US 20130227049A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0227049 A1

(43) Pub. Date: Aug. 29, 2013

UENO et al.

(54) **DISTRIBUTED CACHE SYSTEM**

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(21) Appl. No.: **13/719,401**

(22) Filed: **Dec. 19, 2012**

(30) **Foreign Application Priority Data**

Feb. 29, 2012 (JP) 2012-044716

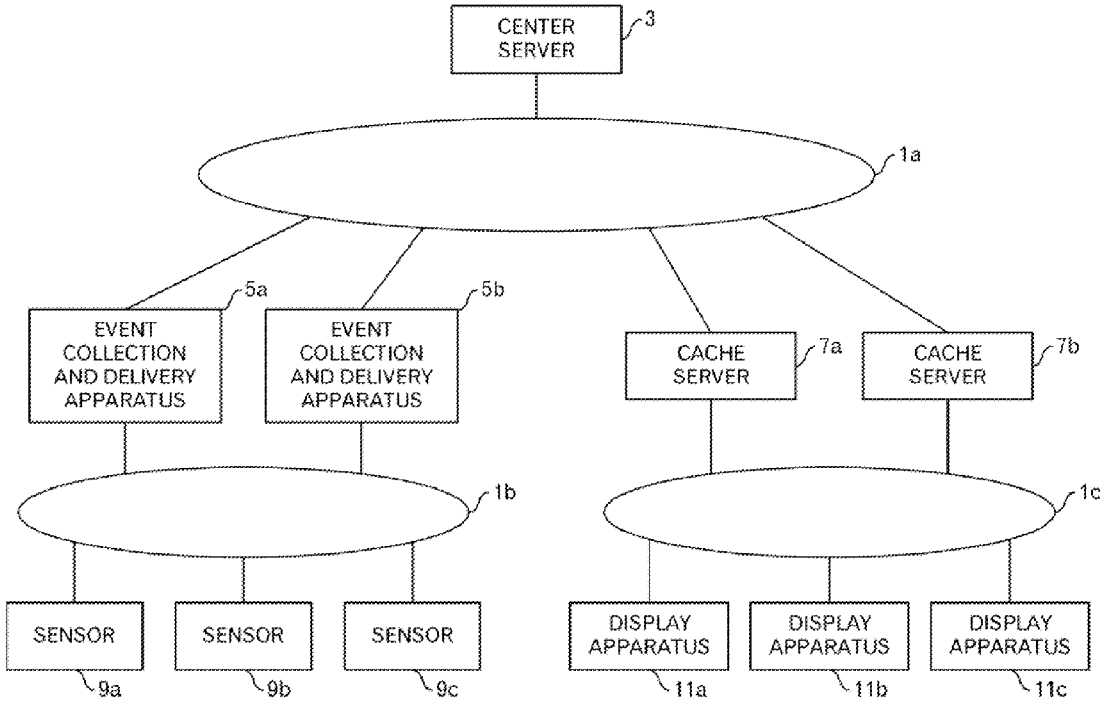
Publication Classification

(51) **Int. Cl.**
G06F 15/167 (2006.01)

(52) **U.S. Cl.**
CPC *G06F 15/167* (2013.01)
USPC **709/213**

(57) **ABSTRACT**

A disclosed system includes a first computer that stores data, a display apparatus that is capable of reading a user identifier, a second computer, and plural third computers. The second computer includes a data storage unit storing first correlation data to correlate a user identifier with at least one third computer, and a controller that refers to the first correlation data upon detecting an event data, identifies a third computer correlated with a first user identifier included in the event data, and transmits the first user identifier to the identified third computer. Each third computer includes a receiver that receives the first user identifier, a storing unit that obtains from the first computer, and stores data identified based on the received first user identifier, and a controller to transmit data corresponding to a second user identifier, which was received from the display apparatus, based on the second user identifier.



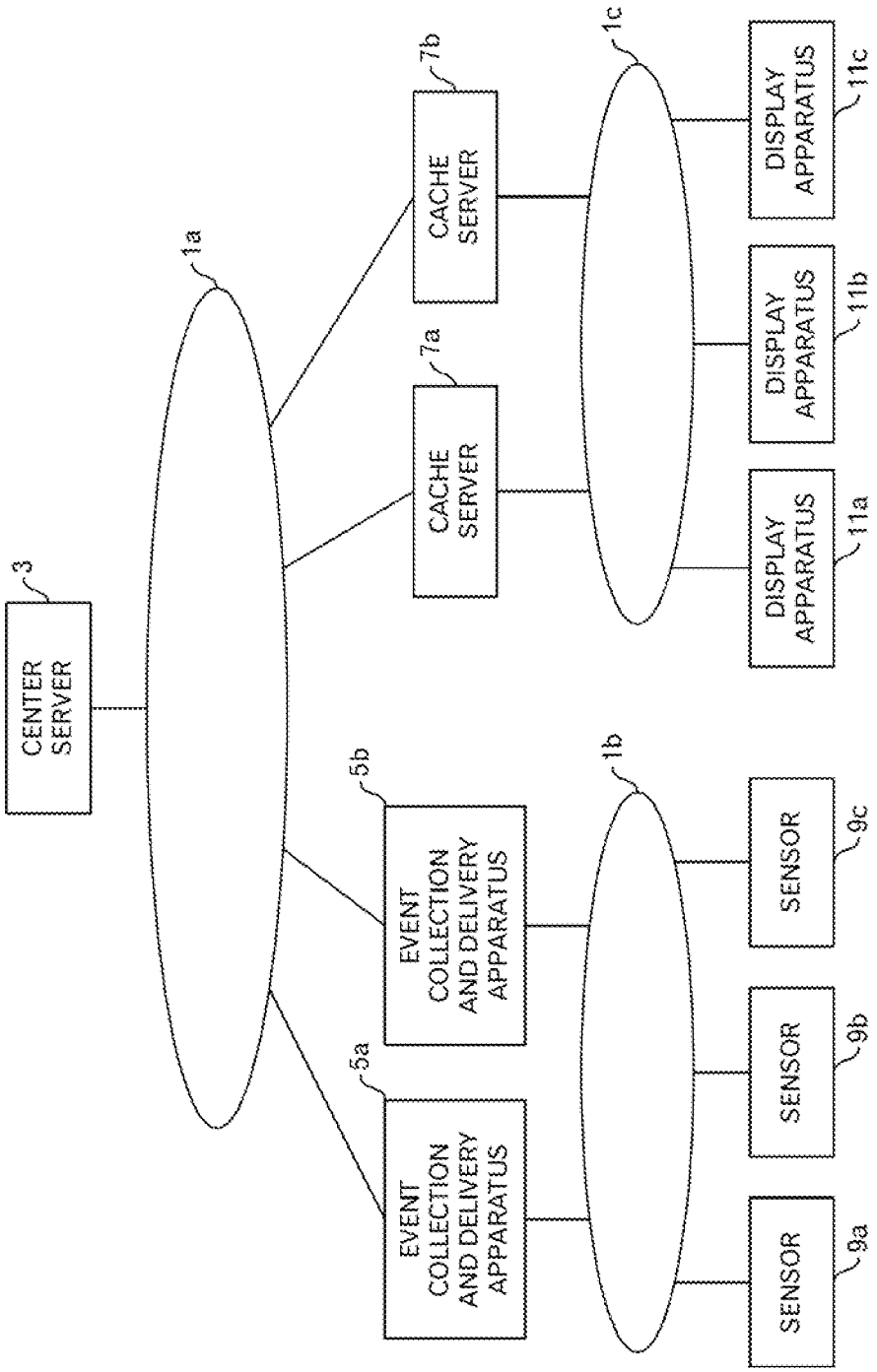

CENTER SERVER
3
1a
CACHE SERVER
7b
CACHE SERVER
7a
1c
DISPLAY APPARATUS
11c
DISPLAY APPARATUS
11b
DISPLAY APPARATUS
11a
EVENT COLLECTION AND DELIVERY APPARATUS
5b
EVENT COLLECTION AND DELIVERY APPARATUS
5a
1b
SENSOR
9c
SENSOR
9b
SENSOR
9a

FIG.1

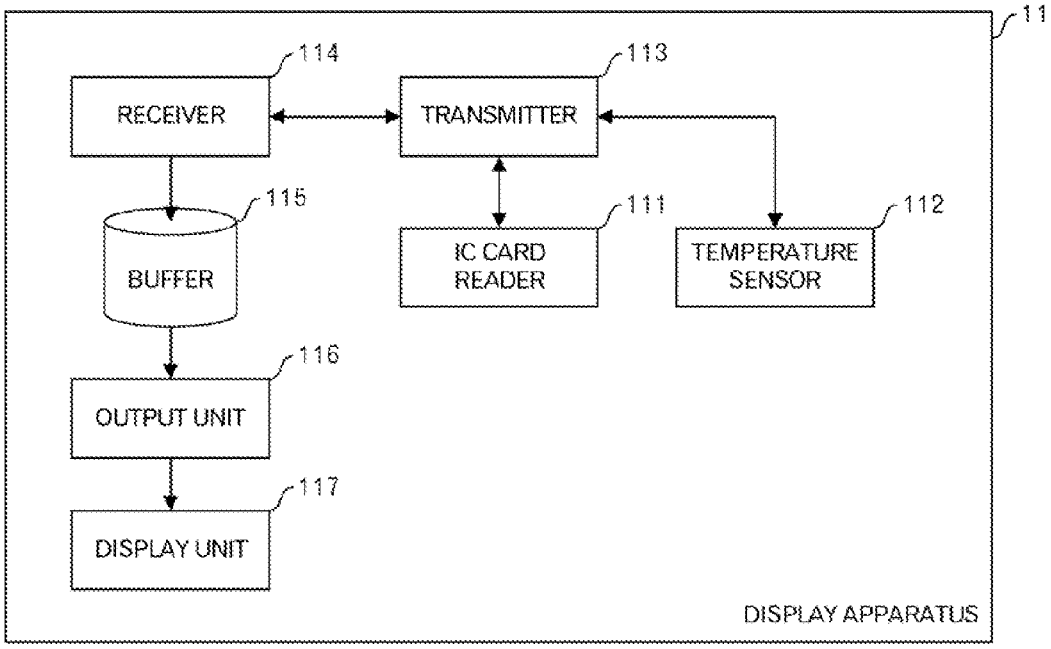

11
114
RECEIVER
113
TRANSMITTER
115
BUFFER
111
IC CARD READER
112
TEMPERATURE SENSOR
116
OUTPUT UNIT
117
DISPLAY UNIT
DISPLAY APPARATUS

