Overview of Equipment Deployment Centre of the Tokyo 2020 Games

KAWATA Masahiko

Abstract

Approximately 30,000 units of IT equipment were used in the operation of the Olympic and Paralympic Games Tokyo 2020. The Equipment Deployment Centre (EDC) was set up independently to achieve efficiency and quick response to changes. EDC collectively handled the preparation, setting, and deployment of all IT equipment to each venue. EDC could set up and ship up to 600 units of equipment per day. By operating this EDC, the Olympic and Paralympic Games Tokyo 2020 could ship and deploy IT equipment on the schedule requested by the venues without delay in May and June 2021, the peak season for venue construction.

Keywords : Tokyo 2020 Games, Equipment configuration, Image deployment

1. Introduction

During the Olympic and Paralympic Games Tokyo 2020 (hereinafter referred to as "Tokyo 2020"), approximately 30,000 units (approximately 11,000 PCs or within the entire period from the inauguration of the Organising Committee to the end of 2021, 17,000 PCs, approximately 3,000 printers/multifunctional printers (MFPs), and approximately 3,000 network devices) were deployed over about one and half months. As mentioned above, previous Olympic and Paralympic Games had their independent Equipment Deployment Centres (EDC) to flexibly handle the preparation and configuration changes of a large quantity of equipment and to quickly replace the equipment that had failed. The following is an overview of the EDC established and operated at the Tokyo 2020 Games, similar to the previous Games.

KAWATA Masahiko
Technology Services Bureau, The Tokyo Organising Committee of the Olympic and Paralympic Games
The Journal of The Institute of Electronics, Information and Communication Engineers, Vol.105, No.8, Supplement, pp.320-326, August 2022

2. Outline of the Equipment Deployment Centre (EDC)

EDC is a facility used for the preparation, temporary storage, and testing of IT equipment required for the operation of the Games and equipment disposal after the Games.

EDC should be located near or within Main Distribution Centre (MDC, i.e., the Olympic and Paralympic Games' warehouse) to efficiently hand over goods between the logistics team responsible for transporting equipment to competition venues and facilities and the technology team responsible for preparing the equipment. Based on the above perspective, EDC for the Tokyo 2020 Games was also set up in MDC.

We designed the PCs for the Tokyo 2020 Games with several patterns of equipment configurations and setup specifications depending on the purpose of the work. And EDC had to efficiently set up and prepare many PCs based on the different patterns to meet the deadlines required by each venue and facility. Therefore, EDC needed to be equipped with a high-speed and wide band local area network (LAN) capable of duplicating and deploying PC settings via a network. Referring to the shipment data of previous Games and the TEAP

(Technology Equipment Allocation Plan), we designed a PC deployment system including LAN with a maximum daily production capacity of 600 PCs at the EDC for the Tokyo 2020 Games.

2.1 Physical Layout of EDC

As mentioned above, EDC was located on the second floor of MDC, adjacent to the technology component storage area (Figure 1). And there was a temporary storage area around the perimeter of EDC for equipment that had been assembled and configured at the EDC and handed over to the logistics team and was awaiting delivery (the status of this equipment was already "shipped from EDC"). The floor layout was such that a handover area surrounded the EDC.

The EDC occupied an area of 726 m^2 in total and was divided into three main sections: the LOAD-OUT/LOAD-IN areas on the left and right and the work area at the centre (Figure 2).

The LOAD-OUT area (150 m^2) was a temporary storage area for finished products that had been completed at the EDC and were waiting for hand over to the logistics team (Figure 3). The LOAD-IN area (150 m^2) was a storage area for parts taken from the

