Study of Usage Tendencies of the Remote Access Service

KANAI Akira HIROSE Masato

Abstract

Remote access environments support various ways of working. In the Olympic and Paralympic Games Tokyo 2020 (hereinafter referred to as "Tokyo 2020 Games"), most users used remote access daily after the new coronavirus pandemic. By analyzing these session logs, it is possible to understand attendance records and the operational status of the organization for use in operations. This article shows a calendar-style heat map of the logs, focusing on overall and individuals, and discusses the characteristics of remote access usage related to the stage of the event, the day of the week, and national holidays.

Keywords : Tokyo 2020 Games, Remote access, Trend analysis, Visualization

1. Introduction

Remote access provides various environments, and a location-independent work style is becoming realized. However, remote access environments are convenient and have the inherent risk of being at the border of intrusion, which should be monitored intensively in operations. In a large-scale event such as the Tokyo 2020 Games, the number of staff members and connection sources may rapidly increase or decrease depending on the preparation stage. It is hard to find anomalies mechanically by trend analysis.

In addition, the new coronavirus pandemic caused a significant increase in the number of remote access users. After the surge of the new coronavirus pandemic, most users routinely use remote access. We attempted to investigate remote access logs by group or by the individual to understand attendance records and the operation status of the organization for operational. This article describes two topics.

The data we analyzed covered approximately 20 months, from January 1, 2020, to September 14, 2021, and included 1,215,753 logs of successful remote access connections. The total number of users was 7,077, not including the logs of failed authentication attempts.

2. Usage Trends during the Tokyo 2020 Games

Figure 1 shows the number of remote access users per day, expressed in color depth. From left to right, the figures show the number of users for each day in 2020 and 2021, such as the calendar-like figure. From top to bottom, each row indicates the weeks of the year, and each column indicates the days of the week. The leftmost cell indicates Sunday, and the rightmost cell indicates Saturday. Each cell represents the number of users on a corresponding day as a color depth. In the figure, white is zero, and the darkest red indicates 3,529 users. The calendar-like display is adequate to visualize usage trends by day of the week, such as many staff members do not work on Saturdays, Sundays, or national holidays. The following are the trends provided by this chart.

KANAI Akira
Innovation Center, NTT Communications Corporation
HIROSE Masato
Innovation Center, NTT Communications Corporation
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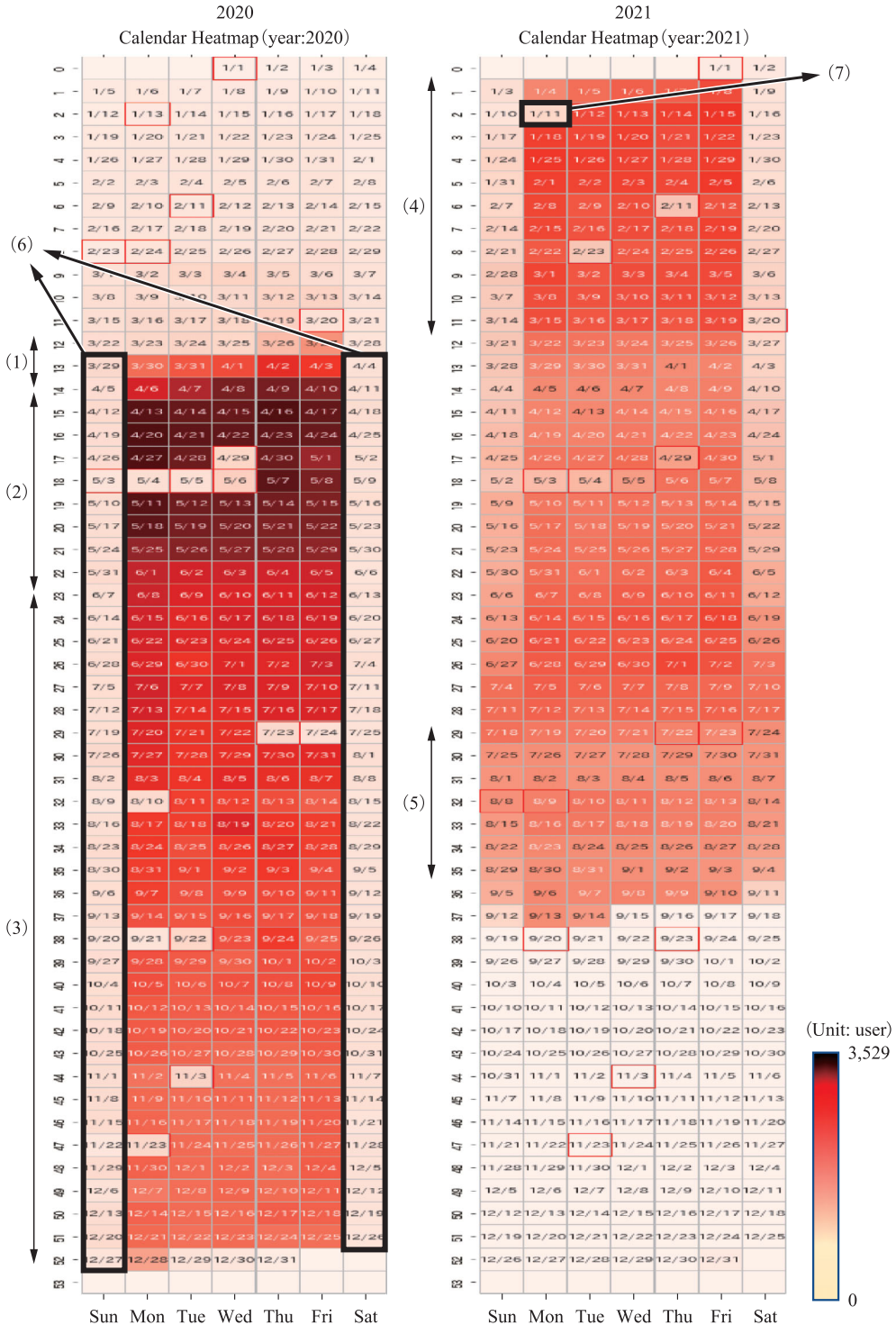