FIG.2

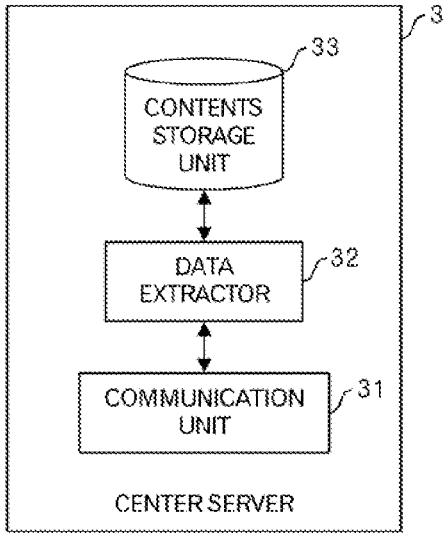

3
33
CONTENTS STORAGE UNIT
DATA EXTRACTOR
32
COMMUNICATION UNIT
31
CENTER SERVER

FIG.3

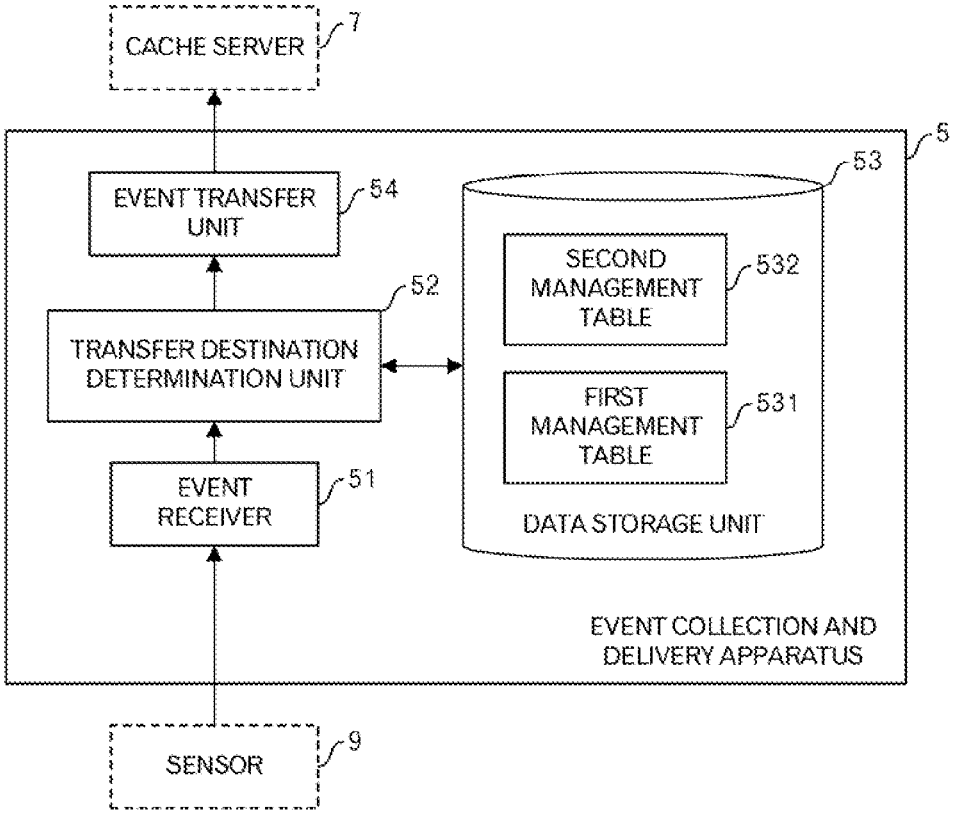


FIG.4

USER ID	DISPLAY APPARATUS ID
u123	d100
⋮	⋮

FIG.5

DISPLAY APPARATUS ID	CS ADDRESS
d100	10.25.25.10
⋮	⋮

FIG.6

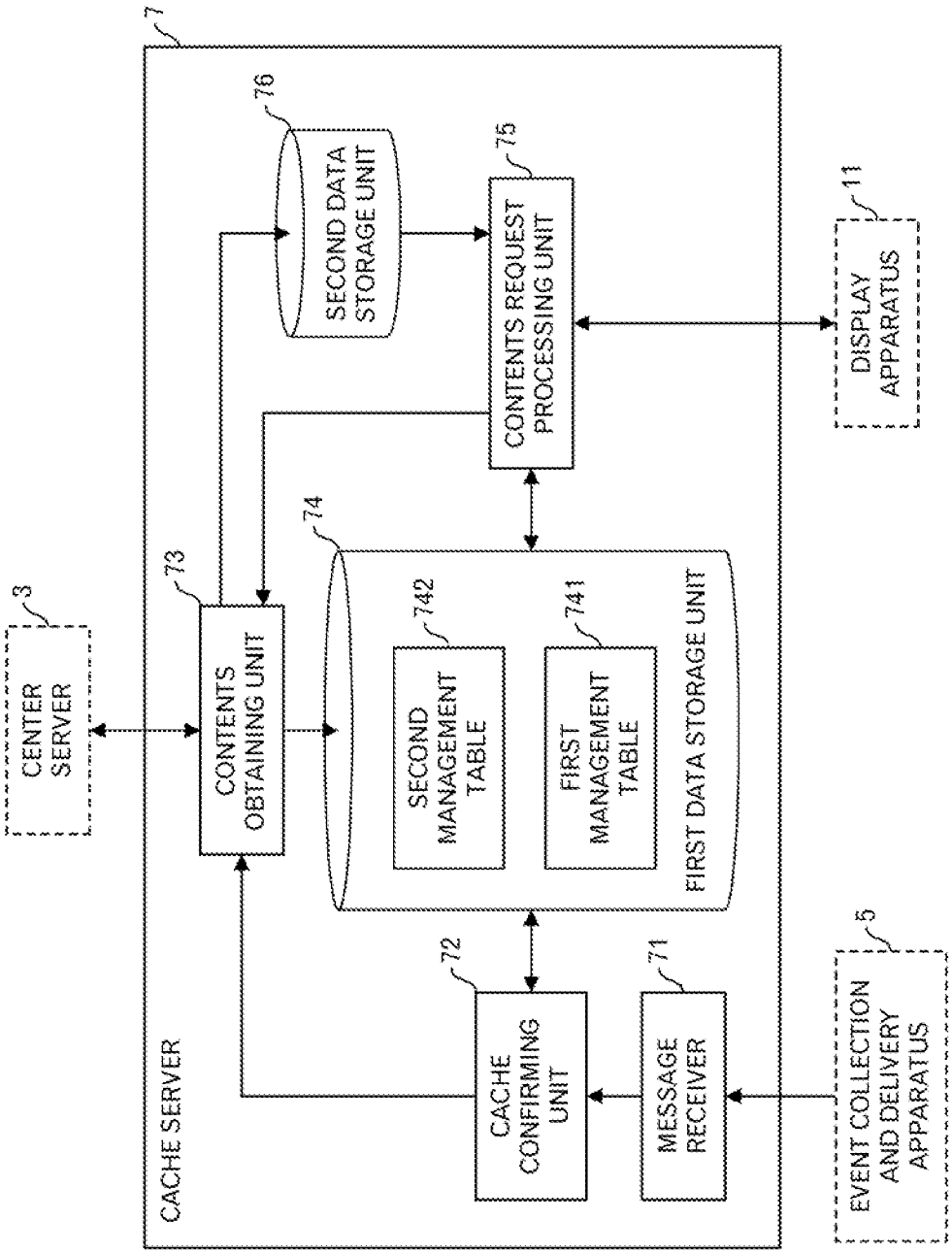

7
CACHE SERVER
76
SECOND DATA STORAGE UNIT
75
CONTENTS REQUEST PROCESSING UNIT
11
DISPLAY APPARATUS
74
FIRST DATA STORAGE UNIT
742
SECOND MANAGEMENT TABLE
741
FIRST MANAGEMENT TABLE
73
CONTENTS OBTAINING UNIT
3
CENTER SERVER
72
CACHE CONFIRMING UNIT
71
MESSAGE RECEIVER
5
EVENT COLLECTION AND DELIVERY APPARATUS

FIG.7

USER ID	CONTENTS ID
u123	c20
⋮	⋮

FIG.8

CONTENTS ID	CONDITION	STORAGE DESTINATION	USER ID OF USER WHO LASTLY USED	DATE OF LAST UTILIZATION
c20	Temp<10	d:¥a1.mpg	u123	10:10
	Temp≧10	d:¥a2.mpg		
⋮	⋮	⋮	⋮	⋮

FIG.9

PARAMETER NAME	VALUE
ERROR PROCESSING FLAG	All (OR Zero)

FIG.11

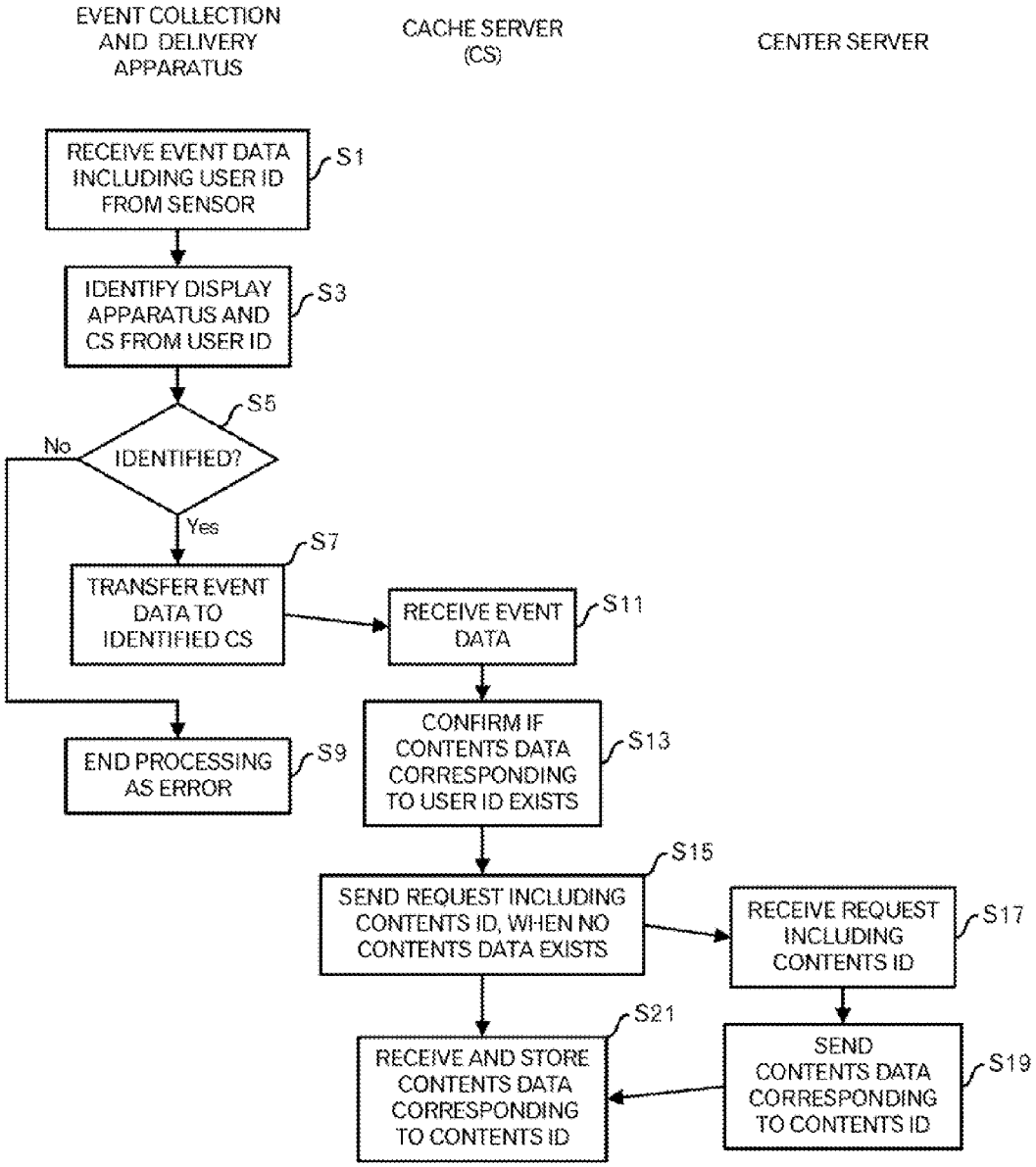

EVENT COLLECTION AND DELIVERY APPARATUS
CACHE SERVER (CS)
CENTER SERVER
RECEIVE EVENT DATA INCLUDING USER ID FROM SENSOR
S1
IDENTIFY DISPLAY APPARATUS AND CS FROM USER ID
S3
S5
IDENTIFIED?
No
Yes
TRANSFER EVENT DATA TO IDENTIFIED CS
S7
RECEIVE EVENT DATA
S11
END PROCESSING AS ERROR
S9
CONFIRM IF CONTENTS DATA CORRESPONDING TO USER ID EXISTS
S13
SEND REQUEST INCLUDING CONTENTS ID, WHEN NO CONTENTS DATA EXISTS
S15
RECEIVE REQUEST INCLUDING CONTENTS ID
S17
SEND CONTENTS DATA CORRESPONDING TO CONTENTS ID
S19
RECEIVE AND STORE CONTENTS DATA CORRESPONDING TO CONTENTS ID
S21

FIG.10

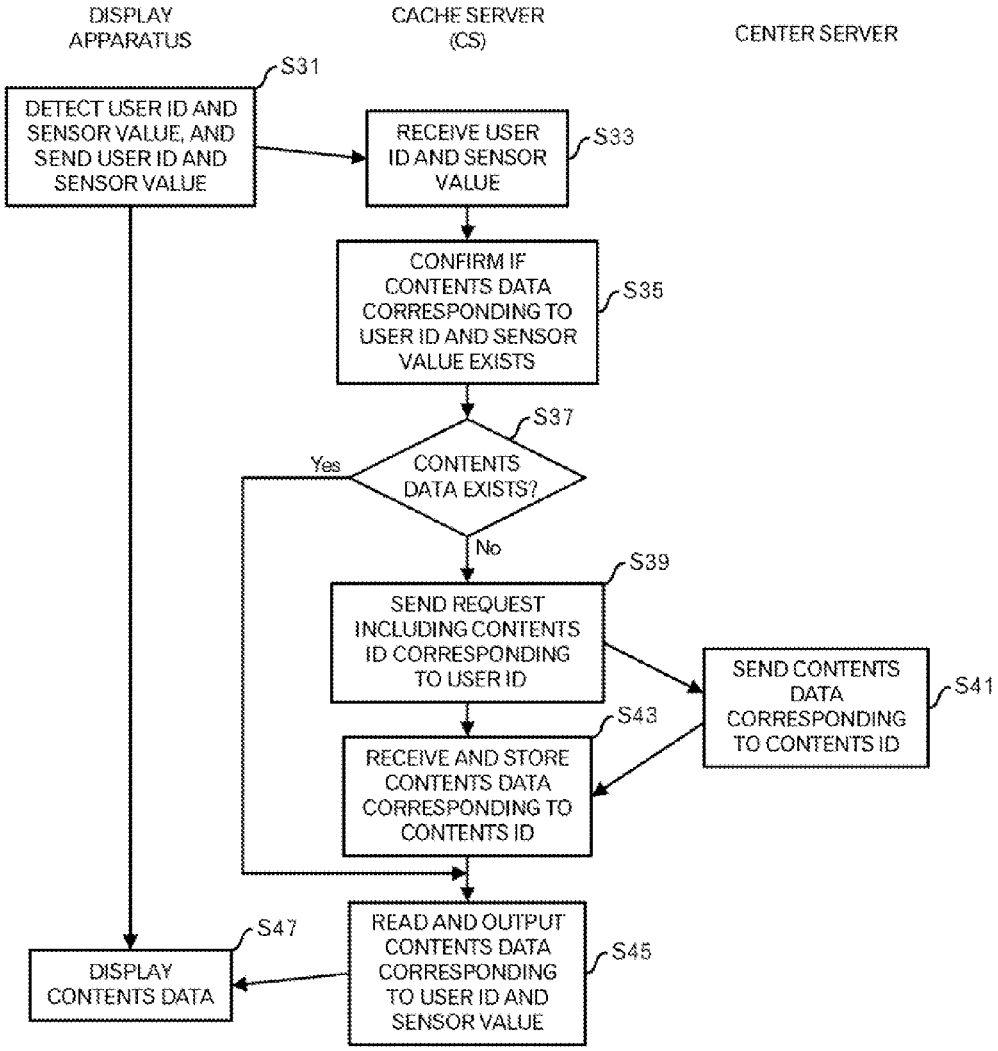

DISPLAY APPARATUS
CACHE SERVER (CS)
CENTER SERVER
S31
DETECT USER ID AND SENSOR VALUE, AND SEND USER ID AND SENSOR VALUE
RECEIVE USER ID AND SENSOR VALUE
S33
CONFIRM IF CONTENTS DATA CORRESPONDING TO USER ID AND SENSOR VALUE EXISTS
S35
S37
CONTENTS DATA EXISTS?
Yes
No
S39
SEND REQUEST INCLUDING CONTENTS ID CORRESPONDING TO USER ID
SEND CONTENTS DATA CORRESPONDING TO CONTENTS ID
S41
S43
RECEIVE AND STORE CONTENTS DATA CORRESPONDING TO CONTENTS ID
READ AND OUTPUT CONTENTS DATA CORRESPONDING TO USER ID AND SENSOR VALUE
S45
S47
DISPLAY CONTENTS DATA

