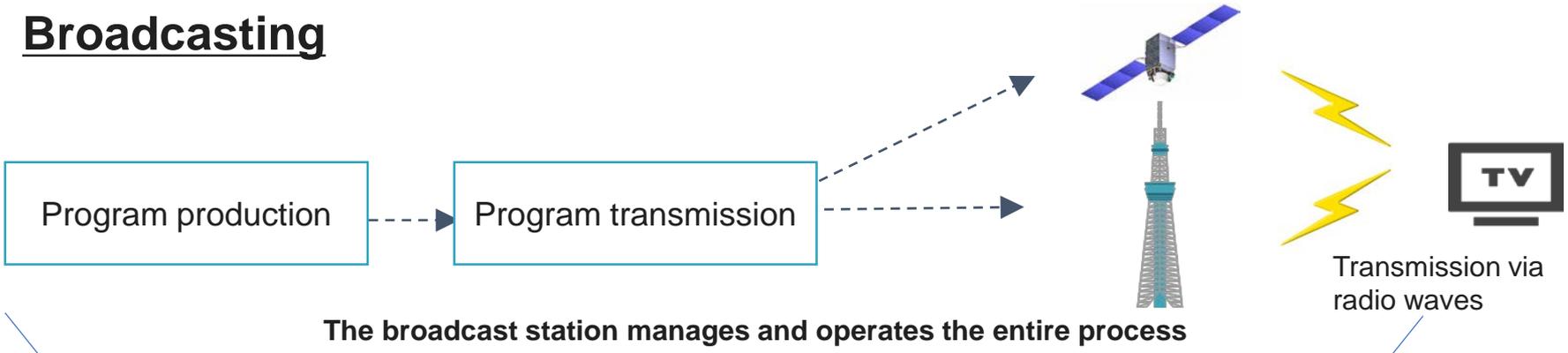
| | |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Company Name | JOCDN Inc. |
| Established | December 1, 2016 |
| Business Activities | Provision of video streaming CDN services in Japan Building and operation of broadcasting and delivery systems |
| Officers | Koichi Suzuki (IIJ), Representative Director and Chairperson Shunichi Shinozaki (NTV), Representative Director and President |
| Location | Fujimi 2-10-2, Chiyoda-ku, Tokyo, Japan TEL:03-5205-6586 FAX:03-5205-6587 |