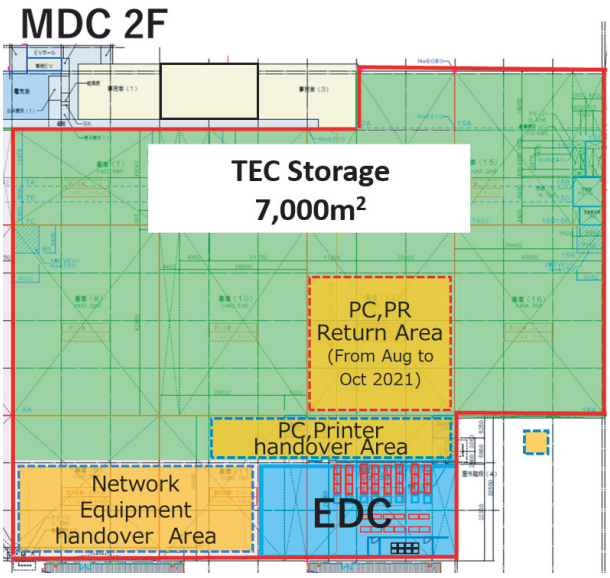

Figure 1 Floor Layout Around the EDC on the Second Floor of MDC

Figure 3 LOAD-OUT Area and Equipment Waiting for Shipment

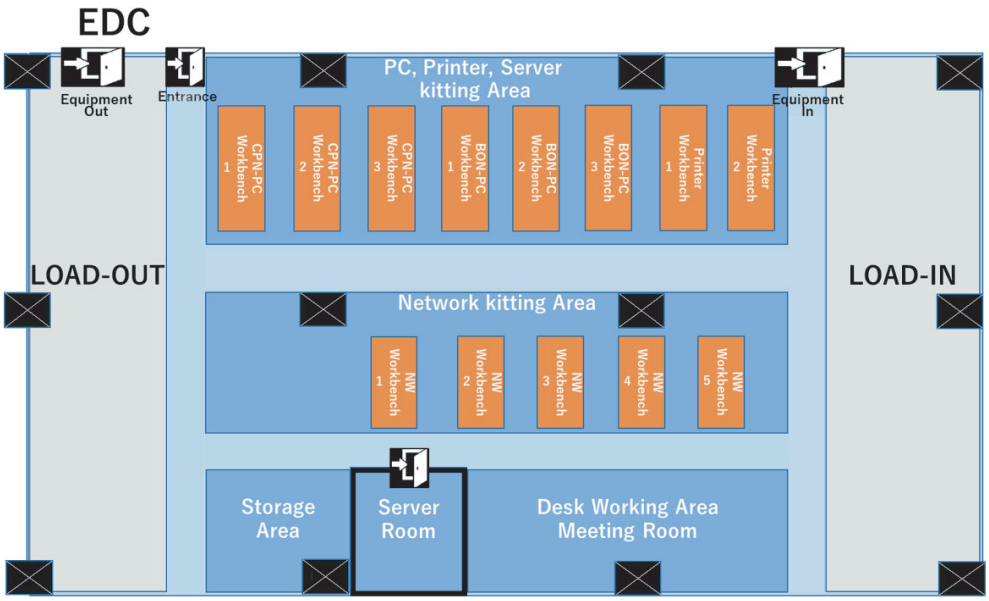

Figure 2 Floor Layout in EDC

Figure 4　PC Deployment Workbench

inventory of the MDC for assembly and setup at the EDC.

The central work area had six workbenches for PCs and two for printers and small MFPs at the top of the figure, a work area for large MFPs and five for network equipment in the middle. The lower section of the work area was allocated to office space, server space, etc.

2.2　PC Deployment System

In Tokyo 2020 Games, there were 12 types of PCs, mainly for the Competition Network (CPN) and 27 for the Back Office Network (BON). We used Microsoft System Center Configuration Manager (SCCM) as the tool for the deployment and production of these PCs. SCCM was also used to deploy the CPN PCs at the Rio 2016 Games. So, for the Tokyo 2020 Games, we started using SCCM in the early phase. This was effective in terms of increasing expertise in SCCM operation. We first implemented the system as a management system for the PC of the Organising Committee. Then we extended the system as a deployment tool. Specifically, we installed six servers to distribute and deploy PC settings, three each for BON and CPN, each of the six workbenches could deploy 36 PCs simultaneously (Figure 4). The distribution servers and the network hubs installed at each workbench are connected via SDN (Software Defined Network). Although the configuration is typically 1:1, CPN (3 workbenches)/BON (3 workbenches), the system was configured in the assignment ratio of workbenches that could be flexibly changed according to the daily production plan of CPN PCs and BON PCs.

The network of this PC deployment system is extended to major sites such as competition venues through a dedicated VLAN and expanded to enable deployment of a small number of PCs at each site in case of emergency.

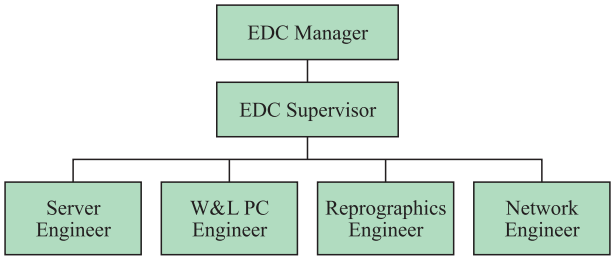

Figure 5　EDC Structure

Table 1　Roles of Each EDC Position

EDC Manager	Responsible for EDC as a whole Coordinates with EDC external parties (logistics team, VITM, etc.) Coordinates emergency EDR and approves production plans
EDC Supervisor	Assist EDC Manager Planning of production plan Receives EDRs, assigns and directs production work to each engineer, and handles incidents
Server Engineer	Responsible for production of server equipment
W&L PC Engineer	Responsible for production of Workstation/Laptop PCs
Reprographics Engineer	Responsible for production of printers and MFPs
Network Engineer	Responsible for production of network equipment

2.3　EDC Structure

EDC structure (Figure 5) and the primary roles of each position (Table 1) are described below.

