

# Summary of Technology Management and Operation in the Tokyo 2020 Games

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Olympic and Paralympic Games is one of the world's largest technology projects in terms of the number of equipment and human resources. It is also a global project conducted by staff not only from all over the world, but from various technological area of many affiliated companies. Therefore, management of technology was crucial for the success of the Games. This article describes the activities of technology management at the Tokyo 2020 Games, dividing into three phases, Planning, Operational Readiness, and Operational.

**Keywords :** Tokyo 2020 Games, Technology management, Operation centre, Test event, COVID-19

## 1. Foreword

The Olympic and Paralympic Games Tokyo 2020 (hereinafter referred to as "Tokyo 2020 Games") provided a variety of technology services at 190 venues including 43 competition venues, such as time results and scoring, distribution of competition results, electronic judging systems, video and audio distribution for broadcasting, and information systems for Games management. The following two points can be cited as difficulties in the operation of technology in Olympic and Paralympic Games. The first is the large scale of operation, as represented by 17,000 PCs, 16,000 network devices, and 15,000 technology operation staff at the Tokyo 2020 Games. The other one is that most of the staff have no experience of sporting events, although some of them, such as the time and scoring staff, have had in the past Games. It was a major challenge for the

success of the Games to manage the technology, because the organization started with no knowledge of the Olympic and Paralympic Games, and many staff members from home and abroad joined just before the Games.

High-quality technology services were realized by strong governance from the Technology Operation Centre (TOC), standardized equipment configuration at the Equipment Deployment Centre (EDC), and the incident management process in an easy-to-understand manner with the Technology Call Centre (TCC) which served as the first contact from users<sup>(1)</sup>. The details of each of these centres are described in the articles that follow, and this article summarizes the overall technology management.

Technology management was divided into three phases same as in the past Games : Planning Phase from the launch of the organization in 2014 to around March 2019, Operational Readiness Phase (preparation) from April 2019 to around May 2021, and Operational Phase from June 2021 onward (Table 1). The following sections summarize each of these phases. Countermeasures of coronavirus disease 2019 (COVID-19) are described in the Operational Phase. The Tokyo 2020 Games were the first Games ever held amid a COVID-19 outbreak. A special support team was established and

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The Journal of The Institute of Electronics, Information and Communication Engineers, Vol.105, No.8, Supplement, pp.301-306, August 2022  
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Table 1 Three Phases of Technology Management

	Planning Phase	Operational Readiness Phase	Operational Phase
Period	April 2014–March 2019	April 2019–May 2021	June–September 2021
Main Activities	<ul style="list-style-type: none"> <li>• Requirements definition for technology services</li> <li>• Determination of technology architecture and solutions</li> <li>• Implementation of each service</li> <li>• Planning of network and equipment allocation at each venue</li> <li>• Definition of operational policies and procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Test events to verify the operation of the technology services</li> <li>• Technology rehearsals to ensure prompt incident response</li> <li>• Disaster recovery exercises to confirm response to major data centre failures</li> <li>• Tabletop exercises to confirm incident response at each venue</li> </ul>	<ul style="list-style-type: none"> <li>• Installation of equipment at venues</li> <li>• Operation during the Olympic Games</li> <li>• Transition from Olympic Games to Paralympics</li> <li>• Operation during the Paralympic Games</li> <li>• Removal of equipment at venues</li> </ul>

operated because infection of technology staff working for time and scoring for instance, could have affected the operation of the Games itself.

## 2. Planning Phase

The Planning Phase was a phase in which technology services and their operation were defined and implemented. Since many stakeholders of the Games who would use the services had the experience of the past Games, the services, such as what, to whom, and where, were determined based on the past Games in the beginning, in order to avoid a confusion in the Games operation. Then, solutions and operational procedures including following items were defined and implemented:

- The architecture of the network, information system infrastructure, cyber security, etc.
- Solutions for each technology area
- Service levels such as response time and recovery time
- Details of equipment allocation
- Requirements of the venue, such as room structure, network, power supply, desk layout, etc.
- Operational policies and standard procedures of operation

For example, only a few types of hardware were used for PCs. But the final number of models reached approximately 70 since the components of peripherals and software differed according to each service. The Technology Equipment Allocation Plan (TEAP) was defined as a deployment plan, which showed which models and how many pieces should be installed in every room of every venue.