Composition of Shareholders

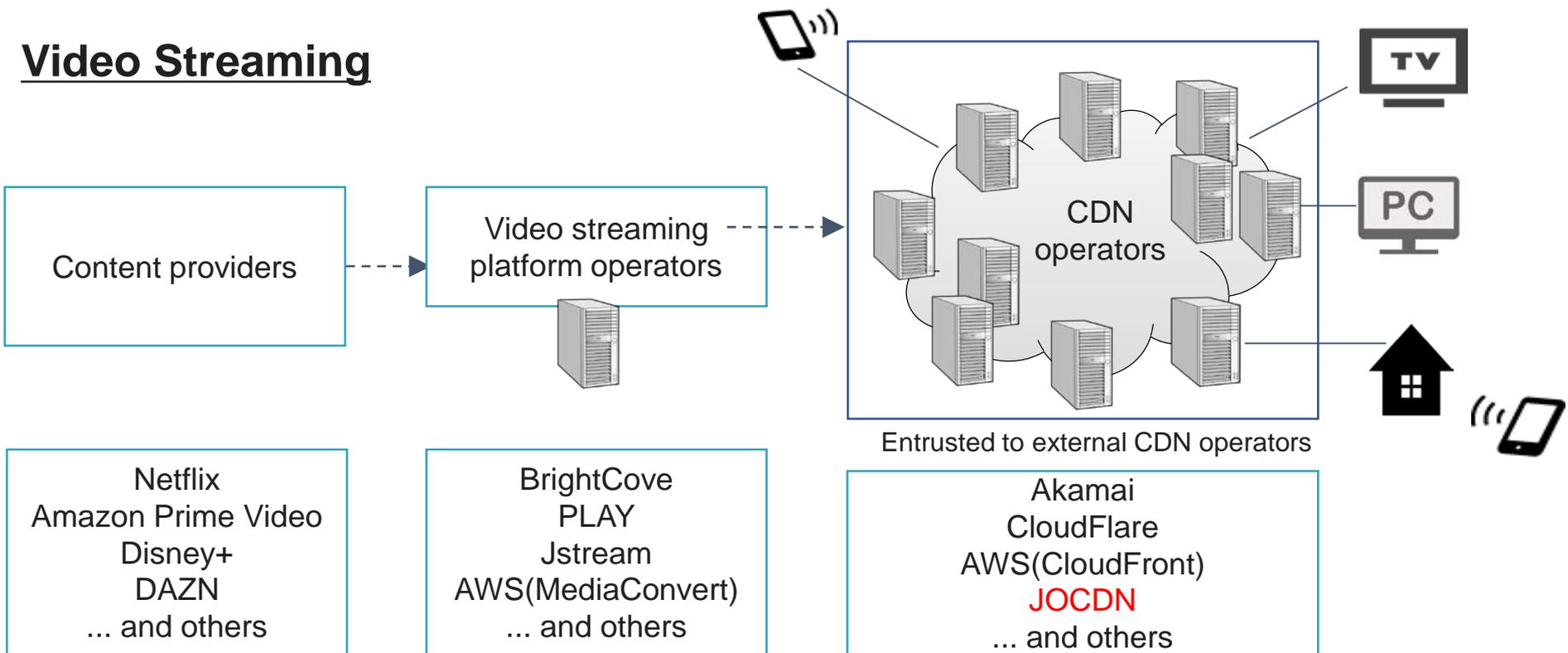
| Shareholder | Amount Invested | Number of shares held | Investment ratio |
|-----------------------------------------------|------------------------|-----------------------|------------------|
| Internet Initiative Japan Inc. | 142,000,000 yen | 2,840 shares | 16.81% |
| Nippon Television Network Corporation | 99,400,000 yen | 1,988 shares | 11.76% |
| TV Asahi Holdings Corporation | 99,400,000 yen | 1,988 shares | 11.76% |
| Tokyo Broadcasting System Holdings, Inc. | 99,400,000 yen | 1,988 shares | 11.76% |
| TV TOKYO Holdings Corporation | 99,400,000 yen | 1,988 shares | 11.76% |
| Fuji Television Network, Inc. | 99,400,000 yen | 1,988 shares | 11.76% |
| MBS Media Holdings, Inc. | 7,100,000 yen | 142 shares | 0.84% |
| Asahi Broadcasting Group Holdings Corporation | 7,100,000 yen | 142 shares | 0.84% |
| Television Osaka, Inc. | 7,100,000 yen | 142 shares | 0.84% |
| Kansai Television Co. Ltd. | 7,100,000 yen | 142 shares | 0.84% |
| Yomiuri Telecasting Corporation | 7,100,000 yen | 142 shares | 0.84% |
| Tokai Television Broadcasting Co., Ltd. | 7,100,000 yen | 142 shares | 0.84% |
| Chukyo TV. Broadcasting Co., Ltd. | 7,100,000 yen | 142 shares | 0.84% |
| Chubu-Nippon Broadcasting Co., Ltd. | 7,100,000 yen | 142 shares | 0.84% |
| Nagoya Broadcasting Network Co., Ltd. | 7,100,000 yen | 142 shares | 0.84% |
| The Aichi Television Broadcasting Co., Ltd. | 7,100,000 yen | 142 shares | 0.84% |
| WOWOW Inc. | 35,500,000 yen | 710 shares | 4.20% |
| Japan Broadcasting Corporation | 99,400,000 yen | 1,988 shares | 11.76% |
| Total | 844,900,000 yen | 16,898 shares | 100% |

What does a CDN mean to a broadcast station?

