

# Tokyo 2020 Games-Time Official Website and Mobile Application

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The Olympic and Paralympic Games Tokyo 2020 Time Official Website and Mobile Application was developed as a digital channel to disseminate Tokyo 2020 Games-related information to Olympic and Paralympic fans and spectators around the world, and attracted the large number of unique user accesses even in comparison with the past Games. The application also blocked all cyber-attacks and prevented serious cyber incidents. This article summarizes the requirements and technical approaches that were considered most important to achieve these goals, and reviews the actual access to the system during the Games.

**Keywords :** Official website & mobile application, System availability, Cyber security measures, User experience

## 1. Introduction

The Olympic and Paralympic Games Tokyo 2020 (hereinafter referred to as “Tokyo 2020 Games”) Time Official Website and Mobile Application (GTWA) played an important role as a digital channel for the comprehensive dissemination of information related to the Tokyo 2020 Games, including competition schedules and results, the torch relay, venue information, precautions against heat, and measures against the coronavirus disease 2019 (COVID-19), to Olympic and Paralympic Games fans and spectators around the world.

As a result, although the Tokyo2020 Games were held with virtually no audience due to the coronavirus pandemic, they ultimately attracted a large number of unique users during the Games Time.

This article looks back on how we built the system

that attracted worldwide attention, taking into account the technological aspects as well as key statistics from the actual Games.

## 2. Summary of GTWA System Architecture

GTWA is an Internet service that attracted attention from all over the world and was accessed by an unspecified large number of people, and we proceeded with the system design and development considering the following three requirements in particular.

- System availability to process high traffic
- Robust security measures against cyber attacks
- User experience for efficient dissemination of Tokyo 2020 Games-related information.

The following sections (2.1 to 2.3) describe the technical approach to achieving these requirements.

### 2.1 System Availability

#### 2.1.1 Cloud Platform

We used a global-scale cloud platform to host the origin VM servers, with a multi-region configuration in geographically sufficiently distant regions and a multi-

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availability zone configuration within each region. This ensured high availability, scalability, and system redundancy that could cope with disaster recovery in case of emergency.

### 2.1.2 CDN (Contents Delivery Network)

CDN was installed in front of the origin servers to cache contents on distribution servers located around the world, distribute them from there to reduce the load concentration on the origin servers and process the high user traffic. In addition, dynamic contents such as competition schedules and results information were dynamically included on the distribution server using ESI (Edge Side Includes) technology, which further reduced the load on the origin server and achieved high performance.

Prior to release, performance tests were conducted on the entire platform, and results showed that the system was able to continuously process 100 k concurrent connections (average of over 500 kreq./s). This number was sufficient for the demand forecast.

## 2.2 Cyber Security Measures

Since several serious security incidents due to cyber-attacks had occurred in past Games, cyber-security measures for servers that were open to the Internet had to be developed with extra care. The security measures taken were reviewed through system audits and penetration tests to ensure that they were properly and fully implemented.

### 2.2.1 Security Solution

As a solution, CDN was used to protect against cyber-attacks from the Internet and EDR (Endpoint Detection and Response) to detect suspicious behavior on endpoint servers. The log information obtained was stored in SIEM (Security Information and Event Management) and the Cyber SOC (Security Operation Centre) monitored the log on a 24-hour basis. This enabled the isolation, rapid detection and response to the cyber-attacks on the GTWA system.

A vulnerability management operation system was also utilized to obtain the latest vulnerability information and respond to them in a timely manner.

### 2.2.2 Incident Response Flow

The first level incident response manual was created for typical cyber-attack scenarios so that the Cyber SOC could complete the response by themselves, and when a

major security alert exceeding the level was generated, the alert was escalated in real time, and the TOC (Technology Operation Centre) started the incident control to smoothly isolate and respond coordinating with all related partners.

Since the partners were located around the world, intensive trainings were conducted through cyber security table-top exercises and technical rehearsals.

## 2.3 User Experience

GTWA played the role of a hub for all information related to the Tokyo 2020 Games, and we pursued user experience to efficiently deliver information that users wanted, and also built a back-end system for operators to edit and publish Tokyo 2020 related contents in a timely and efficient manner.