In addition, more than 400 Policies and Procedures

(PnP) were defined to ensure reliable operation and to enable a quick and flexible response to various incidents. The operational structure was designed to be similar to the past Games, consisting of three levels: TCC, venue, and TOC. All incidents from service users were reported through TCC and escalated to the venue and/or TOC depending on the complexity and importance of the incident.

In this Planning Phase, change of specification that would affect other areas occurred frequently. Because the large number of people involved in the Games, it was important for all parties of stakeholders to share the latest information at all times and to communicate frequently.

## 3. Operational Readiness Phase

Operational Readiness Phase was a phase to confirm the service operations defined in the Planning Phase and to train staff through practical events. Four large-scale and operationally important activities, from the various exercises and rehearsals conducted, are described below.

### 3.1 Test Events

Test Events were a series of events held approximately one year (two years for Tokyo 2020 Games because of the postponement of the Games due to the COVID-19) to six months before the Games, in which the Organising Committee, international and national federations, volunteers, partner companies, and other Games officials participate to conduct the sporting event at the Tokyo 2020 Games venue. The purpose of the event was to confirm the overall operational readiness of the Games, including competition management, venue management, various technology services, information security, and staffing.

In the Tokyo 2020 Games, 56 events were held and technology services were provided for the following purposes :

- Confirmation of the operation of the technology services
- Provision of services for the operation of other business areas
- Pre-installation of infrastructure for the Games

#### (1) Confirmation of the Operation of the Technology Services

Technology services to be used at the Games were checked from the perspective of operating them in the actual venue environment. It was determined in which test events staff members needed to participate and at which points needed to be checked to optimize costs and future risk, based on the viewpoints of the complexity and difficulty of the time results and scoring operation, whether a competition was newly introduced at the Tokyo 2020 Games or not and so on. Since the task of volunteers was important for the timing and scoring systems in some of the events, volunteers participated to check their tasks as well as the technology staff. The golf test event found concerns about the English communication skills of volunteers. However, we were able to prevent problems by increasing training opportunities at the venue in preparation period.

#### (2) Provision of Services for the Operation of Other Business Areas

The operation of the Games required a variety of tasks, such as transportation of athletes and admission management. Hence the tasks to be checked at each test event were different, the technology services to be provided differed accordingly. Therefore, it was necessary to provide technology without any gaps according to the test plans of each business area. It was a good opportunity to discuss the detailed role and responsibility among related stakeholders of the Games.

#### (3) Pre-installation of Infrastructure for the Games

Network equipment and cablings were not removed and remained in use until the Games at the venues that could be exclusively used for Tokyo 2020 from the test event to the Games. This significantly reduced the time and cost of re-installation.

The Test Events were to confirm operations, but they also provided an important opportunity for staff mem-

bers to familiarize procedures and communication, who took on Games roles for the first time and ran the event. In addition, it was a good opportunity to understand each other's activities during the Games time. Their roles between TOC and venue staff sometimes were swapped for better understanding. Debriefing sessions were held after the test events to discuss good points and areas of improvement that needed to be shared with the staff to be joined later.

### 3.2 Technology Rehearsals

Technology Rehearsals (TRs) were large-scale exercises to confirm the procedures for incidents, which were held four to two months before the Games. Whereas the test events focused on experiencing the operational aspects of the competition, the TRs confirmed the readiness of the IT infrastructure, IT systems, support model, staffing, and operational processes through incident response. More than 1,500 people participated, including the Organising Committee, volunteers, relevant delivery partners, the International Olympic Committee (IOC), and the Organising Committees from future Games.

TR exercises simulated or triggered actual problems that might occur at the Games time with scenarios based on incidents that had occurred in the past Games. The incidents covered a broad range of problems including sudden absences of staff members, cable cuts, system malfunctions, unexpected competition delays, etc. The TR Officers (TROs) selected from the IOC and partner companies informed the staff members of the occurrence of problems and/or changes in the situation according to a progression procedure called a scenario, and the staff members took the correct actions according to the procedure manual for their roles.