Broadcasting



Video Streaming



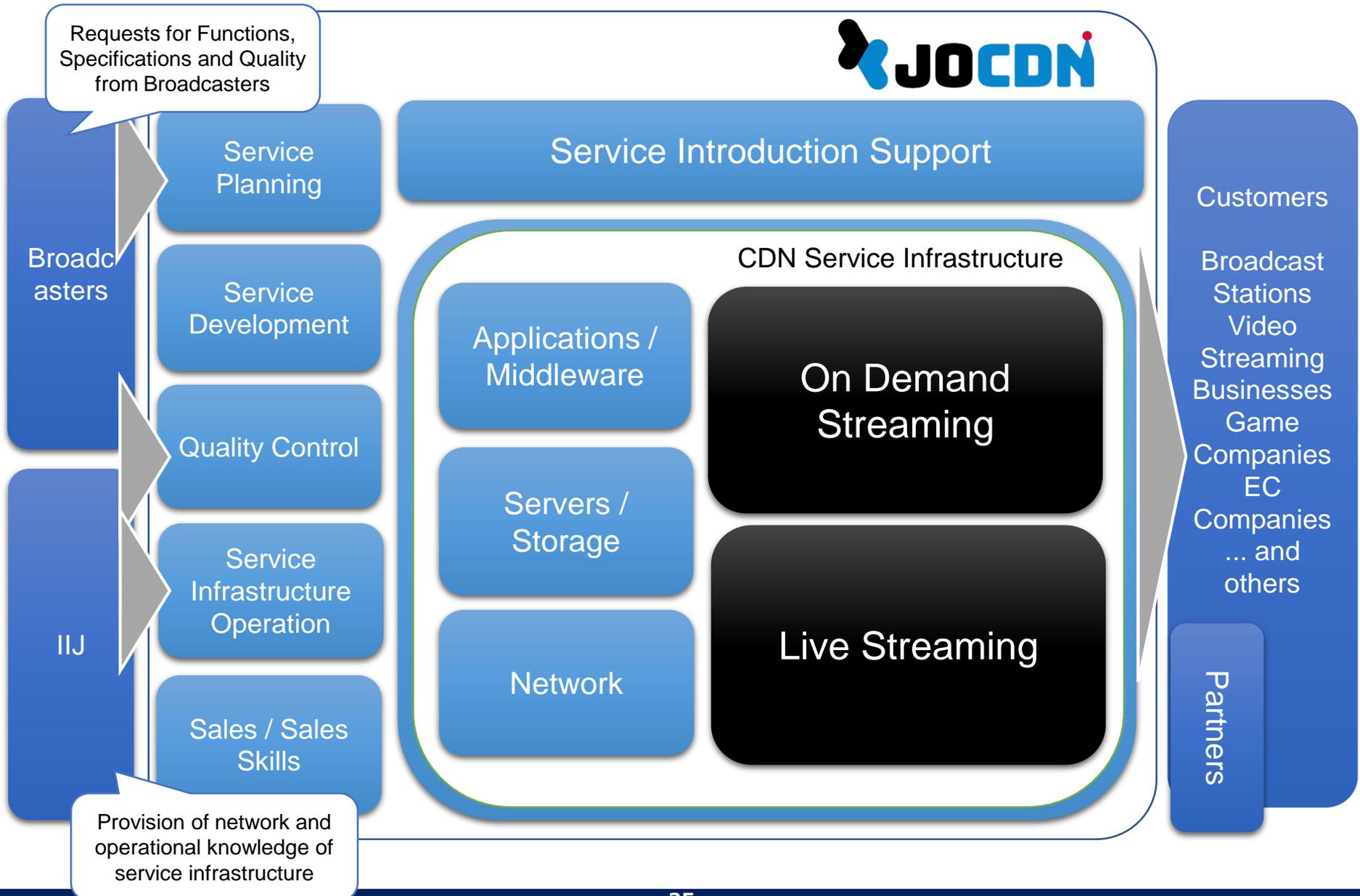
What CDNs Mean to Broadcast Stations

| | Transmission equipment (broadcasting) | CDN equipment (video streaming) |
|----------------------|------------------------------------------|-------------------------------------------|
| Equipment, operation | Self equipped and operated | Entrusted to outside contractors |
| Reliability | Self-control | Reliant on outside contractors |
| Cost structure | Fixed regardless of audience ratings | Proportional to volume (amount viewed) |