### 2.3.1 Supported Languages

GTWA supported seven languages (Japanese, Chinese, English, Korean, French, Spanish, and Hindi), the largest number of languages supported for the digital media ever in the history of the Olympic and Paralympic Games. In particular, mobile applications automatically read the language settings of the user's device and displayed contents in the most appropriate language.

### 2.3.2 Website and Mobile Application Development

The GTWA project team completed the service requirements definition through a number of meetings and reviews with the relevant departments within the Tokyo 2020 Organising Committee. The application was then developed and refined with top-level partners in the sports technology industry, in almost 60 cycles of agile sprints over a three-year period, including the postponement period of Tokyo 2020 Games.

For instance, easy content personalization and sign-up through onboarding, single sign-on with Tokyo 2020 ID to other digital channels provided by Tokyo 2020 Organising Committee such as My TOKYO2020 site, official ticket site, official online shop site, and so on.

### 2.3.3 CMS (Contents Management System) Development

To disseminate the latest Olympic and Paralympic Games information in a timely manner during the Games Time, Tokyo 2020 Organising Committee and the IOC jointly established a global content editing team and they worked in shifts. Also, the back-end Content Management System (CMS) was developed and customized for

Table 1 Major Statistics during the Tokyo 2020 Games

Item	Number	Period
Total number of unique users	199 million	1 Jan, 2021-5 Sep, 2021
Total number of page views	1.34 billion	1 Jan, 2021-5 Sep, 2021
Total number of mobile app downloads	5.5 million	25 May, 2021-5 Sep, 2021 *1
Peak number of concurrent users	261 thousand/minute	21 : 48, 27 Jul, 2021
Peak number of page views	191 thousand/minute	20 : 52, 7 Aug, 2021
Total number of cyber-attacks blocked	163 million	23 Jul, 2021-8 Aug, 2021 and 24 Aug, 2021-5 Sep, 2021
Total number of critical security incidents	0	
Average CDN cache hit rate	98.5%	

\*1 25 May, 2021 : Pre-release date of the official mobile app.

them to improve the efficiency of editing work.

For example, a dedicated template for each content page, such as a live blogging, was provided to minimize the number of editing points and reduce the workload, and integration with external services such as photo albums, weather and WBGT (heat index) information enabled the automatic contents update via Push notification.

### 3. Key Statistics during Tokyo 2020 Games Time

The main statistics of the GTWA system during the Tokyo 2020 Games are shown in Table 1 and discussed in Sections 3.1 through 3.5. Note that the figures for cyber security are those that occurred only during the Olympic and Paralympic Games, excluding the transition period.

#### 3.1 Number of Unique Users/Page Views

GTWA was positioned as a digital channel for disseminating Tokyo 2020 Games information to users, and also as a means of realizing the digital marketing strategy of the Olympic and Paralympic Games. For the Tokyo 2020 Games, 200 million unique users were set as KPI (key performance indicator), and the target was almost achieved with 199 million unique users, including 31 million mobile app users, which was a little more than 15%. As mentioned earlier, this was a very large number of user accesses even in comparison with the past Games, indicating that the status of Internet media as a means of watching the Olympic and Paralympic Games is improving more and more (Figure 1).

In terms of page views, there were a total of 1.34 billion accesses. During Tokyo 2020 Games, approximately 90% of the user accesses were to the pages of the competition schedule, results, and medals.

In addition, Japan, the host country, was ranked in the second of the top ten countries/regions in terms of page