Figure 1　Number of Users per Day

（1） Until March 2020, the number of users was about 200 users/day. It always exceeded 2,000 users/day from the end of the same month.

（2） On April 28, 2020, the maximum number of users was 3,529 users/day. The number of users exceeded 3,000 users/day on weekdays in May 2020 and gradually decreased to about 2,500 users/day in June 2020.

（3） The decreasing trend continued.

（4） In January 2021, the number of accesses increased again to about 2,200 users/day and continued until March 2021. It gradually decreased to about 1,400 users/day from March 22, 2021.

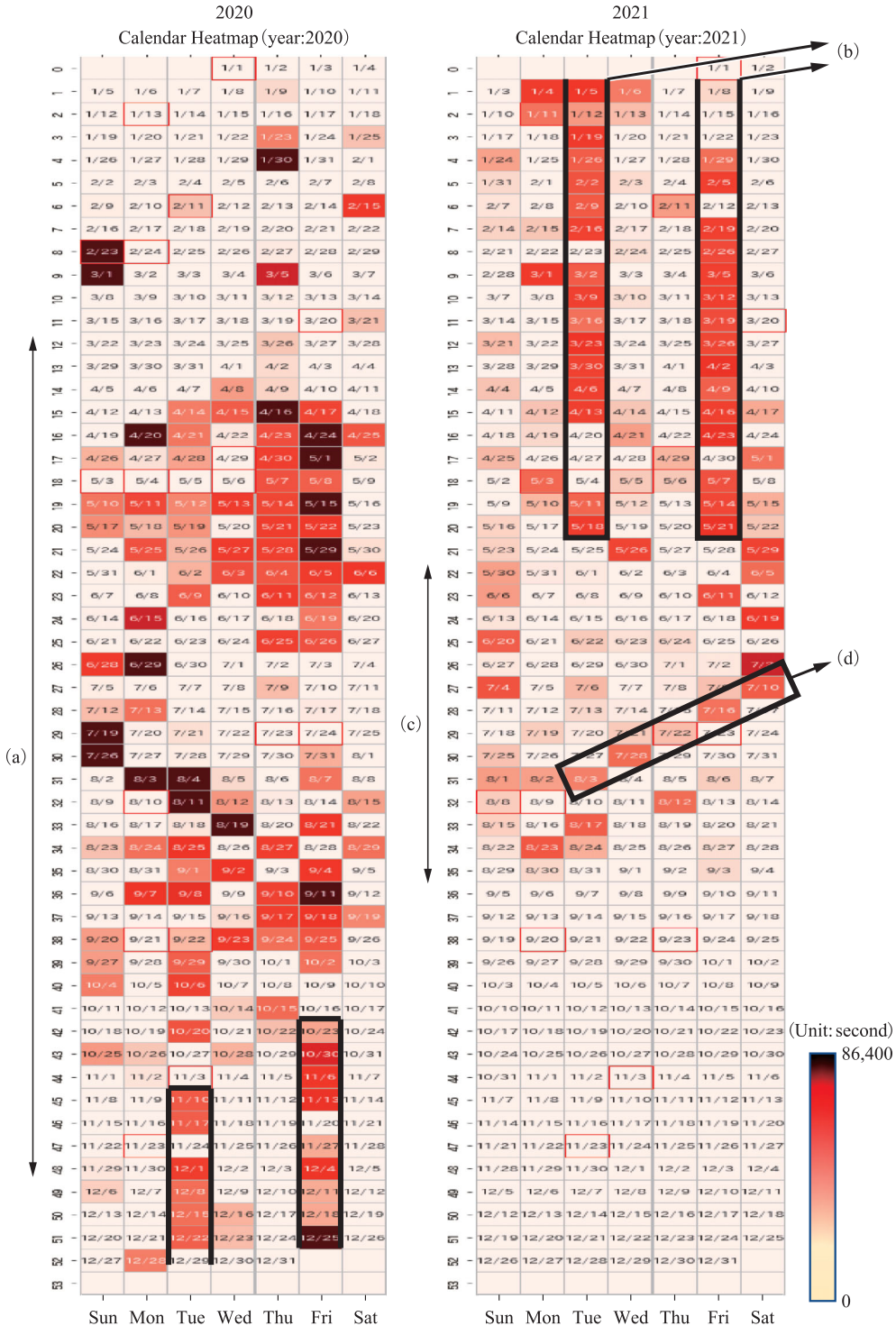

Figure 2　Total Daily Connection Time of Staff Member (A)

(5)　Around July 20, 2021, the number of users decreased to about 1,200 users/day.

(6)　The color depth at both ends of each column is light except during the Tokyo 2020 Games period.

(7)　The number of users is about the same every day from Monday to Friday of the same week throughout the entire period. Nevertheless, there are occasional days when the number of users is low. For example, on January 11, 2021 (second row from the top, second cell from the left), the number of users was about 200 users/day, about 90% less than the 2,000 users/day for the previous Friday and following Monday.

3. Overall Usage Trend's Consideration and Individual Usage Trends

We think the reasons for each of these events shown in Section 2 are due to the following factors.

(1) On April 7, 2020, the government declared a state of emergency for Tokyo and encouraged employees to work at home.
(2) On May 28, 2020, the government lifted a state of emergency for Tokyo.
(3) On January 8, 2021, the government declared a state of emergency for Tokyo.
(4) On March 21, 2021, the government lifted a state of emergency for Tokyo. Then the number of staff members involved in preparations for the Tokyo 2020 Games increased from April 2021.
(5) In July 2021, the opening ceremony was held, and many staff members mainly gathered in the office during the Tokyo 2020 Games.
(6) Few staff members work because it is Saturdays or Sundays.
(7) Few staff members work because it is a national holiday.

This calendar-style figure can easily explain the events (6) and (7) caused by days of the week and national holidays. This method also effectively analyzes individual and group logs to clarify the organization's attendance record and operation status. Figure 2 shows the daily remote work time for a specific staff member (A) as a sample of focusing on an individual. He had belonged to the operation team. (A) was an administrator who organized the group and sometimes used remote access on weekends due to his duties.

Figure 2 differs from Figure 1. Each cell represents (A)'s total daily connection time as color depth. The white on the cell figure is a 0-second connection, and the darkest red indicates a 24-hour connection. The trends provided by Figure 2 are following.