With video streaming set to take on a growing role in the future, CDN businesses are being promoted at the same level as transmission equipment for broadcasting to ensure that stable, high-quality CDNs can be provided at a reasonable price.

JOCDN Business Structure



Track Record of Service Usage

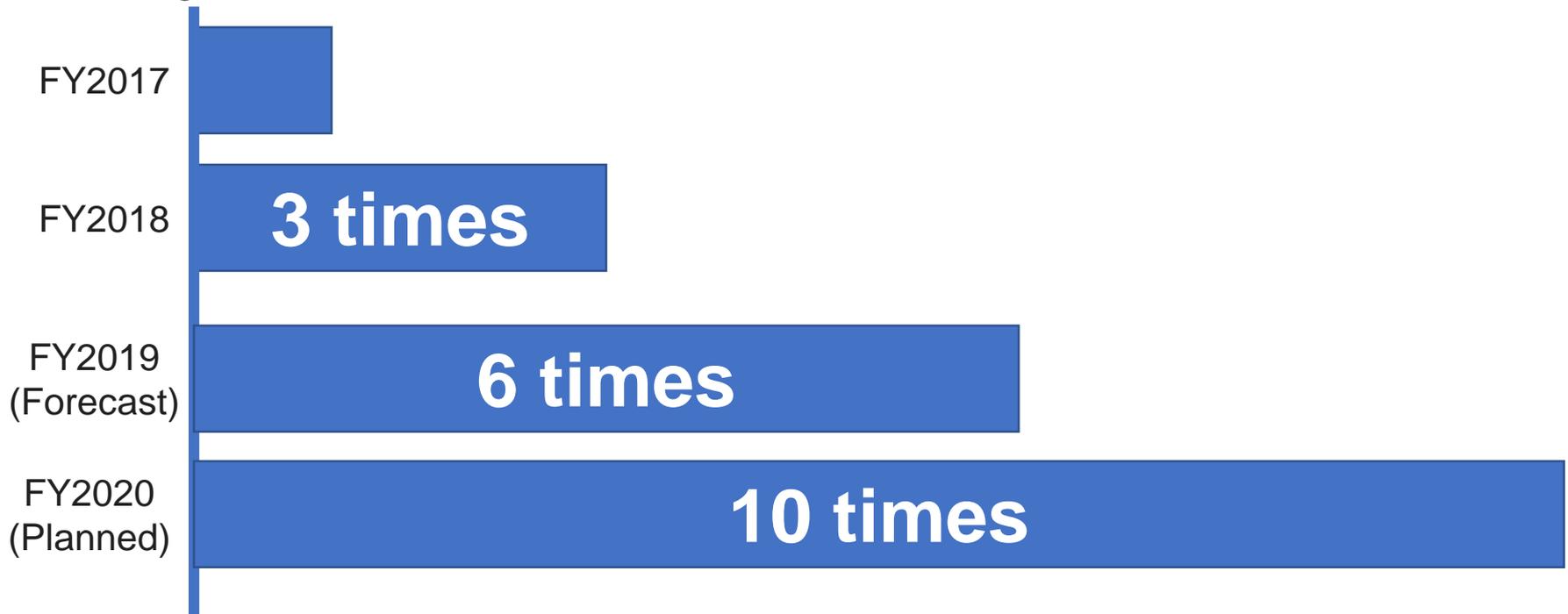
Each day, several hundred Gbps of on-demand streaming is carried out, including usage as the CDN for TVer.