EDC Manager and EDC Supervisor were assigned to two people for shift work. A total of up to 20 engineers were engaged in production and responsible for setting up the actual equipment.

3.　EDC Operation

3.1　Launch of EDC

EDC construction started in time for the shipment of equipment for a test event held in the summer of 2019. However, due to delays in preparing the MDC where the EDC is to be housed, the existing office floor (approximately 250 m^2) within the MDC was initially used as a temporary EDC, and the equipment for the test event was shipped in May 2019. Subsequently, after complet-

ing construction of the permanent EDC, production equipment and other facilities were moved to the location shown on the MDC floor (Figure 1) at the end of December 2019, and production at this EDC began for shipments in 2020.

3.2 Preparation of PC Master Image for Finish Product

Although we reduced the number of PC hardware platforms for the Tokyo 2020 Games to four main models, 49 master images of equipment configuration and setting specifications were defined as the final PC Finish Product (FP). Furthermore, due to the postponement of the Games for one year in March 2020 because of the coronavirus disease 2019 (COVID-19) outbreak, the support period of OS used for the prepared FPs expired, and we had to recreate the PC master images with the upgraded OS version. In both original and recreated, the staff in charge of each Finish Product PC weren't familiar with the method of duplicate deployment, and they took the work to create the PC master image longer than planned. But, EDC shipped each device with keeping the first delivery date requested by the venue.

3.3 Equipment Deployment Request Process

To deploy PCs and other equipment at competition venues and facilities, the Venue Information Technology Manager (VITM), in charge of IT management and equipment installation at the venue, first issues an Equipment Deployment Request (EDR) based on the TEAP. VITM must issue EDR to the equipment management system at least four weeks before the required delivery date at the venue for test events and eight weeks for the Games period.

VITM must share information about the EDR with the Venue Logistic Manager (VLM) of the venue and have the VLM issue an equipment logistics request for the logistics system from EDC to the venue.

The Venue Technology Implementation Duty Manager (Imp. DM) in the Technology Operation Centre checks the EDR issued for consistency with TEAP, availability of parts stock, delivery date, etc., and then sends the EDR as status approved to EDC. The confusion at EDC is avoided with the collection of EDRs from multiple venues by the Imp. DM and sent to EDC after checking and considering parts availability, priority, etc., by the Imp. DM.

Upon receipt of the EDRs, EDC reflects the EDRs in its production plan, produces the equipment according to the delivery date, and delivers the equipment with the EDRs and logistics requests mentioned above to the logistics warehouse team and delivery team in MDC.

In Tokyo 2020 Games, there were two systems, the equipment management system and the logistics system. EDC, VITM and logistics staff had to operate both systems ; Tokyo 2020 Games combined the EDR number and logistics request number manually by VITM and VLM. However, it would be better to have both systems automatically link EDR numbers and logistics request numbers to each other to avoid errors in linking. But, while the equipment management system will be used across multiple Games, the logistics system will change from one host city to another, so a challenge is how to design the interface of the two systems.

3.4 Key Points of EDC Operation

3.4.1 Production Planning and Refinement

As described in Section 4, the number of devices produced by EDC varies from month to month. This is mainly due to the non-uniform schedule of venue construction and the concentration of equipment deliveries during specific periods. The fluctuation in the number of devices produced leads to variations in man-hours, making it challenging to arrange the workforce. For the Tokyo 2020 Games, the venue construction schedule was constantly checked from the early stages, and initiatives were implemented to streamline the equipment production plan. This allowed optimizing allocation based on correct forecasts of the workforce plan.

3.4.2 Collaboration with the Logistics Team

From the initial stages of launching EDC for the Tokyo 2020 Games, we had multiple discussions for operational design with the logistics teams, including the warehouse team that stores the equipment and the delivery team that transports the equipment to the venue. As a result, we reduced the overall shipping lead time by optimizing the setup from parts dispatch to delivery of Finish Products. We also established a procedure for responding to emergency shipping requests from the venue in advance.

In addition, visualization of the production schedule for the most recent week, from the start of production to the completion of shipment, enabled close cooperation among relevant parties and prompt response to emergency shipments (Figure 6).