FIG.12

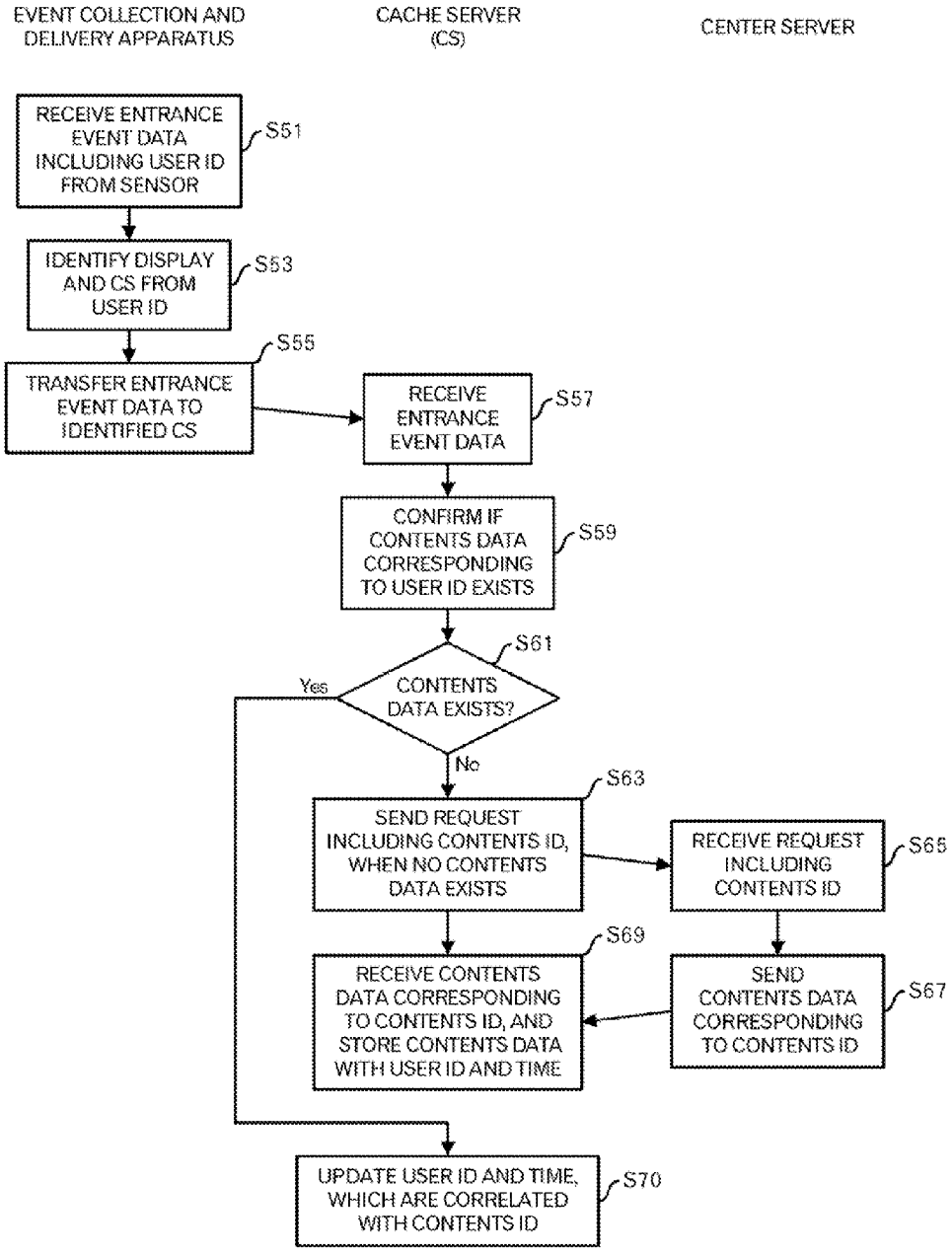

EVENT COLLECTION AND DELIVERY APPARATUS
CACHE SERVER (CS)
CENTER SERVER
RECEIVE ENTRANCE EVENT DATA INCLUDING USER ID FROM SENSOR
S51
IDENTIFY DISPLAY AND CS FROM USER ID
S53
TRANSFER ENTRANCE EVENT DATA TO IDENTIFIED CS
S55
RECEIVE ENTRANCE EVENT DATA
S57
CONFIRM IF CONTENTS DATA CORRESPONDING TO USER ID EXISTS
S59
CONTENTS DATA EXISTS?
S61
Yes
No
SEND REQUEST INCLUDING CONTENTS ID, WHEN NO CONTENTS DATA EXISTS
S63
RECEIVE REQUEST INCLUDING CONTENTS ID
S65
RECEIVE CONTENTS DATA CORRESPONDING TO CONTENTS ID, AND STORE CONTENTS DATA WITH USER ID AND TIME
S69
SEND CONTENTS DATA CORRESPONDING TO CONTENTS ID
S67
UPDATE USER ID AND TIME, WHICH ARE CORRELATED WITH CONTENTS ID
S70

FIG.13

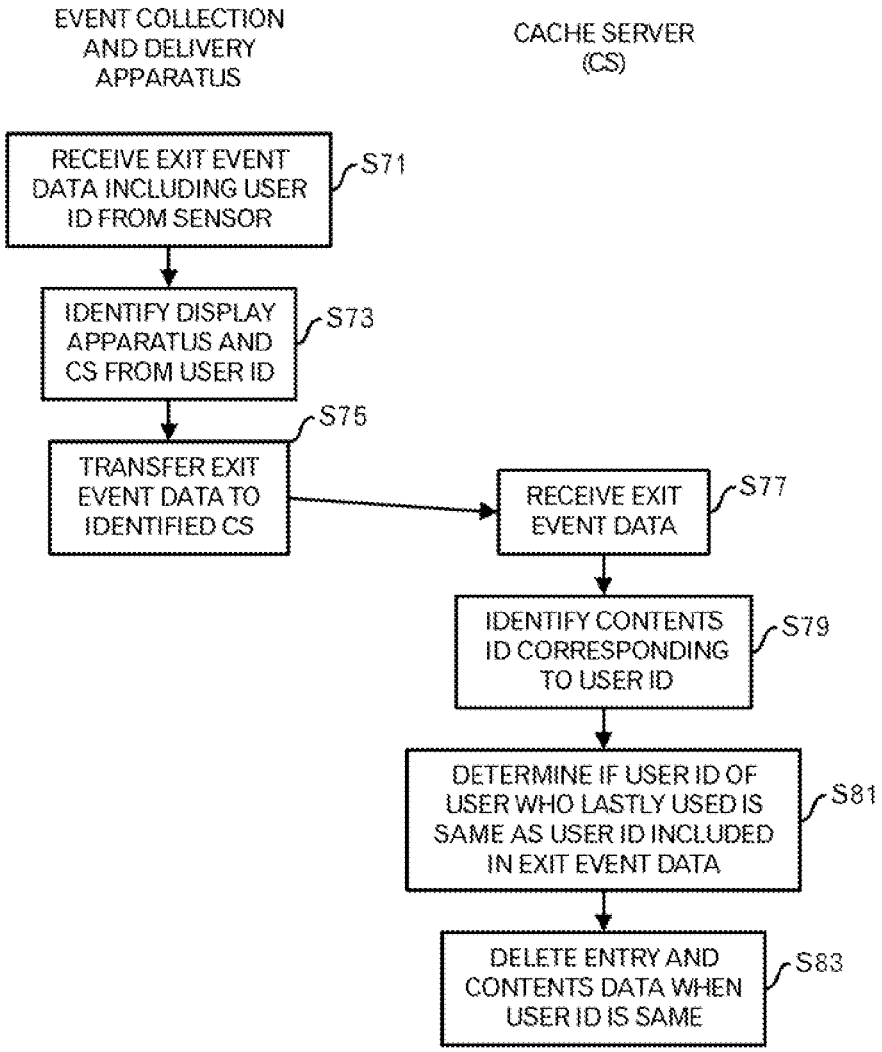


FIG.14

USER ID	CONTENTS ID
u123	c20
u222	c20
u333	c20
⋮	⋮

FIG.17

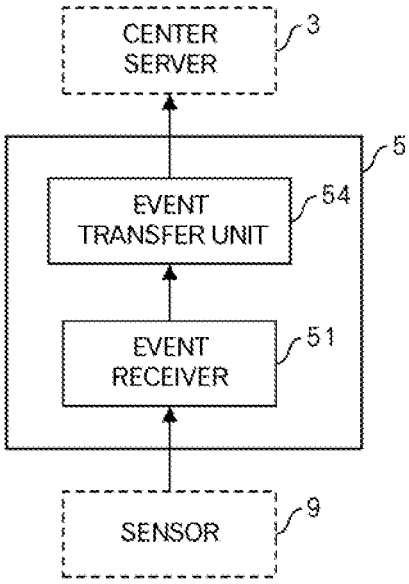


FIG.15

CONTENTS ID	USER ID
c20	u123
c20	u222
c20	u333
⋮	⋮

FIG.18

USER ID	DISPLAY APPARATUS ID
u123	d100
u222	d101
u333	d201
⋮	⋮

FIG.19

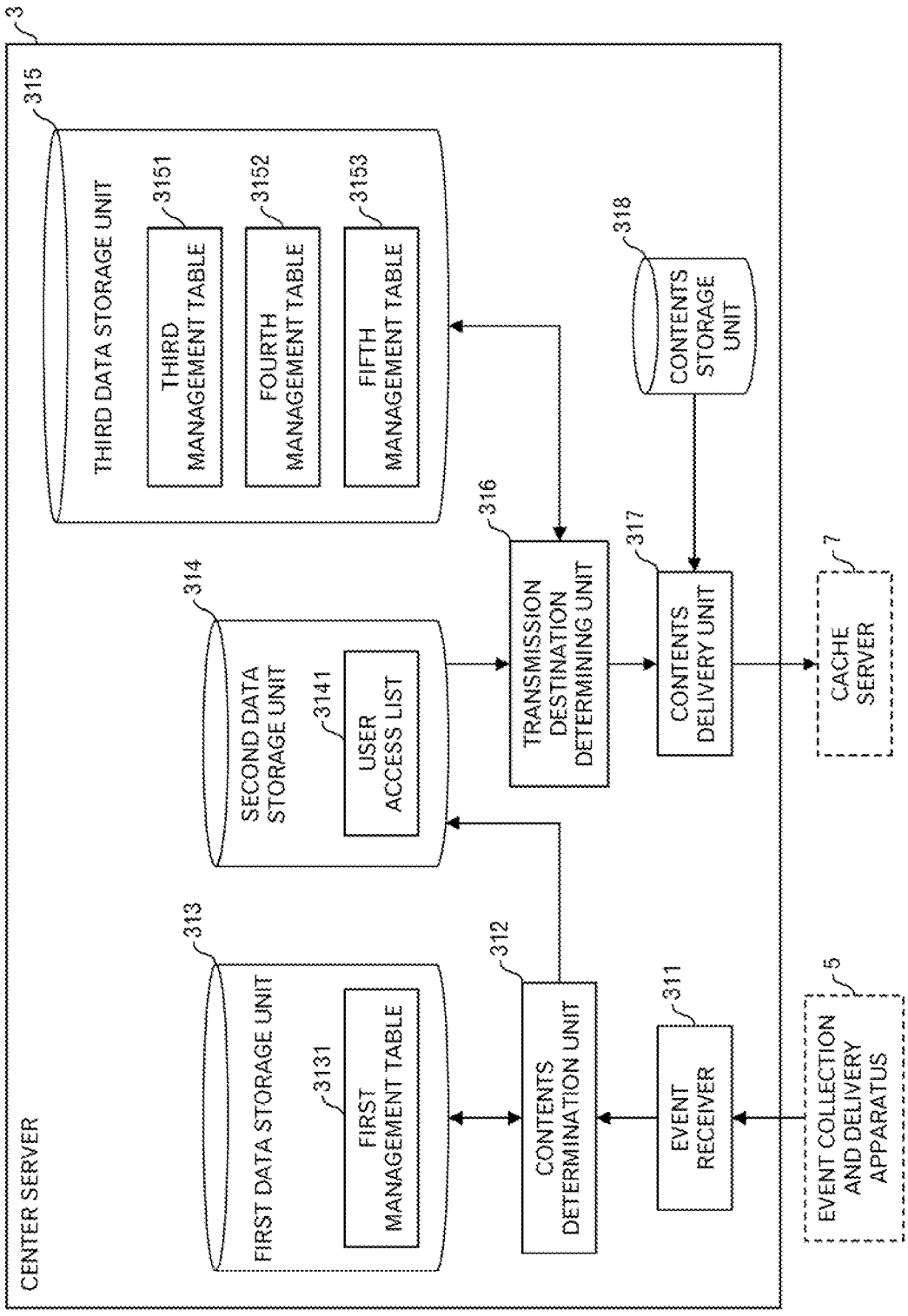

3
CENTER SERVER
315
THIRD DATA STORAGE UNIT
3151
THIRD MANAGEMENT TABLE
3152
FOURTH MANAGEMENT TABLE
3153
FIFTH MANAGEMENT TABLE
318
CONTENTS STORAGE UNIT
316
TRANSMISSION DESTINATION DETERMINING UNIT
317
CONTENTS DELIVERY UNIT
7
CACHE SERVER
314
SECOND DATA STORAGE UNIT
3141
USER ACCESS LIST
313
FIRST DATA STORAGE UNIT
3131
FIRST MANAGEMENT TABLE
312
CONTENTS DETERMINATION UNIT
311
EVENT RECEIVER
5
EVENT COLLECTION AND DELIVERY APPARATUS