- JOCDN has been used as the CDN for TVer since May 2017.
 - * Scope of Service (November 2019 results)
 - Number of Active Users: 9.47 million
 - Number of Video Playbacks: 85.87 million
- The service is used by a large number of customers including the key commercial television stations in Tokyo (NTV, TV Asahi, TBS, TV Tokyo and Fuji TV) in addition to stations in Osaka and Nagoya, BS stations and CS stations.

Change in Streaming Transmission Volume

After the full-scale launch in April 2017, usage has steadily expanded.

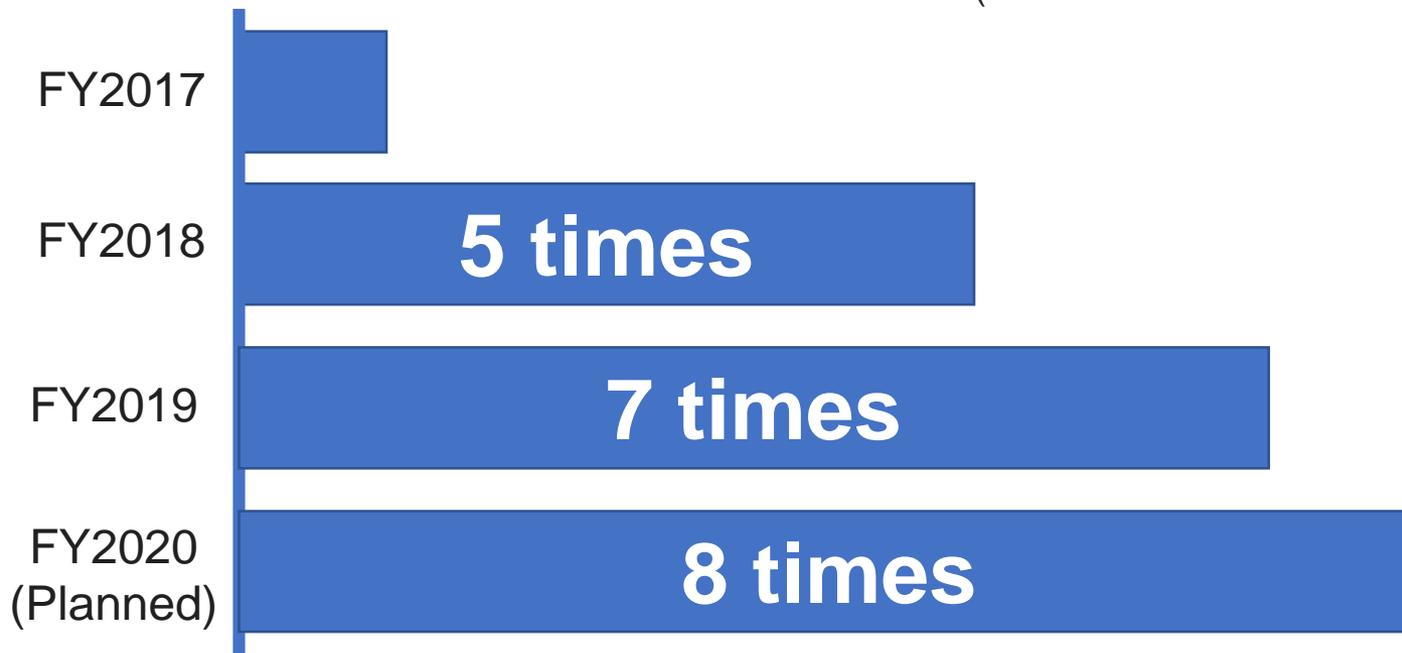
- From May 2017, JOCDN started to be used as the CDN for TVer.
- Thereafter, usage has expanded, primarily for the video streaming services of broadcasters.
- From 2019 onwards, JOCDN started to accommodate major customers such as Hulu, and streaming transmission volume has also expanded as a result.
- Streaming transmission volume with annual transmission volume in FY2017 indexed to 1.