TRs were taken place twice, TR1 and TR2. TR1 was conducted for three days in March 2020, mainly to evaluate the operation of the competition results in the distribution system at the Integration Testing Lab (ITL) in Europe. Although the number of actual venues used in Tokyo was limited to seven, the ITL operated the results distribution system for all competitions, with more than 500 scenarios (about 300 types) for 33 competitions.

TR2 was originally planned for May 2020, but was postponed to June 2021 due to the COVID-19. It was conducted at 25 venues for three days, with a cumulative total of 1,200 scenarios (about 600 types). 60 scenarios were conducted at the Olympic Stadium (National

Stadium), which was the largest venue for Tokyo 2020 Games. A total of 37 scenarios were conducted for infectious disease control, which was a new challenge due to the COVID-19. TR2 participants included many people from overseas, such as the IOC and the Paris 2024 Organising Committee, who followed the strict entry/exit and action rules of infectious disease control regulated by the Japanese Government and the Playbook defined by the Tokyo 2020 Organising Committee. This operational experience was useful for infection control at the time of the Games period.

TRs were effective and last practical opportunity before the Games, to improve the proficiency and understanding of the procedures of staff. They learned the importance of quick prioritization and action, as well as sharing information and communication to enable quick actions.

### 3.3 Disaster Recovery Rehearsal

Disaster Recovery Rehearsal (DRR) was an exercise to ensure smooth restoration of services in the event of an unexpected disaster or security incident, that would significantly affect the operation of critical equipment and systems.

For the Tokyo 2020 Games, three DRRs were conducted between October 2020 and April 2021. Data Centres were implemented in the host city of each Games conventionally, however, the transition to cloud computing was promoted from PyeongChang 2018. System services provided by worldwide partners were offered using Data Centres in Europe. For this reason, DRR1 in October 2020 was conducted for a group of services located in European Data Centres and confirmed that the primary Data Centre switched over to a backup secondary Centre within two hours as planned.

While many services were migrated to the cloud environment, the Data Centre in Tokyo also operated a critical system exclusively for the Tokyo 2020 Games. DRR2 in March 2020 confirmed the migration procedures, work time, and communication system for these services. Through this exercise, we were able to identify configuration problems and shorten the recovery time.

DRR3 in March 2021 expanded the scope with a scenario in which the authentication servers were down due to a cyberattack, in addition to confirming improvements from DRR2 regarding the failover, because PyeongChang 2018 was suffered from a cyberattack on the opening ceremony day. The criticality and priority of each service and its dependency on the system

infrastructure were clarified in the preparation period of the exercise. The exercise clarified not only the procedure of restoring the authentication server from its backup data, but also the procedure of recovery for important systems to run individually without the authentication server by changing the configuration to disconnect it. This DRR3 achieved a practical and effective exercise for service restoration from the incident of a large-scale disaster or cyberattack.

### 3.4 Tabletop Exercise

The purpose of the tabletop exercise is to confirm the process flow of the response to incidents and the communication procedures among stakeholders. Normally, this exercise is conducted just before the Games when all staff members are present, but for the Tokyo 2020 Games, it was conducted for a longer period, from August 2020 to April 2021 for venue staff, and from December 2020 to January 2021 for TOC staff, because of following reasons: (1) there was one-year blank because of the postponement of the Games due to the COVID-19, and (2) many staff members left/re-joined the Tokyo 2020 Games. TR scenarios were used in the exercise, and the findings of TR1 were re-shared to improve the knowledge level of the staff.

Four sets of scenarios were prepared for venue staff. Four rounds of the exercise, using each set of scenarios for each round, were conducted for a total of 170 people who already joined. The venue staff was divided into groups of four to six people with a mixture of technology venue managers and venue IT managers. One of seven core staff members was assigned as a facilitator to each session and triggered five to seven scenarios in the session. Other activities included a study session on technology services by service owners, and decision-making and communication procedures to remove large equipment in the event of a typhoon.

Group training used to be an in-person exercise at the past Games. The tabletop exercise above, however, made extensive use of online conferencing and e-learning because of COVID-19 infection control. In addition, e-learning, which enabled self-learning, was effective for staff members who joined after the tabletop exercise, because it was difficult to find time for group training so that each staff member could move to the venue and start their work as it was getting closer to the opening of the Games. Remote training using ICT is expected to become more and more important in the future.