FIG.16

DISPLAY APPARATUS ID	CS ADDRESS	AVERAGE THROUGHPUT
d100	10.25.25.10	25M
d101	10.25.25.10	30M
d100	10.25.25.11	15M
d101	10.25.25.11	20M
d201	10.25.25.19	18M
⋮	⋮	⋮

FIG.20

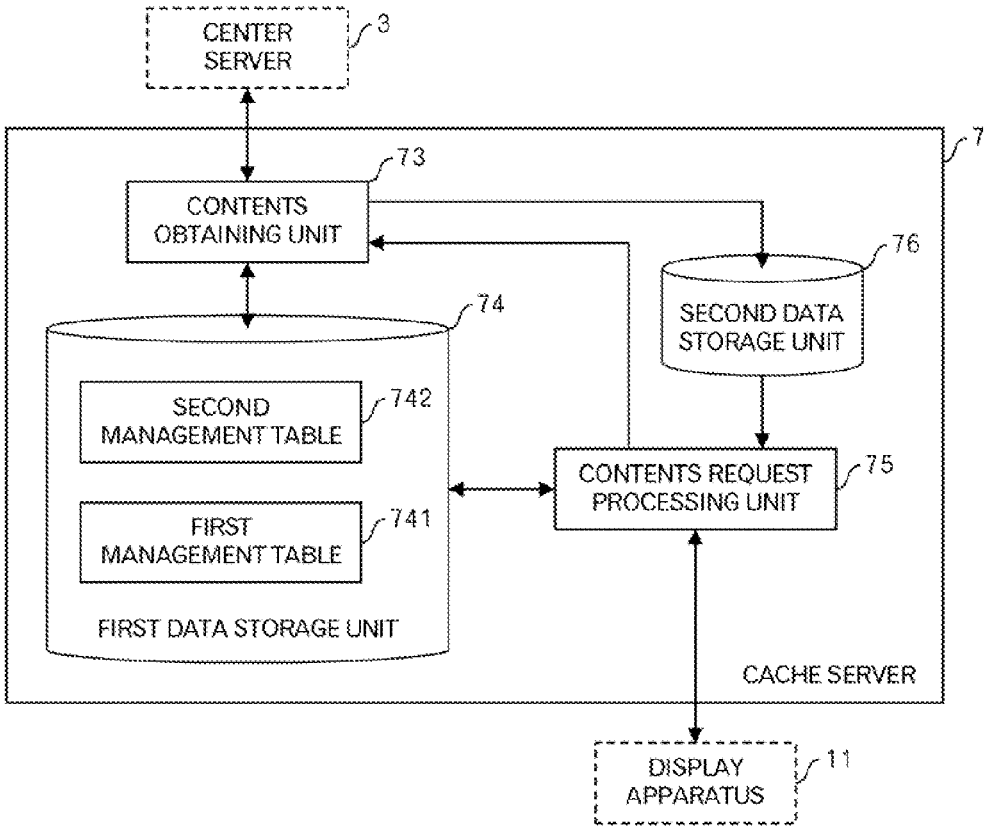


FIG.22

CONTENTS ID	CONDITION	STORAGE DESTINATION	SIZE
c20	Temp<10	d:¥a1.mpg	20M
	Temp≧10	d:¥a2.mpg	
⋮	⋮	⋮	⋮

FIG.21

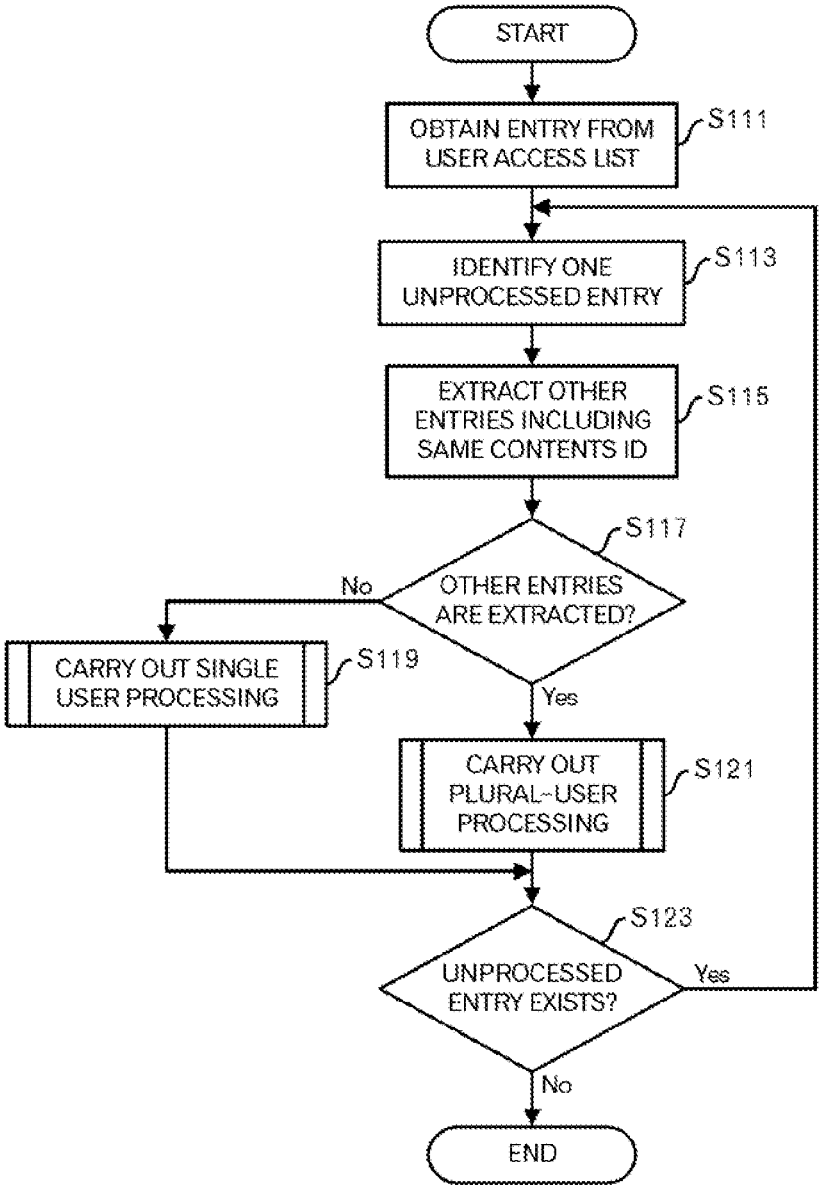


FIG.24

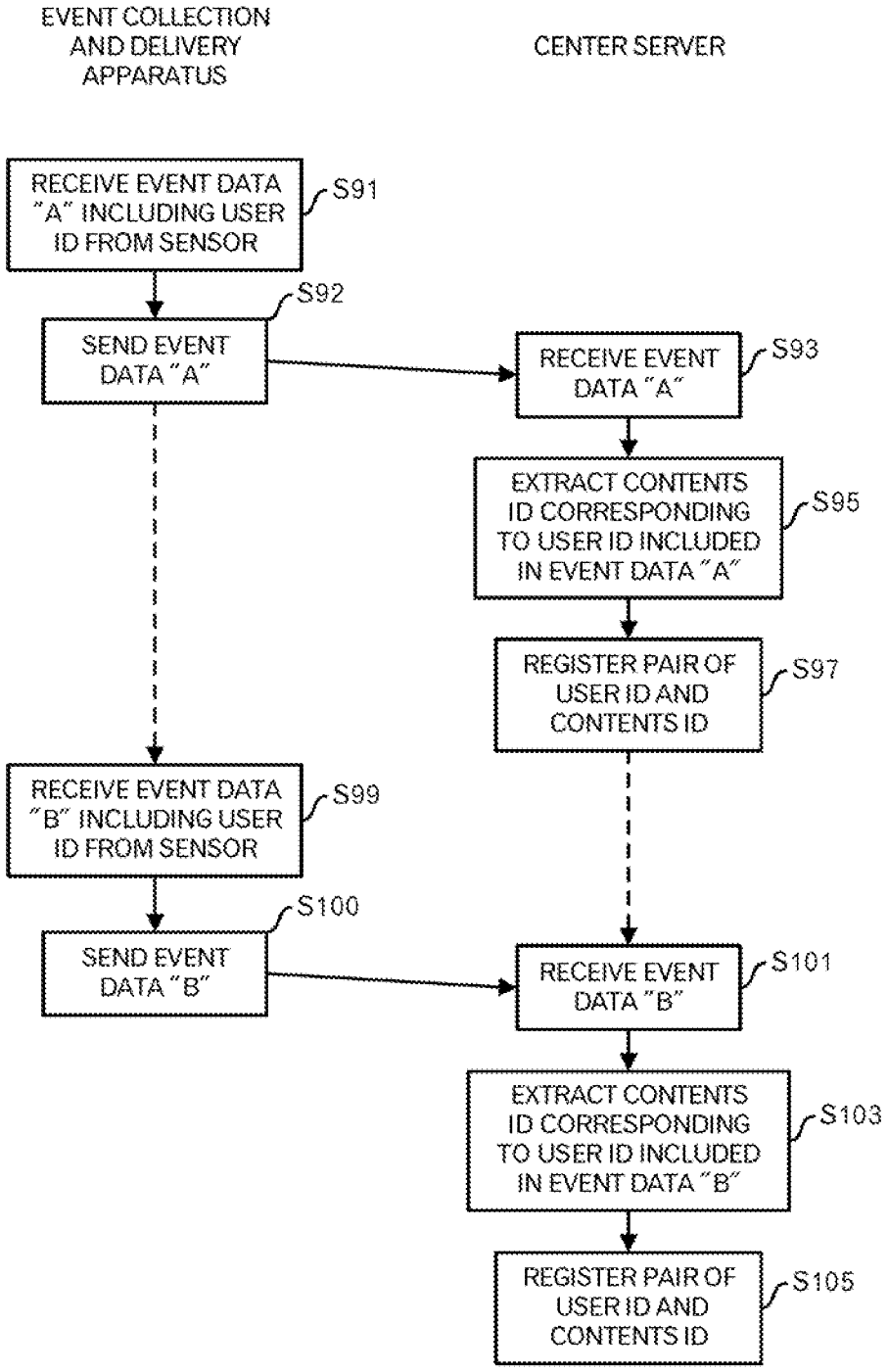

EVENT COLLECTION AND DELIVERY APPARATUS
CENTER SERVER
RECEIVE EVENT DATA "A" INCLUDING USER ID FROM SENSOR
S91
SEND EVENT DATA "A"
S92
RECEIVE EVENT DATA "A"
S93
EXTRACT CONTENTS ID CORRESPONDING TO USER ID INCLUDED IN EVENT DATA "A"
S95
REGISTER PAIR OF USER ID AND CONTENTS ID
S97
RECEIVE EVENT DATA "B" INCLUDING USER ID FROM SENSOR
S99
SEND EVENT DATA "B"
S100
RECEIVE EVENT DATA "B"
S101
EXTRACT CONTENTS ID CORRESPONDING TO USER ID INCLUDED IN EVENT DATA "B"
S103
REGISTER PAIR OF USER ID AND CONTENTS ID
S105

FIG.23

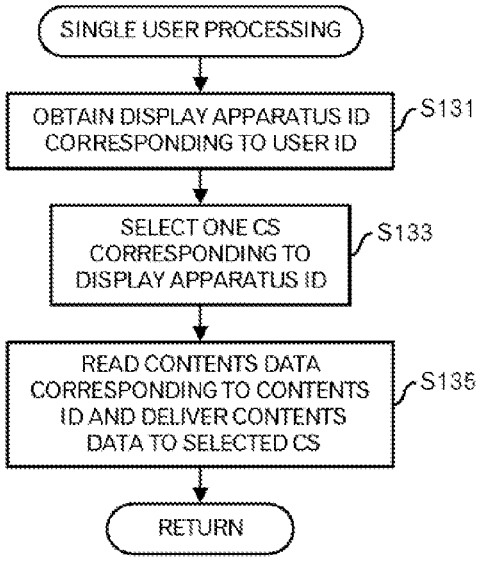

SINGLE USER PROCESSING
OBTAIN DISPLAY APPARATUS ID CORRESPONDING TO USER ID
S131
SELECT ONE CS CORRESPONDING TO DISPLAY APPARATUS ID
S133
READ CONTENTS DATA CORRESPONDING TO CONTENTS ID AND DELIVER CONTENTS DATA TO SELECTED CS
S135
RETURN