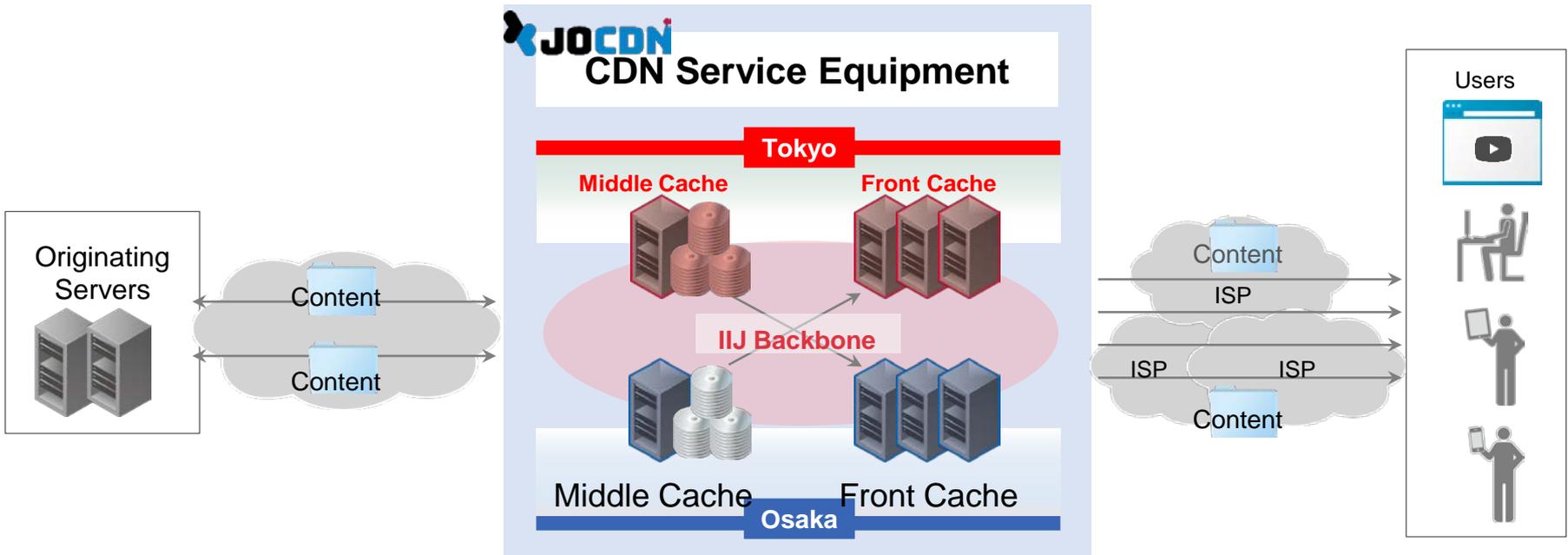
State of Facility Expansion

- **A systematic expansion of facilities is underway due to increases in the volume of data handled.**
 - Since the company was established, content delivery equipment has been expanded in a systematic way while taking increased data transmission volume into account.
 - Equipment configurations are also changed as needed to ensure optimal streaming performance in light of the characteristics of the traffic being streamed by contracted customers.
- Change in streaming bandwidth with maximum streaming bandwidth in FY2017 indexed to 1

(Bandwidth: bit rate that can be transmitted)



Features of the JOCDN CDN Service



Point 1

High-quality CDN service specifically geared towards video streaming

Point 2

Highly reliable support as a domestic service provider

Point 3

Advanced network design harnessing ISP knowledge

Point 4

Configuration designed based on the characteristics of on-demand and live streaming