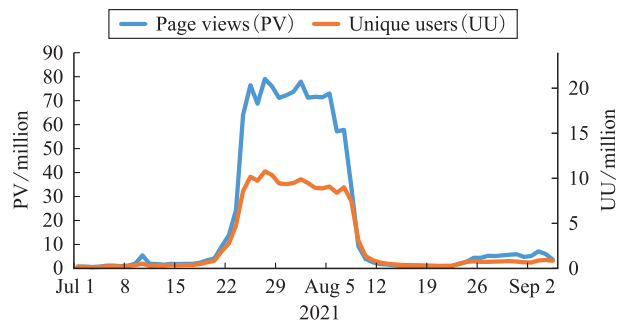


Figure 1 Daily Transition in Page Views/Unique Users

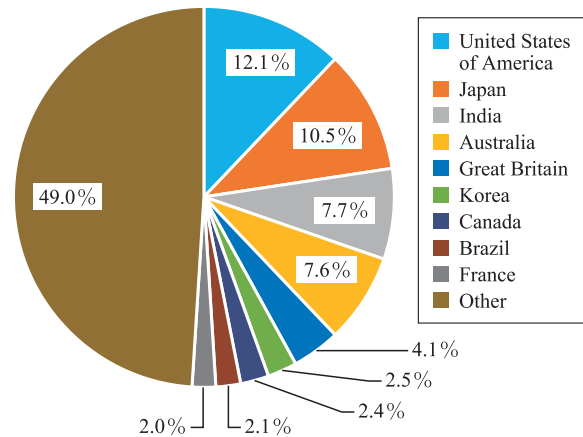


Figure 2 Top 10 Countries in Page Views

views, indicating they had a high level of interest in the Tokyo 2020 Games. On the other hand, 49% of the accesses were from other countries not in the top ten, indicating that thanks to the provision of contents in seven languages, many people from all over the world accessed GTWA. (Figure 2).

#### 3.2 Mobile Applications

The number of downloads of the official mobile application began to increase rapidly after the start of the Olympics Games, as expected, but then suddenly

slowed down over the next few days (Figure 3). The mobile application was intended to deliver proper information in a timely manner to Japanese and international spectators visiting the venues by utilizing the push notification function. However, due to the coronavirus pandemic, Tokyo 2020 Games was held with almost no spectators in the venues and the promotion could not be conducted sufficiently, that may be one of

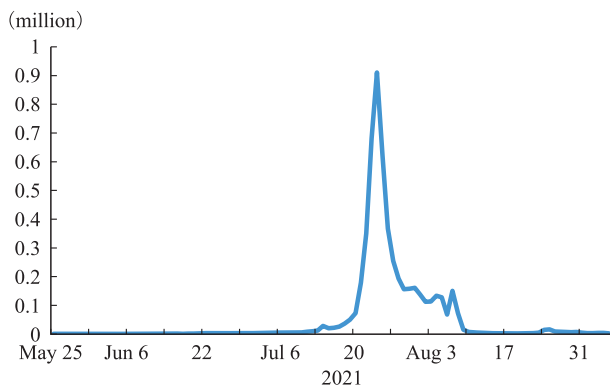


Figure 3 Daily Transition in Mobile App Downloads

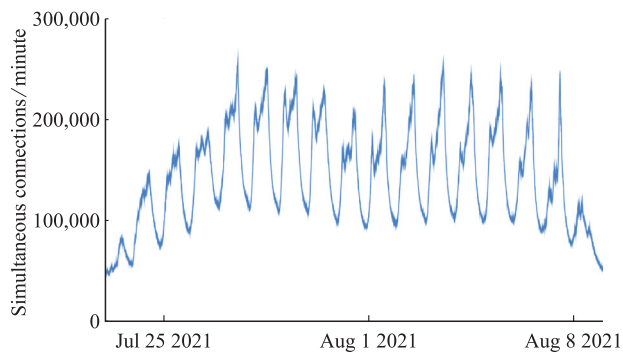


Figure 4 Transition in Concurrent Users per Minute (Olympic Games Time)

the reasons why the number of mobile application download did not increase as expected.

The ratio of the number of app downloads per mobileOS was 47% for Android and 53% for iOS.

### 3.3 Peak Access

Peak accesses were considered to have been processed well within the range guaranteed in the performance test. There was no significant peak, and the number of traffic increased and decreased repeatedly in daily cycle (Figure 4 and Figure 5).

### 3.4 Cyber Security Measures

Regarding access to the GTWA system, the number of blocked unauthorized communications including cyber-attacks, began to increase gradually about 10 days before the opening ceremony of the Olympics, peaked on the second day, and did not reach any significant peaks thereafter (Figure 6). During the Olympic and Paralympic Games, the CDN blocked all of

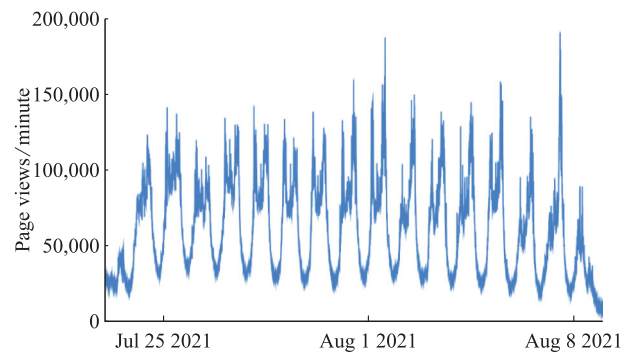


Figure 5 Transition in Page Views per Minute (Olympic Games Time)