3.4.3 Business Continuity Plan (BCP) Preparation

Tokyo 2020 Games did not have a backup site of EDC. If a problem occurred at the EDC and production or shipment of equipment stopped, it would significantly impact preparations for the Games. Therefore, plans and work procedures were established in advance so that if a problem were to occur, equipment shipment could continue even though production capacity would be reduced. Specifically, we prepared a plan that would allow work to continue even if these problems occurred : NW failure, PC deployment system down, and equipment request system down. The business continuity plan was rehearsed in January 2020 to verify its accuracy.

3.5 Issues in PC Deployment Planning for the Tokyo 2020 Games

The number of people involved in the operation of the Olympic Games, including the Tokyo 2020 Games, increased rapidly a few months before the opening of the Games. On the other hand, during the Games period, work shifts were set, and each role was assigned to multiple staff members. Therefore, only about one-half of the total number of people involved in the operation of the Games will be working simultaneously during the Games, and having the same number of PCs as the number of staff was not necessary. Therefore, PCs have been allocated to each operation role and shared by multiple people to control the increase in the number of PCs (called this kind of PC "position PC").

On the other hand, the main PCs for the Tokyo 2020 Games were portable notebook PCs, and before the Games, one PC was given to each person involved. (It was also necessary to give a PC to each person for remote work as part of the measures for COVID-19.) It was necessary to transform the PC usage pattern from individual use before the Games to shared use during the Games. However, due to delays in Games preparation, the use of individual PCs was extended until the very last minute of the Games, and the number of PCs that had once increased to the number of staff members had to be reduced by the number required for position PCs. This resulted in a shortage of PCs and confusion in the field due to the replacement of position PCs.

The shortage of personal PCs before the Games was compensated for by renting the necessary number of PCs in a short period, but EDC also needed to produce additional PCs to meet the shortage. In recent years, as the use and dependence on PCs in business have become more common, the concept and operation of position PCs are no longer suited to the actual situation. In the future, it may be more appropriate to plan and operate one PC per person for the entire duration of the Games to

Figure 6 EDC Production Control Board

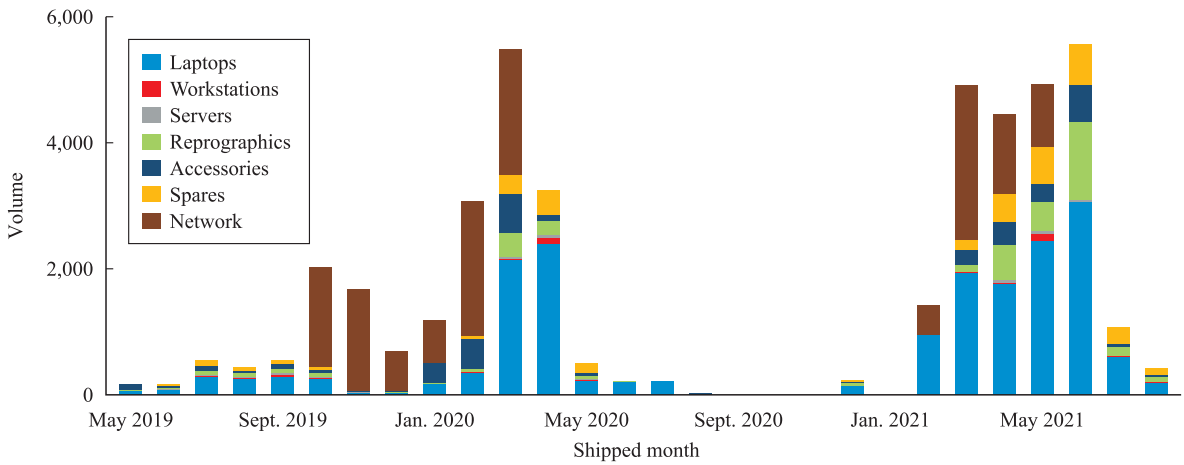

Figure 7 Number of Monthly Shipments by Equipment Type

eliminate wasteful work such as replacement work.

4. Statistical Information on Equipment Shipments for the Tokyo 2020 Games

Next, statistics on EDC equipment shipments for the Tokyo 2020 Games are shown below (Figure 7). A total of 2,100 EDRs were processed at the Tokyo 2020 Games, and a total of 43,076 units of IT equipment were produced and shipped. This quantity includes equipment shipped before the postponement of the Games in March 2020 and returned to EDC by the venues due to the postponement. Due to the postponement, no equipment was shipped from August 2020 to November 2020.