Highly reliable support as a domestic service provider

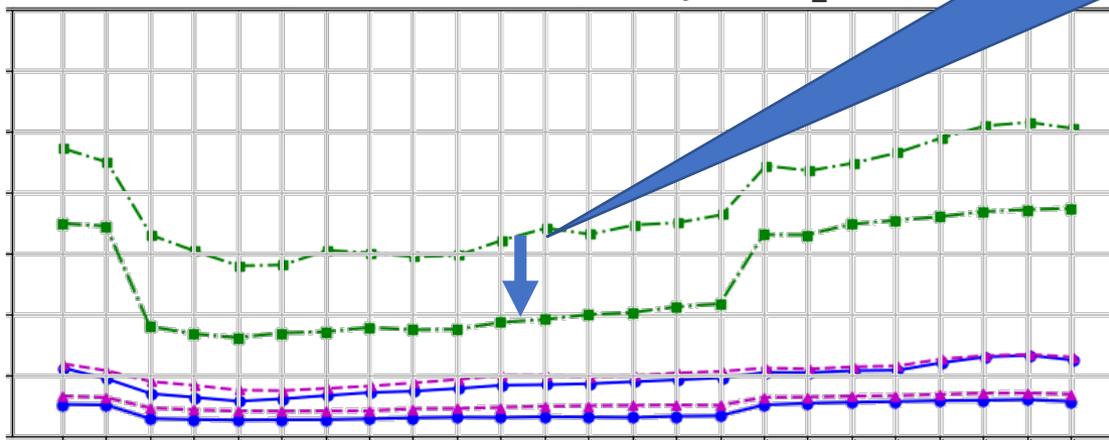


- **Development Structure**
- **Operation and Support**
- **Delivery Infrastructure**

Development Structure

- Closed development system in Japan
- Functions added and fixes applied in response to requests from customers
- Releases made once or twice a month with new functions or bug fixes
 - As an example of these efforts, last year performance improvements were achieved by introducing congestion control

Average content file acquisition time by hour



Performance improvements achieved thanks to newly introduced congestion control

Operation and Support

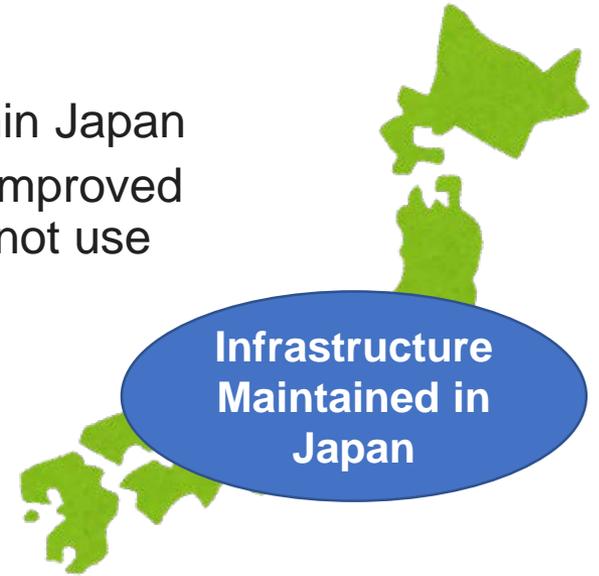
- **Service provision structure offering development, operation and support in an integrated fashion**
 - Reassuring support structure cultivated from close coordination, and a rapid failure response system
 - Promotion of feature development that places an emphasis on the needs of customers in Japan

- **Close coordination with the IJ team supporting JOCDN's technologies**
 - Traffic handling through a network team
 - Infrastructure design, building and operational support through a server team
 - Monitoring system and incident handling through a security team

Delivery Infrastructure

■ Delivery infrastructure entirely within Japan

- Specifically geared towards video streaming within Japan
- Contributes to video streaming stability such as improved response times due to a configuration that does not use overseas distribution infrastructure



■ Equipment developed based on the characteristics of both on-demand and live streaming

- For on-demand streaming, equipment configuration is designed to achieve high cache hit rates
- For live streaming, the equipment configuration takes peak traffic into account

* Cache hit: When data for the content requested by an end user is present on a cache server (CDN), this constitutes a cache hit. When a cache hit occurs, the response speed to the end user's device is improved. Additionally, as this does not involve the transfer of data between the delivery server and cache server, load on the delivery server is reduced.