(a) Until March 2020, the frequency of access had been about 4 times/month and then increased to 15 times/month in April 2020.
(b) From September 2020, darker colors had observed on Tuesdays (3rd cell from the left) and Fridays (6th cell from the left) than on other days of the week. This trend continued until May 2021.
(c) From June 2021, trend (b) disappeared.
(d) From July 10, 2021, dark red was observed every 6 days.

We interviewed (A) about the reasons for these trends. The summary of the interview is as follows.

(a) (A) started working from home in preparation for the declaration of a state of emergency.
(b) (A) made a weekly work schedule for each section under his management and designated Tuesdays and Fridays as remote work days to avoid being caught in proximity.
(c) From June 2021, (A) started tasks that required him to go to the office every day in preparation for the Tokyo 2020 Games (reducing his working from home opportunities).
(d) From July 10, 2021, (A) began a six-day work cycle that includes four consecutive days of office work. (A) used remote access for a long period on the day before his office workday to assess the situation.

The analysis for remote access focused on individuals shows similar characteristics to the overall trend. It also shows changes in the work from home cycle according to the setting of remote work days and the event phase for each individual.

4. Conclusion

IT infrastructures are being used more and more closely in our daily lives after the surge of the new coronavirus pandemic. This article presented remote access session logs in a calendar-style heat map for overall and individuals. Furthermore, we also showed and explained the characteristics and considerations related to event phases, days of the week, and holidays. This method can also investigate the characteristics of each group by focusing on attributes such as teams. We believe that in the future, in addition to commonly used monitoring methods that combine multiple products, it will be essential to use information that analyzes organizational objectives and staff utilization information.

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KANAI Akira

Akira Kanai got a Master of Media and Governance, Keio University in 2009. He joined NTT Communications Corporation in the same year. He has been engaged in developing and operating services related to IX and IP network. CISSP, CISA, CISM, Professional Engineer (Information Engineering).

HIROSE Masato

Masato Hirose completed his master's degree at School of Information Science and Technology, Japan Advanced Institute of Science and Technology (JAIST) in 2017. He joined NTT Communications Corporation in the same year. Since then, he has been engaged in research and development of Internet technologies and services.