To exclude the impact of the Games postponement, we narrowed down the shipment period to December 2020 through August 2021. We found that 1,307 EDRs (Figure 8) were handled, with the main items being laptop PCs : 19,030 units, printer devices : 2,626 units, and network devices : 5,157 units. In total, 22,699 units of IT equipment were produced and shipped (Figure 9). Shipments peaked in June 2021 with 5,544 units shipped, followed by 4,927 units in May and 4,896 units in March, with 86% of total shipments concentrated in these four months from March to June.

Furthermore, 60% of all EDRs for Games complied with the rule that EDRs should be issued at least 8 weeks before the required delivery date at the venue. Of the 114 EDRs issued 7 days before the required delivery date, 75 EDRs were emergency shipments that took less than 2 days from issuance to arrival at the venue, and 67 of these EDRs were issued during the Games period (Figure 10).

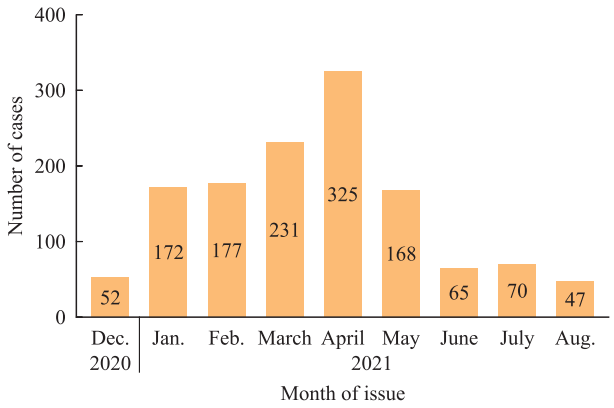

Figure 8 Number of EDRs Issued per Month

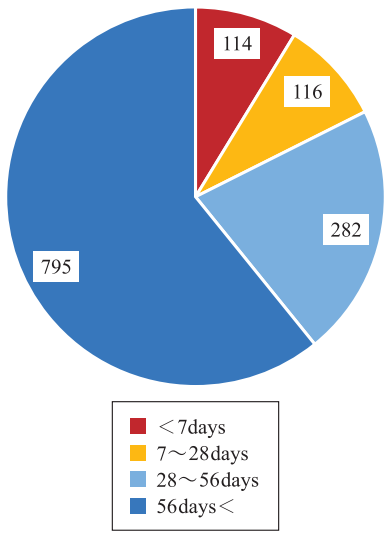

Figure 10 Distribution of Time from EDR Issue Date to Required Delivery Date at Venue

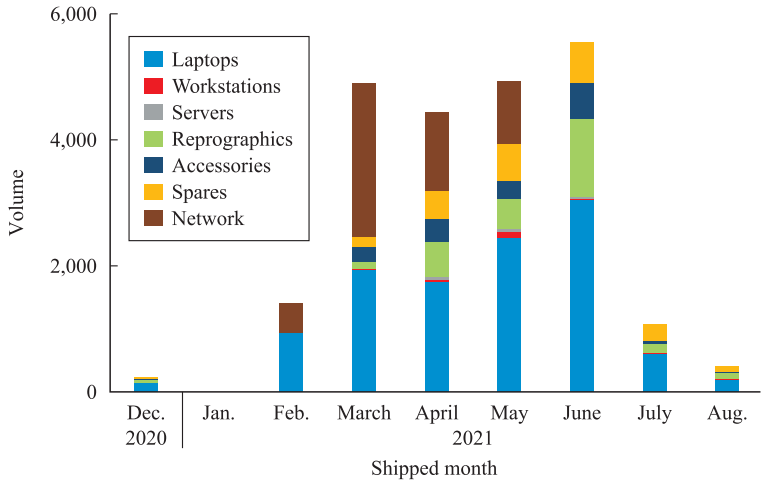

Figure 9 Number of Shipments by Month (December 2020–August 2021)

5. Conclusion

This was an overview of EDC, which played an important role in deploying IT equipment for the Tokyo 2020 Games. EDC met all shipping deadlines for the EDRs it received, including those for emergency response.

EDC produced 11,198 PCs and achieved high work quality. There were only 248 defective units with a defect rate of only 2.2%. Therefore EDC has made a significant contribution to the Tokyo 2020 Games.

(Received February 28, 2022 ; Revised March 16, 2022)

KAWATA Masahiko

KAWATA Masahiko graduated from Osaka City University in 1990 with a Bachelor's degree in Mechanical Engineering and has been a member of the Technology Services Bureau of the Tokyo Organising Committee of the Olympic and Paralympic Games since April 2015. He is currently with NEC Solution Innovator, Ltd. in the Smart Society Solutions Division.