Traffic During Live Streaming

Traffic prediction at the start of simultaneous streaming

- Estimated 2.7 Tbps during a disaster, 900 Gbps during a sporting event

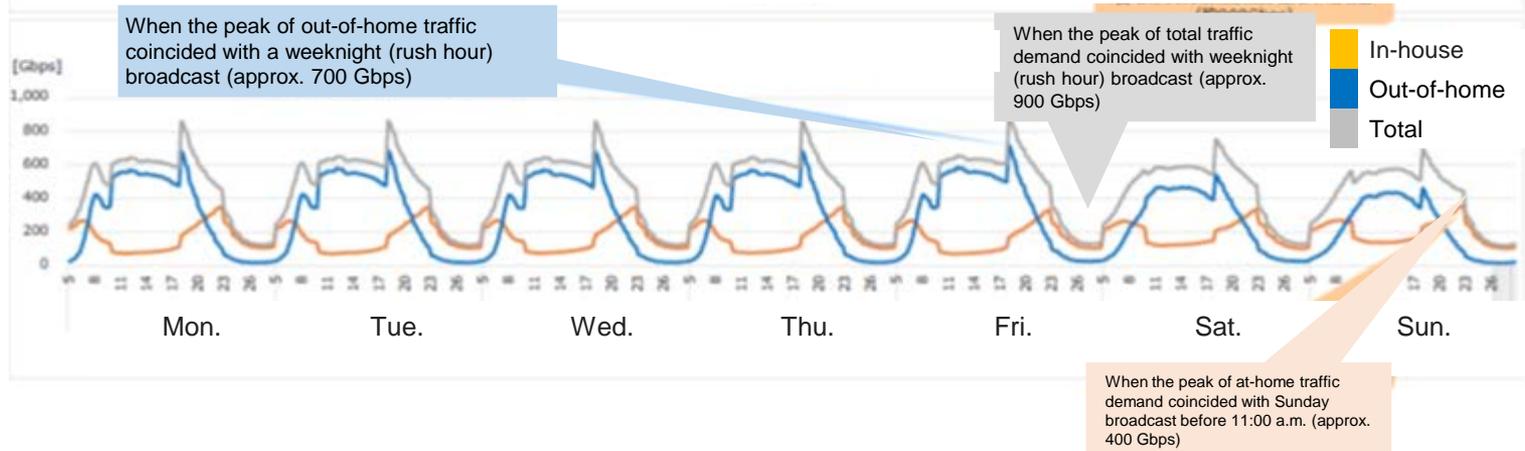
3-(2): Estimated Traffic Demand 2) Investigation Based on a Large-scale Event **By weekday and time of day** (In-Home Traffic / Out-of-home Traffic)

- Events generating high levels of interest are more likely to lead to **unique peaks in simultaneous viewing that differ from television viewing, especially when broadcast from the middle of the day to the evening** (rather than at night) on a weekday.
- In these cases, most traffic may be due to **out-of-home traffic**.

(2) Immediately following a major earthquake (in-home / out-of-home)



(4) Major Sporting Event Hosted in Japan (at-home / out-of-home)



Preparations for Simultaneous Streaming

- IIJ has experience with traffic levels of the same scale
- The knowledge of IIJ is being utilized to make preparations for simultaneous streaming

From August 6 to August 22, 2019, the 48 main games of the Koshien high school baseball tournament took place over 14 days. During the final held on August 22, **peak traffic of around 700 Gbps** was recorded. While only a single baseball game took place on this day as the final, the daily access count broke the record.



Future Initiatives

■ Initiatives aimed at simultaneous streaming

- Upgraded live streaming services
- Continual upgrades to distribution equipment

■ Initiatives to lower the hurdles to video streaming entry

- Providing stable CDN services at reasonable prices
- Providing video streaming technical support and expertise

■ Active R&D activities

- Ongoing development of base technologies to ensure reliability and security, etc.
- Development of features that match the needs of broadcast stations and various other customers