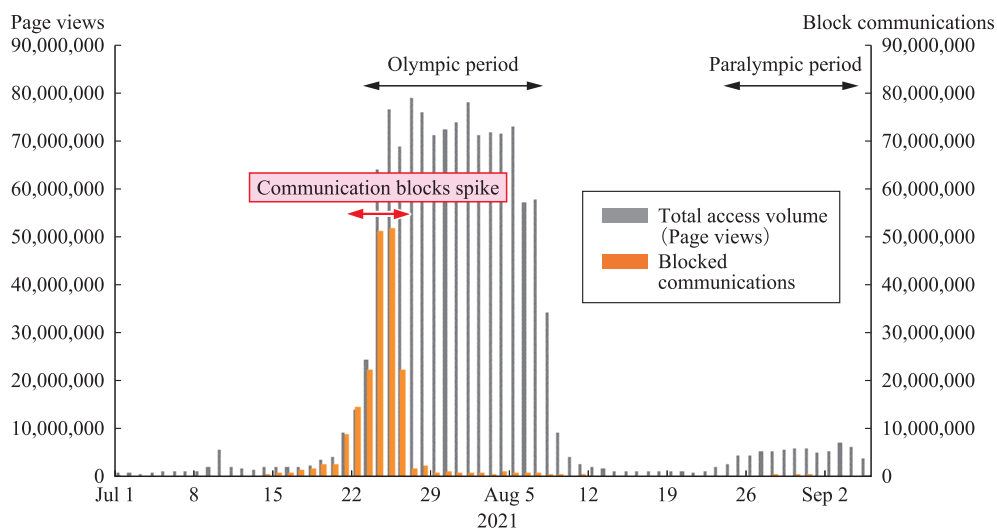


Figure 6 Daily Transition in Total Number of Accesses (page views) and Blocked Communications Including Cyber Attacks

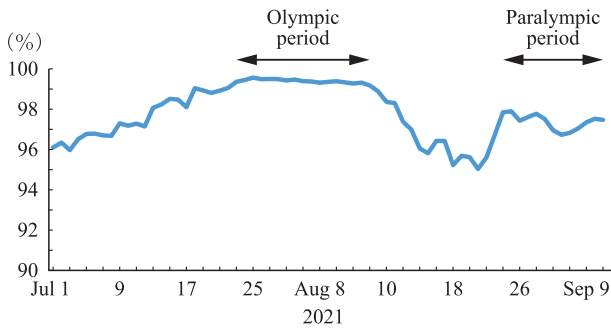


Figure 7 Daily Transition in CDN Cache Hit Rate (bits)

the 163 million unauthorized communications in total, and Tokyo 2020 Games successfully completed without any impact on services. No major security incidents were escalated by the SOC during the Games, indicating that security measures of GTWA achieved significant success.

### 3.5 Cache Hit Rate

During the Olympic and Paralympic Games, CDN recorded a very high cache hit rate of 98.5% on average, which was effective enough to improve response quality (Figure 7). Also, the origin server operated stably during this period without running out of resources.

## 4. Conclusion

In the past Games, the official websites and mobile application of the Olympic and Paralympic Games were built for limited-time events; however, it also had characteristics that they attracted significant accesses from users around the world and could become the target of cyber-attacks repeatedly, therefore, the stable operation of the systems was a challenge for the Olympic and Paralympic organising committees.

While building the GTWA systems, experts/partners

in various fields from around the world were engaged to focus on platform availability, scalability, user experience, and cyber security measures. Also, an efficient operation flow was developed to work closely with partners and suppliers involved in operations during the Tokyo 2020 Games. As a result, we could successfully operate GTWA systems without any serious incident.

GTWA systems were built in collaboration with IOC and Tokyo 2020 Organising Committee, which were for the first time in the history of the Olympic and Paralympic Games. They will be taken over by IOC and used as a valuable legacy for future Games. In addition, we believe that the knowledge and successful experiences of the engineers and managers who participated in this project will be of great significance to the Japanese industry in the future.

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