Four major activities in the Operational Readiness Phase elicited the following findings :

- The person in charge of each technology area needed to understand the entire related architecture to give a prompt and accurate response to the incident reports because information systems and networks varied and related to each other.
- The communication channels among the operational centres of the business units needed to be established, and all staff members needed to have full knowledge of the communication process so that the incident reports on technology could be escalated promptly.
- The fundamental procedure needed to be defined for managers and other members in each technology area, so that advanced incident scenarios, which caused complicated incidents simultaneously, could be integrated for practical exercises.

#### 4. Operational Phase

The Operational Phase includes both the period of the competition and the installation of venues beforehand. Service level such as response time to an incident went up in this phase because one incident could be critical for the overall Games operations. TOC provided 24-hour support to the venues with a total of 551 experts of all technical areas in 171 positions. TOC detected and resolved problems proactively through twice-daily status review meetings held with key managers from all technical areas, and also through coordination meetings with all business functional managers of the Games. This section focuses on the COVID-19 handling.

Countermeasures against COVID-19 were urgently needed just before the Games, which caused special immigration procedures for overseas staff, transport between airports, hotels, and venues, arrangement of designated accommodation, PCR tests for all technology staff including Japanese local staff, and health monitoring. A specialized support team with six staff was established hastily in TOC. The team developed and disseminated a guidebook on infectious disease countermeasures. They also managed necessary information by using Tokyo2020 ICON, an infectious control business support system, and supported staff when incidents happened.

The daily operation with Tokyo2020 ICON went well in health monitoring, visualization of PCR test results,

and prompt identification of close contact person when found positive. On the other hand, overseas staff faced many problems when entering Japan. The entry of overseas staff required government permission, which was to be processed through Tokyo2020 ICON. However, there were many cases where registration was not completed in time before entry, or inconsistencies of registration information occurred, because the system was released just before the entry. The team had to solve these issues with irregular paper procedures. In addition, there were many incidents such as a delay in the immigration process due to incomplete PCR-negative certificates at the time of entry into Japan.

The team accomplished their mission to coordinate with airports and travel agencies from early in the morning to late at night, to handle infected staff, and to follow up on sudden illnesses without any problems, despite the late recruitment and teaming of the staff just before the Games. As a result, the team supported 642 technology-related overseas staff members entering Japan in July including 112 staff members entering only for July 15. They worked around the clock to register information into the system, handled incidents and arranged transportation for those who could not register in the system or enter the country due to insufficient certificates. PCR testing subject to the playbook was conducted for 14,637 technology-related staff members including volunteers during the Games time. Although 24 people tested positive during the Games, the identification and follow-up of persons with close contacts prevented the outbreak of cluster infections and minimized the impact on the Game's operation.

#### 5. Conclusion

This article has summarized the technology management of the Tokyo 2020 Games, dividing it into three phases, Planning, Operational Readiness, and Operational Phase.

Although Olympic and Paralympic Games has already sophisticated systems and operational processes throughout their long history, it is crucial to implement technology services according to the evolution of technology and to adjust the difference in role and responsibility of stakeholders from the past Games. By enhancing close communication with stakeholders including IOC and partner companies from the early stage of planning, we, as the Tokyo 2020 Games, were able to realize our TOC, EDC, and TCC and provide technology

services designed based on the past Games.

It is said that each of the Games has its challenges, and COVID-19 was certainly the biggest challenge for Tokyo 2020 Games. It was the first time for anyone, including IOC and those who had participated in previous Games, to hold the Games in the face of COVID-19 as well as to postpone the Games for any reason. Although the management itself was a bit of a challenge, the postponement period was able to be used for staff training and other activities to improve the quality of services.

As a result, the Games accomplished with great success, with only 47 of high severity incidents escalated to the TOC, one-third to one-fifth of the number of incidents compared to the recent summer Games.

The Olympic and Paralympic Games is a too huge events to be achieved by a small number of specialized staff members. We are confident that the 15,000 technology staff members as well as the many technology professionals who worked together as One Team led the Tokyo 2020 Games to a successful conclusion. We would like to take this opportunity to express my gratitude to all of them. #Arigato

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(Received February 9, 2022 ; Revised March 4, 2022)



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