FIG.25

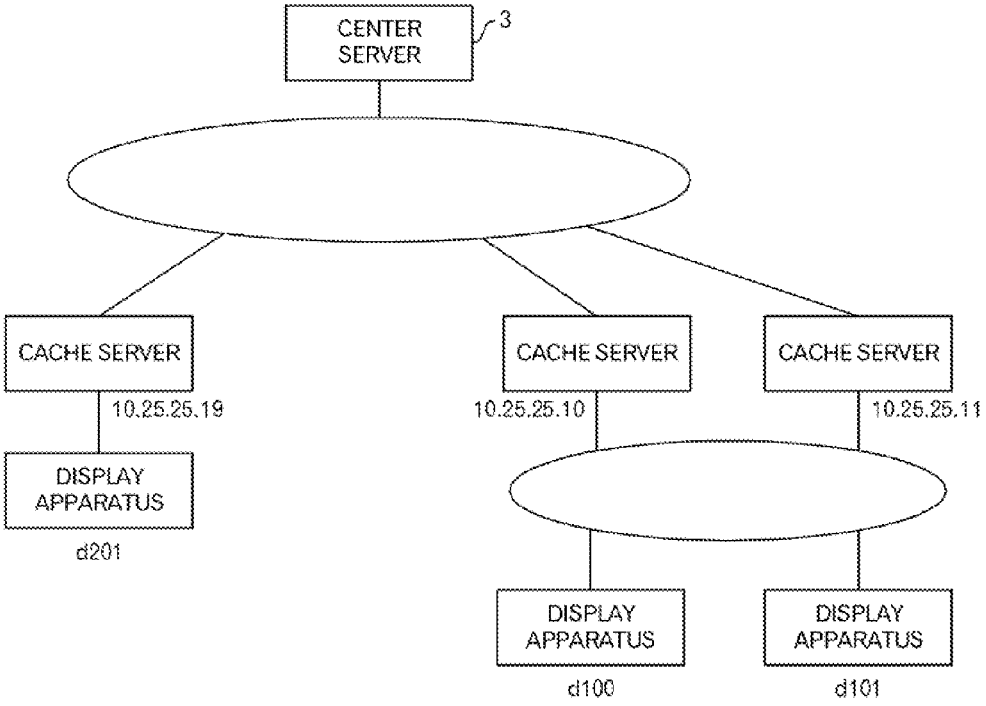

CENTER SERVER
3
CACHE SERVER
10.25.25.19
DISPLAY APPARATUS
d201
CACHE SERVER
10.25.25.10
CACHE SERVER
10.25.25.11
DISPLAY APPARATUS
d100
DISPLAY APPARATUS
d101

FIG.27

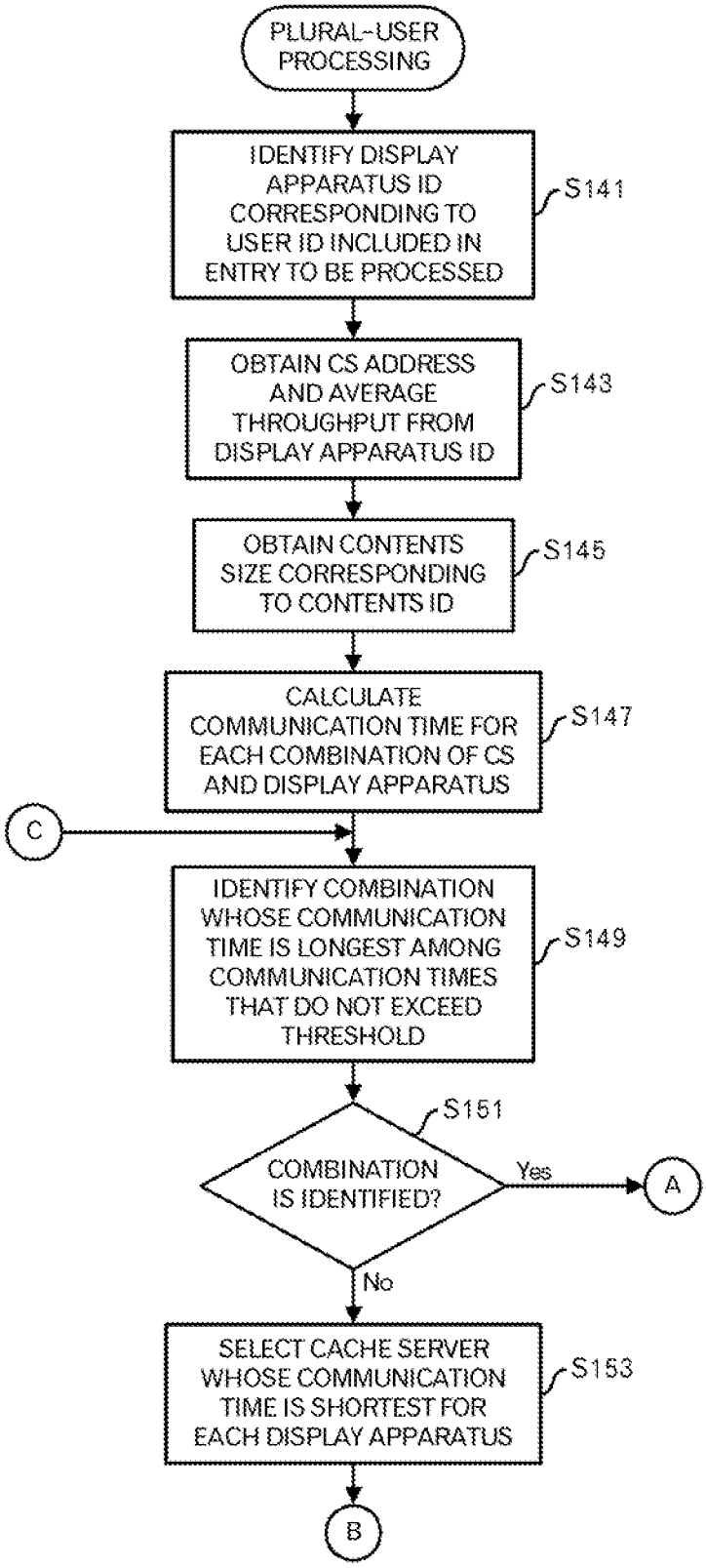

PLURAL-USER PROCESSING
IDENTIFY DISPLAY APPARATUS ID CORRESPONDING TO USER ID INCLUDED IN ENTRY TO BE PROCESSED
S141
OBTAIN CS ADDRESS AND AVERAGE THROUGHPUT FROM DISPLAY APPARATUS ID
S143
OBTAIN CONTENTS SIZE CORRESPONDING TO CONTENTS ID
S145
CALCULATE COMMUNICATION TIME FOR EACH COMBINATION OF CS AND DISPLAY APPARATUS
S147
C
IDENTIFY COMBINATION WHOSE COMMUNICATION TIME IS LONGEST AMONG COMMUNICATION TIMES THAT DO NOT EXCEED THRESHOLD
S149
S151
COMBINATION IS IDENTIFIED?
Yes
A
No
SELECT CACHE SERVER WHOSE COMMUNICATION TIME IS SHORTEST FOR EACH DISPLAY APPARATUS
S153
B

FIG.26

DISPLAY APPARATUS ID	CS ADDRESS	AVERAGE THROUGHPUT	COMMUNICATION TIME
d100	10.25.25.10	25M	0.8
d101	10.25.25.10	30M	0.67
d100	10.25.25.11	15M	1.33
d101	10.25.25.11	20M	1.0
d201	10.25.25.19	18M	1.1
d201	10.25.25.10	-	-
d201	10.25.25.11	-	-
d100	10.25.25.19	-	-
d101	10.25.25.19	-	-

FIG.28

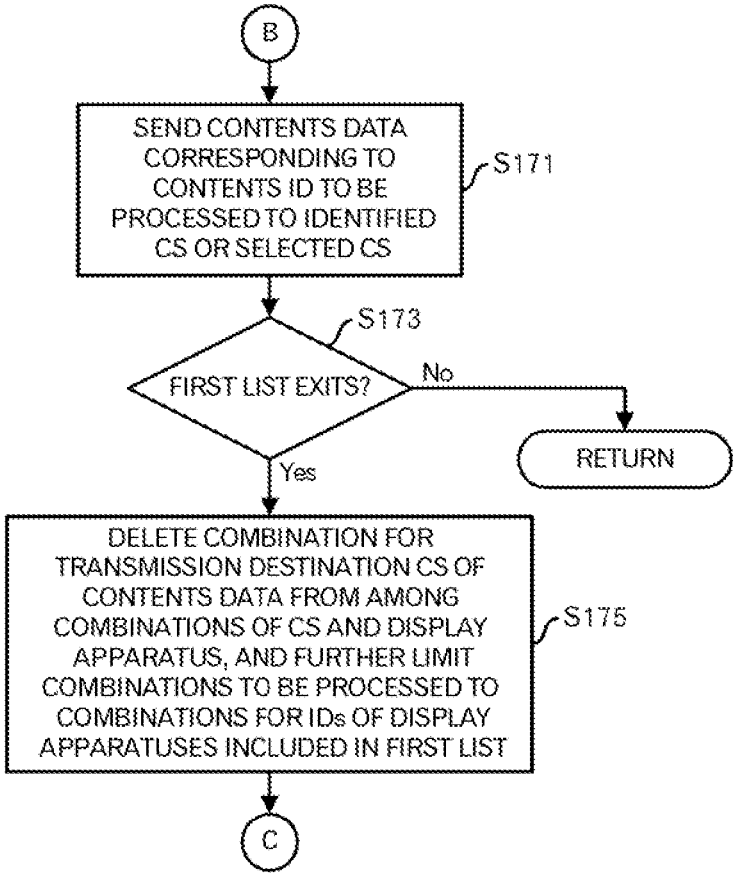


FIG.30

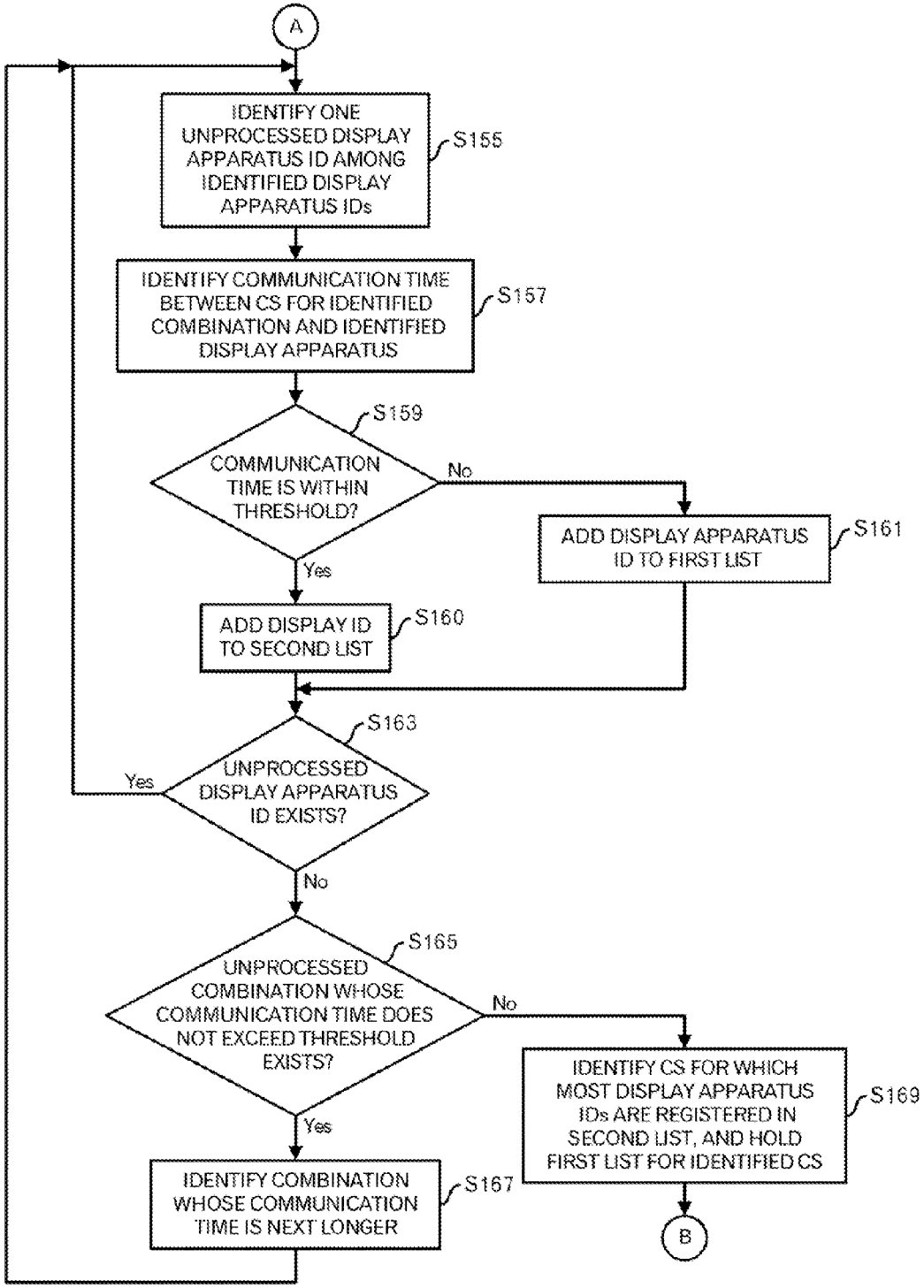

A
IDENTIFY ONE UNPROCESSED DISPLAY APPARATUS ID AMONG IDENTIFIED DISPLAY APPARATUS IDs
S155
IDENTIFY COMMUNICATION TIME BETWEEN CS FOR IDENTIFIED COMBINATION AND IDENTIFIED DISPLAY APPARATUS
S157
S159
COMMUNICATION TIME IS WITHIN THRESHOLD?
No
Yes
ADD DISPLAY APPARATUS ID TO FIRST LIST
S161
ADD DISPLAY ID TO SECOND LIST
S160
S163
UNPROCESSED DISPLAY APPARATUS ID EXISTS?
Yes
No
S165
UNPROCESSED COMBINATION WHOSE COMMUNICATION TIME DOES NOT EXCEED THRESHOLD EXISTS?
No
Yes
IDENTIFY CS FOR WHICH MOST DISPLAY APPARATUS IDs ARE REGISTERED IN SECOND LIST, AND HOLD FIRST LIST FOR IDENTIFIED CS
S169
IDENTIFY COMBINATION WHOSE COMMUNICATION TIME IS NEXT LONGER
S167
B

FIG.29

DISPLAY APPARATUS ID	CS ADDRESS	AVERAGE THROUGHPUT	COMMUNICATION TIME
d201	10.25.25.19	18M	1.1

FIG.31A

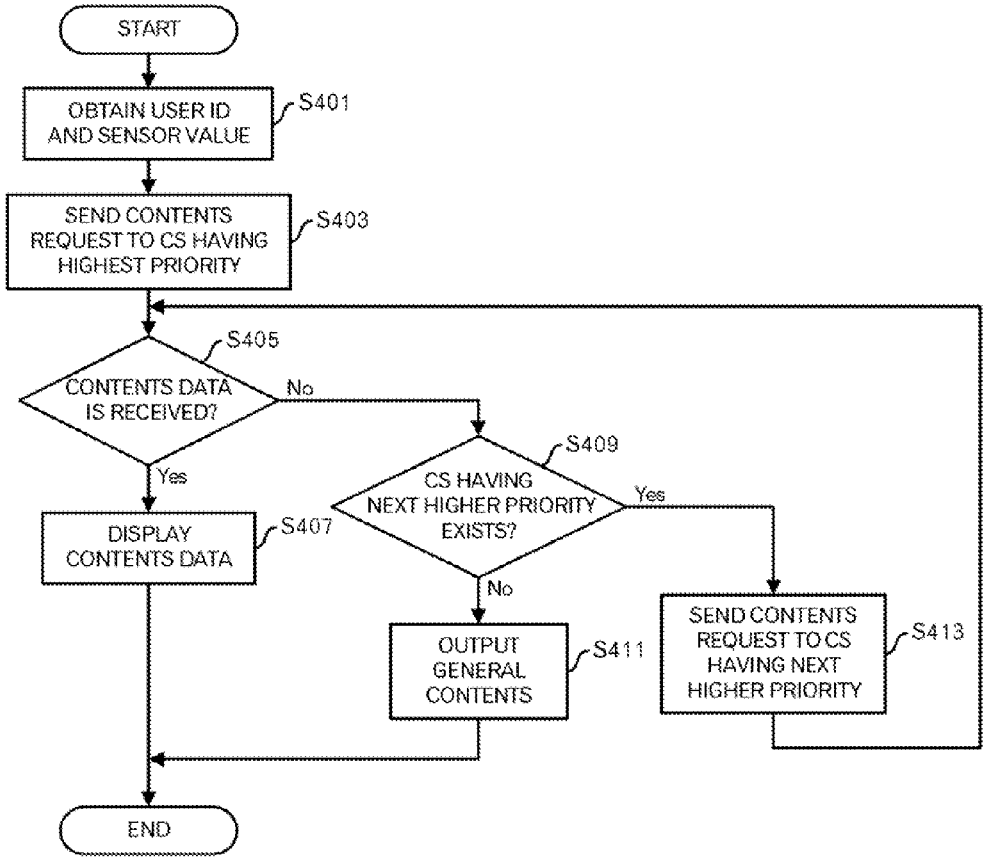


FIG.31B

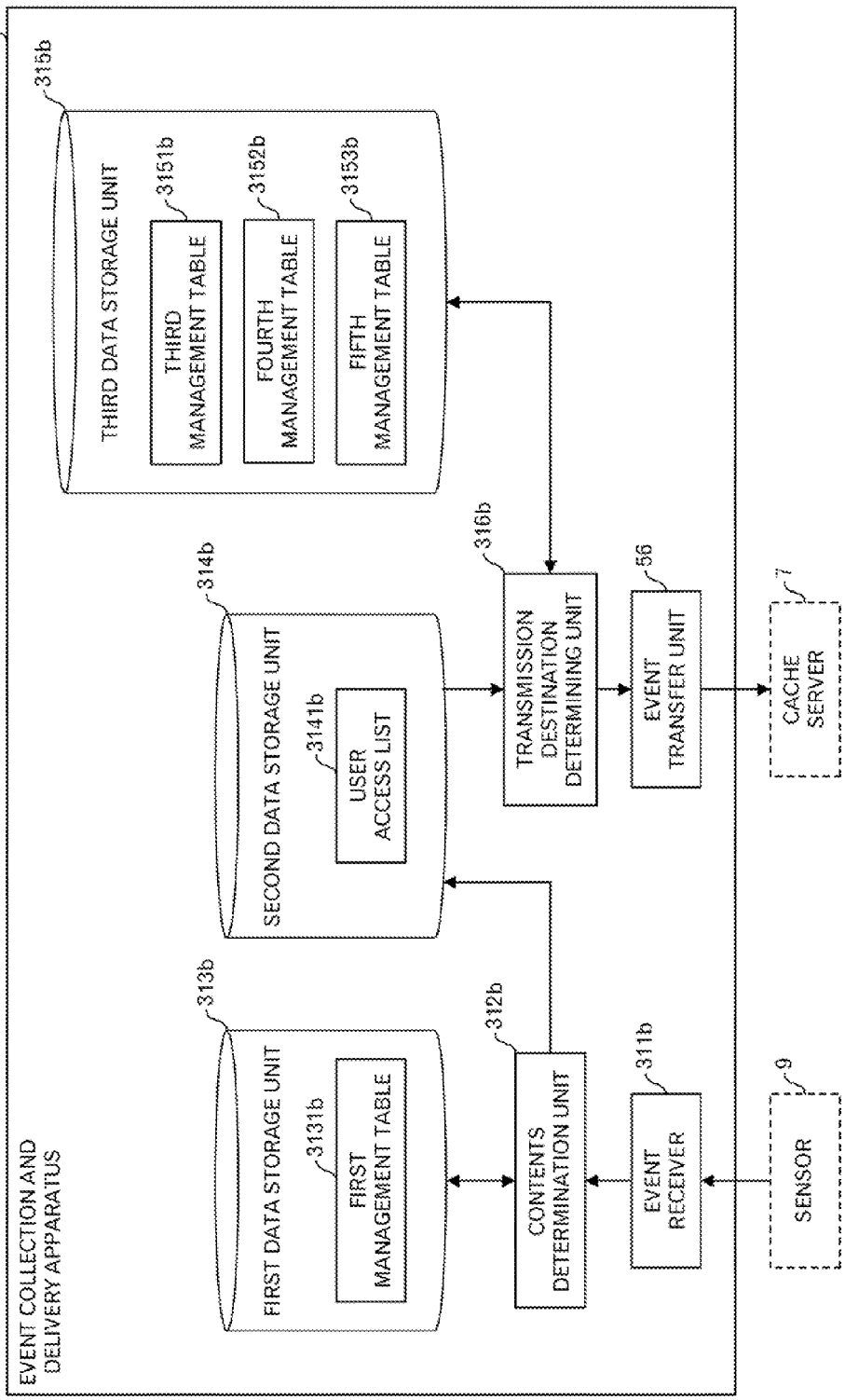

5
EVENT COLLECTION AND DELIVERY APPARATUS
315b
THIRD DATA STORAGE UNIT
3151b
THIRD MANAGEMENT TABLE
3152b
FOURTH MANAGEMENT TABLE
3153b
FIFTH MANAGEMENT TABLE
314b
SECOND DATA STORAGE UNIT
3141b
USER ACCESS LIST
313b
FIRST DATA STORAGE UNIT
3131b
FIRST MANAGEMENT TABLE
316b
TRANSMISSION DESTINATION DETERMINING UNIT
56
EVENT TRANSFER UNIT
7
CACHE SERVER
312b
CONTENTS DETERMINATION UNIT
311b
EVENT RECEIVER
9
SENSOR

FIG.32

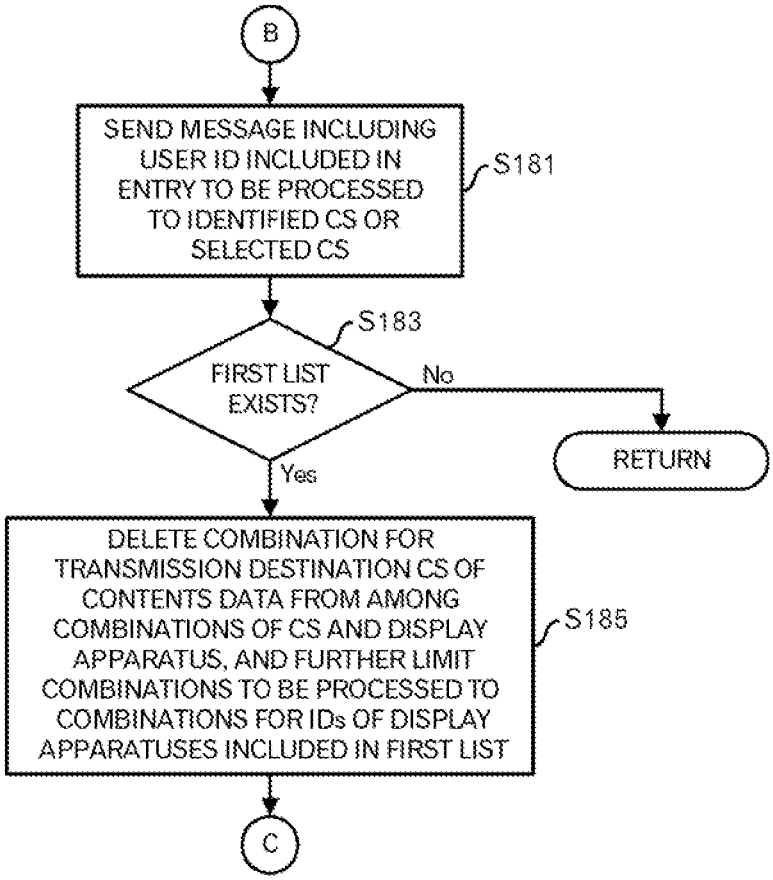


FIG.33

USER ID	CONTENTS ID
u123	c20
u222	c20
⋮	⋮

FIG.36

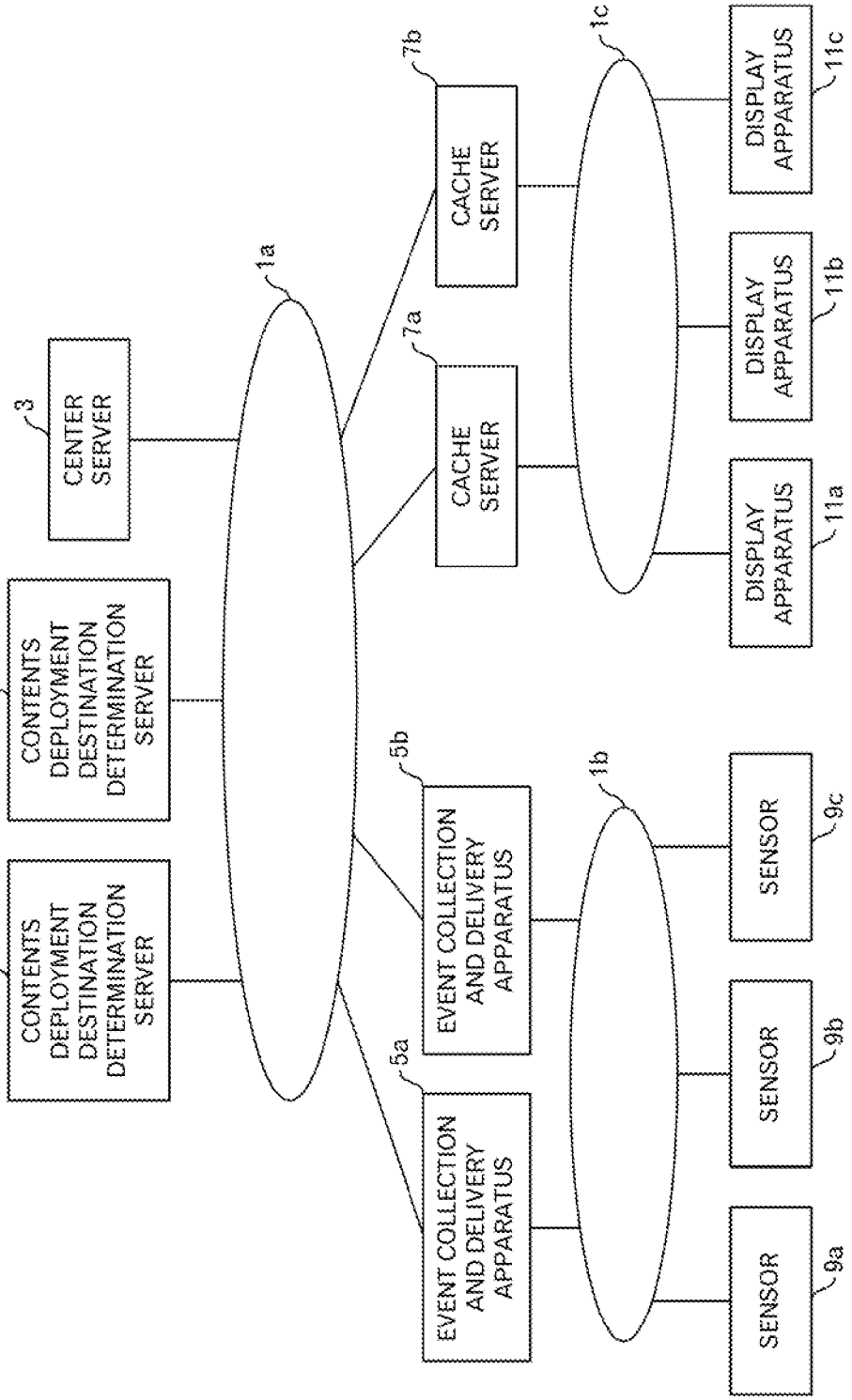

CENTER SERVER
3
CONTENTS DEPLOYMENT DESTINATION DETERMINATION SERVER
13b
CONTENTS DEPLOYMENT DESTINATION DETERMINATION SERVER
13a
1a
CACHE SERVER
7b
CACHE SERVER
7a
EVENT COLLECTION AND DELIVERY APPARATUS
5b
EVENT COLLECTION AND DELIVERY APPARATUS
5a
1c
DISPLAY APPARATUS
11c
DISPLAY APPARATUS
11b
DISPLAY APPARATUS
11a
1b
SENSOR
9c
SENSOR
9b
SENSOR
9a

FIG.34

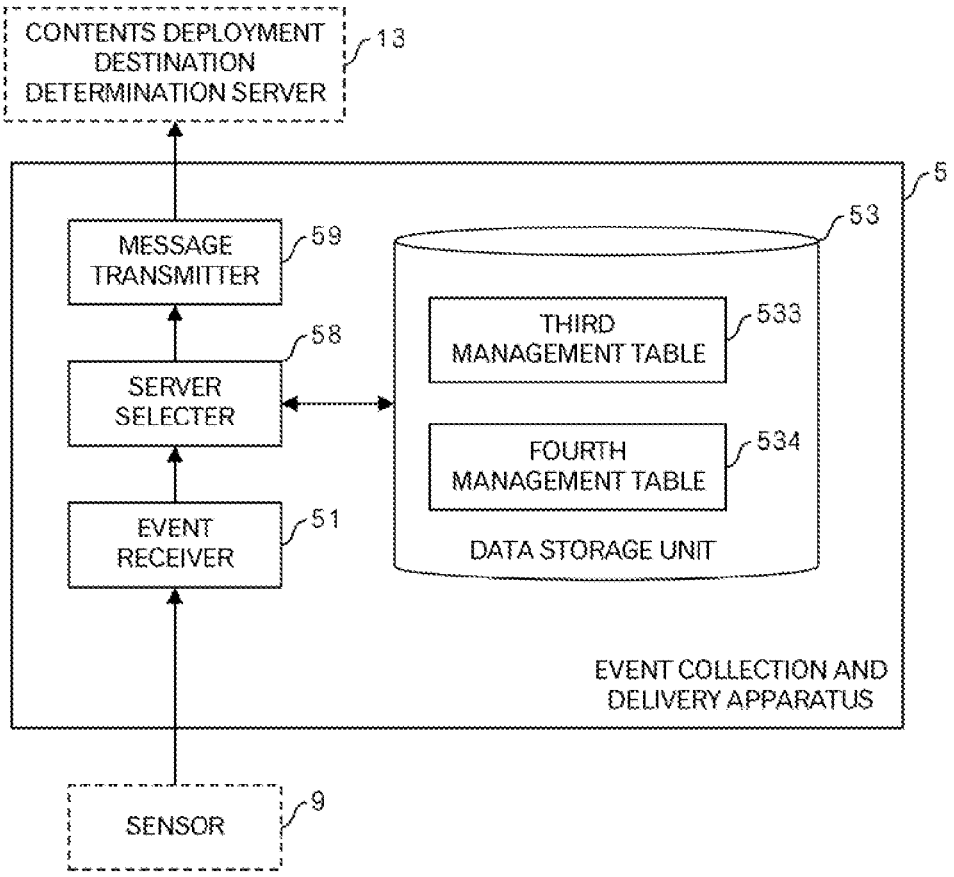


FIG.35

CONTENTS ID	ADDRESS OF CONTENTS DEPLOYMENT DESTINATION DETERMINATION SERVER
c1**	10.25.100.111
c2**	10.25.100.112
⋮	⋮

FIG.37

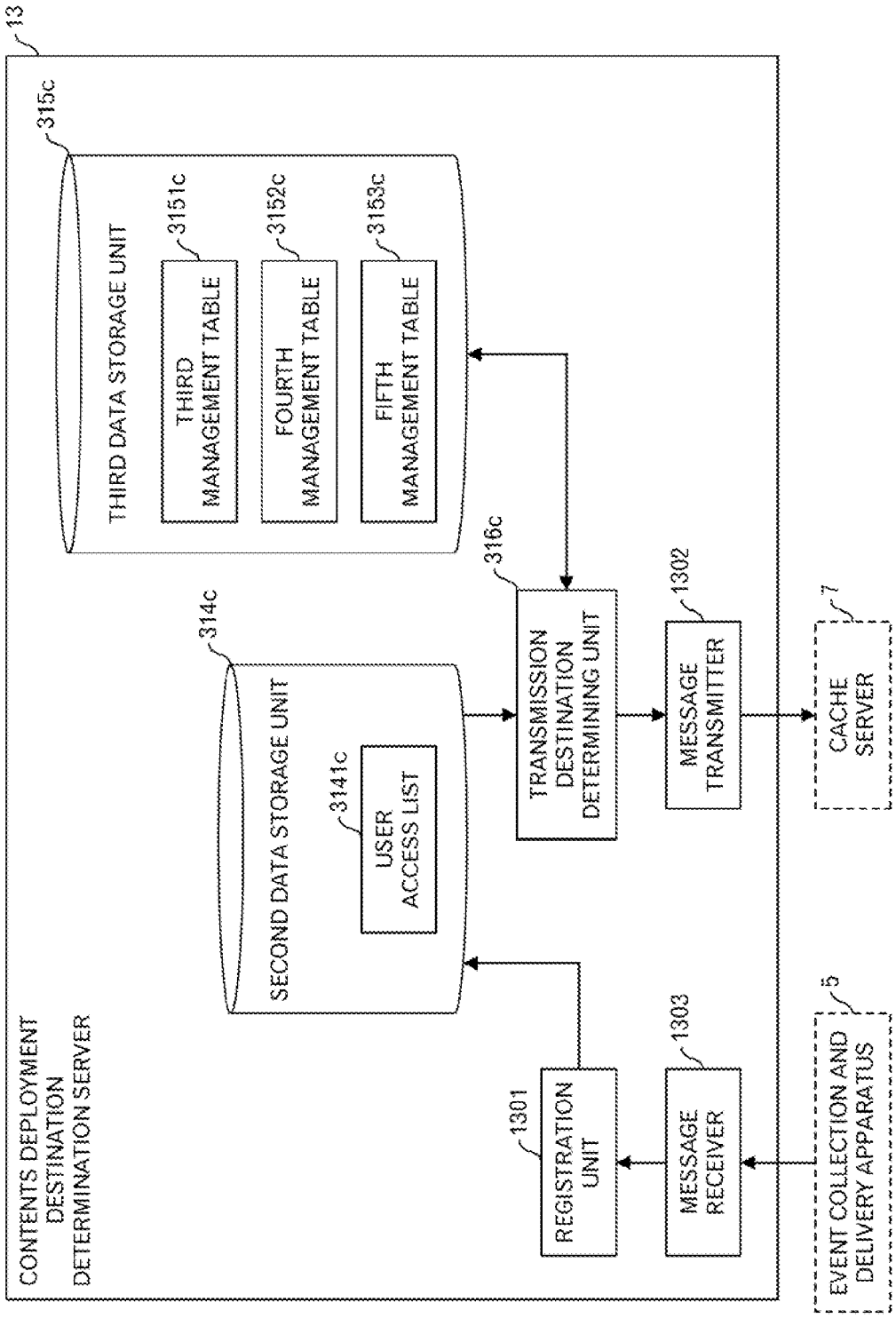

13
CONTENTS DEPLOYMENT DESTINATION DETERMINATION SERVER
315c
THIRD DATA STORAGE UNIT
3151c
THIRD MANAGEMENT TABLE
3152c
FOURTH MANAGEMENT TABLE
3153c
FIFTH MANAGEMENT TABLE
314c
SECOND DATA STORAGE UNIT
3141c
USER ACCESS LIST
316c
TRANSMISSION DESTINATION DETERMINING UNIT
1302
MESSAGE TRANSMITTER
7
CACHE SERVER
1301
REGISTRATION UNIT
1303
MESSAGE RECEIVER
5
EVENT COLLECTION AND DELIVERY APPARATUS

FIG.38

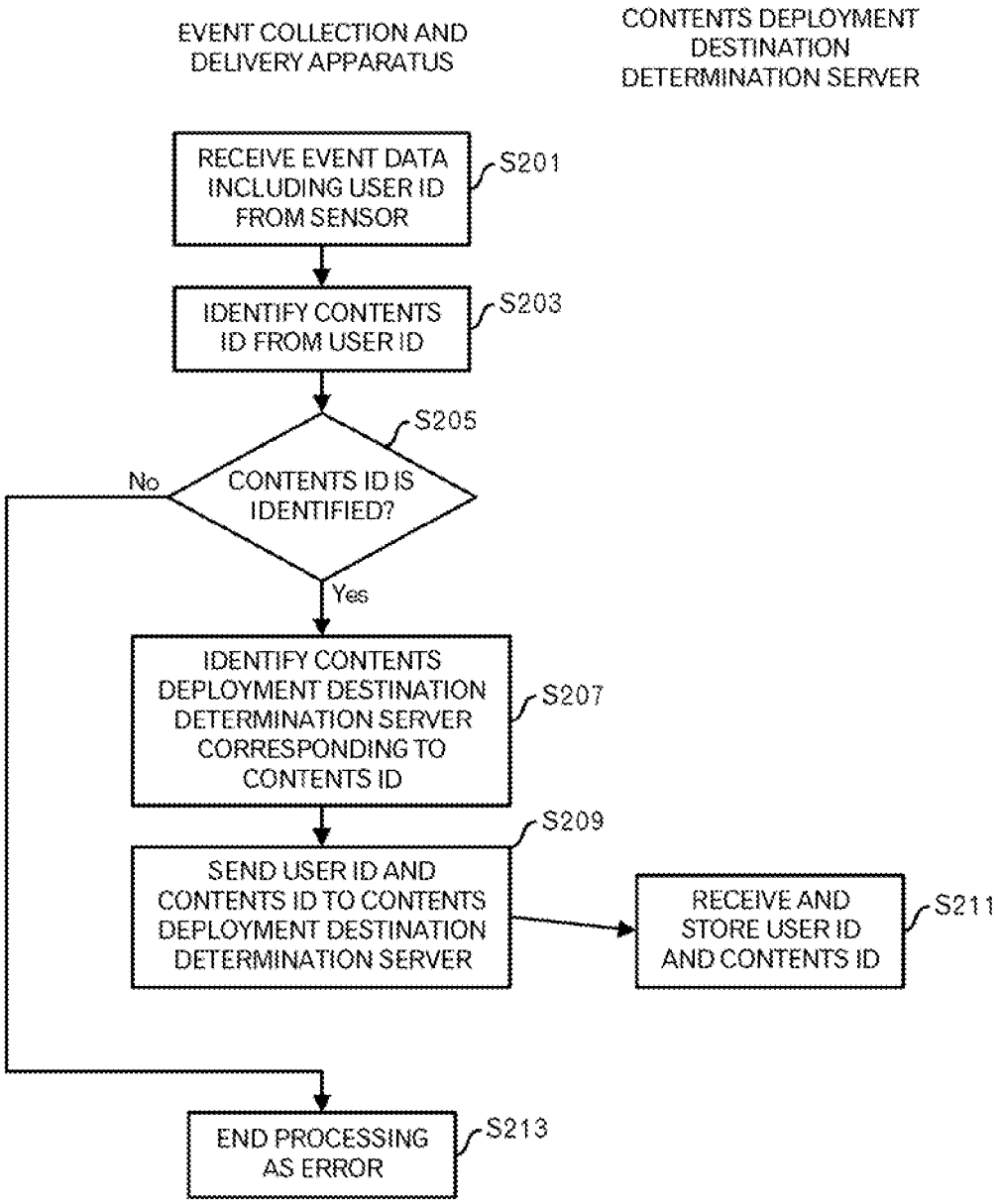

EVENT COLLECTION AND DELIVERY APPARATUS
CONTENTS DEPLOYMENT DESTINATION DETERMINATION SERVER
RECEIVE EVENT DATA INCLUDING USER ID FROM SENSOR
S201
IDENTIFY CONTENTS ID FROM USER ID
S203
S205
CONTENTS ID IS IDENTIFIED?
No
Yes
IDENTIFY CONTENTS DEPLOYMENT DESTINATION DETERMINATION SERVER CORRESPONDING TO CONTENTS ID
S207
S209
SEND USER ID AND CONTENTS ID TO CONTENTS DEPLOYMENT DESTINATION DETERMINATION SERVER
RECEIVE AND STORE USER ID AND CONTENTS ID
S211
END PROCESSING AS ERROR
S213

FIG.39

ADDRESS OF CS SERVER	NO. OF CONTENTS
10.25.25.10	100
10.25.25.11	30
10.25.25.19	40

FIG.40

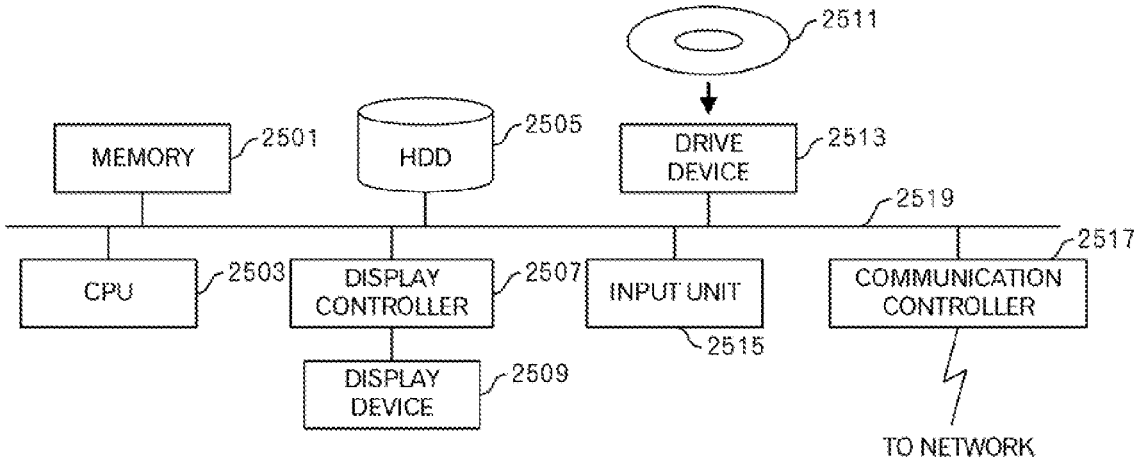


FIG.42

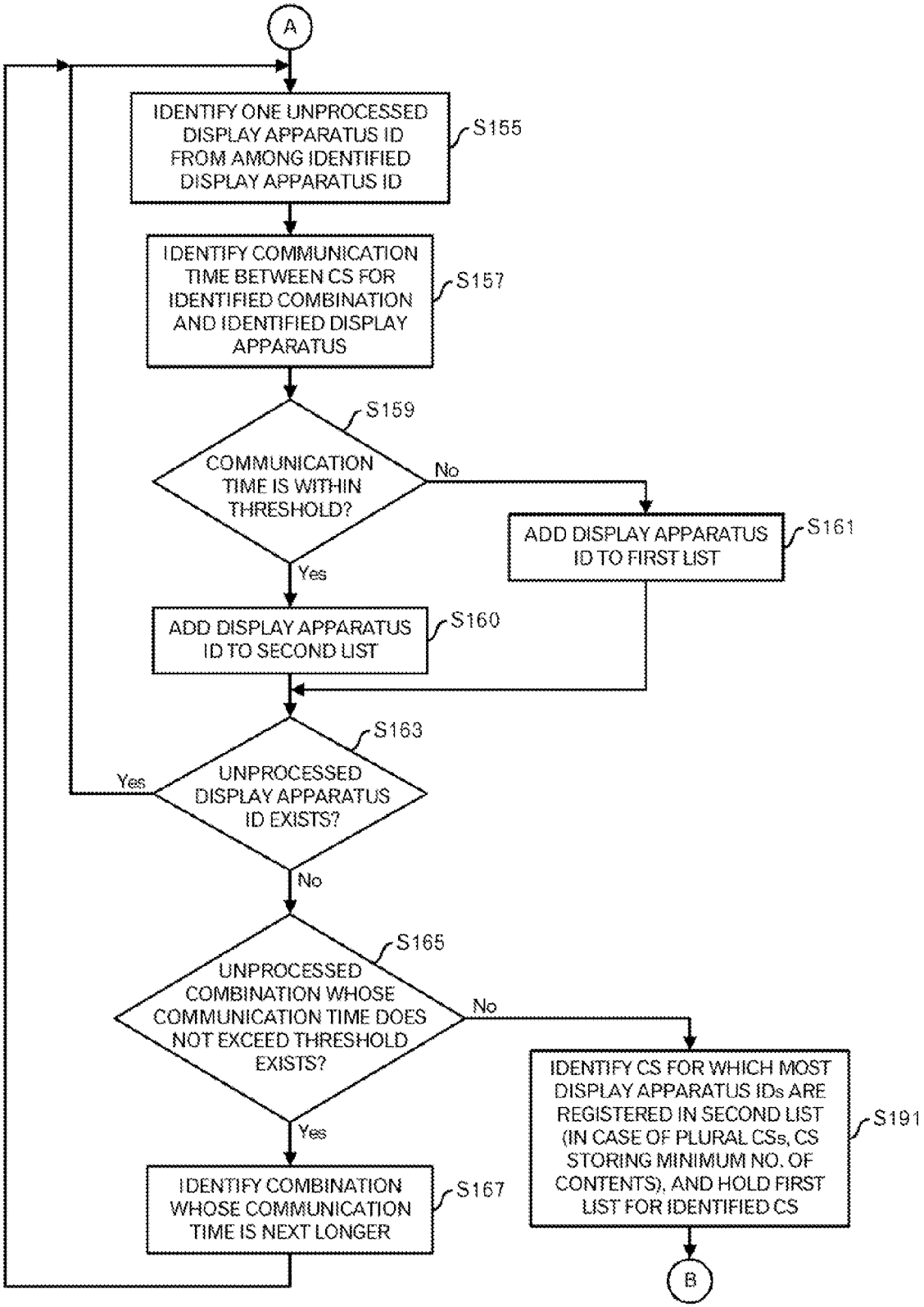

A
IDENTIFY ONE UNPROCESSED DISPLAY APPARATUS ID FROM AMONG IDENTIFIED DISPLAY APPARATUS ID
S155
IDENTIFY COMMUNICATION TIME BETWEEN CS FOR IDENTIFIED COMBINATION AND IDENTIFIED DISPLAY APPARATUS
S157
S159
COMMUNICATION TIME IS WITHIN THRESHOLD?
No
ADD DISPLAY APPARATUS ID TO FIRST LIST
S161
Yes
ADD DISPLAY APPARATUS ID TO SECOND LIST
S160
S163
UNPROCESSED DISPLAY APPARATUS ID EXISTS?
Yes
No
S165
UNPROCESSED COMBINATION WHOSE COMMUNICATION TIME DOES NOT EXCEED THRESHOLD EXISTS?
No
IDENTIFY CS FOR WHICH MOST DISPLAY APPARATUS IDs ARE REGISTERED IN SECOND LIST (IN CASE OF PLURAL CSs, CS STORING MINIMUM NO. OF CONTENTS), AND HOLD FIRST LIST FOR IDENTIFIED CS
S191
Yes
IDENTIFY COMBINATION WHOSE COMMUNICATION TIME IS NEXT LONGER
S167
B

FIG.41

DISTRIBUTED CACHE SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority of the prior Japanese Patent Application No. 2012-044716, filed on Feb. 29, 2012, the entire contents of which are incorporated herein by reference.

FIELD

[0002] This technique relates to a technique for caching data in a distributed manner.

BACKGROUND

[0003] With reduced costs of broadband networks in recent years, many data distribution systems have been created, in which large displays are installed in stores throughout the city and/or in vending machines, and high-resolution videos such as information or advertisements for a particular area are distributed from a center server. These distribution systems include systems that distribute predetermined contents to display apparatuses at preset times, and systems in which display apparatuses acquire contents from a center server periodically or in response to an acquisition instruction from a user as a trigger.

[0004] Particularly, in the latter case, information that matches the tastes and interests of the user viewing the information can be displayed, so such systems are expected to increase in the future. However, there are problems in which, due to communication delays in the network between the center server and a display apparatus, there are cases where the user may leave the spot before the contents are displayed.

[0005] As one method for shortening the time until contents are displayed, there is a method of arranging a cache server near the display apparatuses, and distributing contents from that cache server. When many display apparatuses are distributed, plural cache servers are also installed, however, when there are contents in the cache server for a user that is currently at a display apparatus, it is possible to shorten the time necessary for displaying the contents. However, when there are no contents in a cache server for the user, the cache server acquires contents from the center server. Therefore, it still takes time.

[0006] The following technique has been proposed for solving this kind of problem concerning a time required for the display. That is, the center server obtains an event that represents that a user has come closer to a display apparatus from an entrance and exit system of a building and the like, and distributes contents beforehand for that user to a cache server near the display apparatus, in response to that event as a trigger. As a result, when the user causes the display apparatus to read the user ID by holding up an IC card or the like in front of the display apparatus, the contents can be displayed right away.

[0007] However, in this technique, an event from the entrance and exit system is directly transmitted to the center server, so as the number of users using the system increases, events become concentrated at the center server, and sometimes the processing speed of the center server decreases. Moreover, there is a limit to a capacity of the cache server, so preferably caching of contents that wastes resources in the cache servers is avoided.

[0008] Namely, there is no technique for improving the efficiency of a system that outputs contents data, which matches each user, at plural display apparatuses.

SUMMARY

[0009] A system relating to a first aspect of this technique includes: (A) a first information processing apparatus having data of a plurality of contents; (B) a plurality of display apparatuses, each including a function to read an identifier of a user; (C) a plurality of second information processing apparatuses, each of which obtains and stores portion of data of the plurality of contents from the first information processing apparatus, and outputs stored data to at least one of the plurality of display apparatuses; and (D) a third information processing apparatus that detects a predetermined event. The third information processing apparatus includes a first data storage unit storing first correlation data to correlate an identifier of a user with at least one second information processing apparatus of the plurality of second information processing apparatuses. When detecting the predetermined event, the third information processing apparatus identifies a second information processing apparatus correlated with an identifier of a user, which is included in data of the detected predetermined event, from the first data storage unit, and transmits the identifier of the user, which is included in the detected predetermined event, to the identified second information processing apparatus. At least one second information processing apparatus of the plurality of second information processing apparatuses identifies data of contents to be outputted to the at least one of the plurality of display apparatuses based on the identifier of the user, which is transmitted from the third in format ion processing apparatus. The at least one second information processing apparatus obtains and stores the identified data from the first information processing apparatus. When receiving the identifier of the user from the at least one of the plurality of display apparatuses, the at least one second information processing apparatus outputs data of contents corresponding to the identifier of the user to the at least one of the plurality of display apparatuses.

[0010] A system relating to a second aspect of this technique includes: (A) a first information processing apparatus having a first data storage unit storing data of a plurality of contents; (B) a plurality of display apparatuses, each including a function to read an identifier of a user; (C) a plurality of second information processing apparatuses, each of which obtains from the first information processing apparatus and caches data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus; and (D) a third information processing apparatus that transmits data including an identifier of a user to the first information processing apparatus, upon detecting a predetermined event including the identifier of the user. Then, the first information processing apparatus comprises a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents, second correlation data to correlate an identifier of a display apparatus with an identifier of a user, and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses. When receiving the data including the identifier of the user from the third information processing apparatus, the first information processing apparatus identifies an identifier of

contents, which is correlated with the identifier of the user, which is included in the received data, from the first correlation data, and stores data to correlate the identifier of the user, which is included in the received data, with the identified identifier of the contents in a third data storage unit. When the third data storage unit stores data to correlate a same identifier of contents with plural identifiers of plural users, the first information processing apparatus identifies an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, from the second correlation data, and extracts from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus. When a same identifier of a second information processing apparatus is extracted, for at least two identifiers of at least two users among the plural identifiers of the plural users, the first information processing apparatus reads from the first data storage unit and transmits data of the contents, for which the same identifier is identified, to the second information processing apparatus for which the same identifier is extracted or transmits the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0011] A system relating to a third aspect of this technique includes: (A) a first information processing apparatus having a first data storage unit storing data of a plurality of contents; (B) a plurality of display apparatuses, each including a function to read an identifier of a user; (C) a plurality of second information processing apparatuses, each of which identifies data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses based on an identifier of a user, and obtains and caches the identified data of the contents from the first information processing apparatus, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus; and (D) a third information processing apparatus comprising a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents, second correlation data to correlate an identifier of a display apparatus with an identifier of a user, and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses, and a third data storage unit. When detecting a predetermined event including an identifier of a user, the third information processing apparatus identifies, from the first correlation data, an identifier of contents, which is correlated with the identifier of the user, which is included in the detected predetermined event, and stores data to correlate the identified identifier of the contents with the identifier of the user, which is included in the detected predetermined event in the third data storage unit. When the third data storage unit stores data to correlate a same identifier of contents with plural identifiers of plural users, the third information processing apparatus identifies an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, from the second correlation data, and extracts from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus. When a same identifier of a second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, the third in formation processing apparatus transmits the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0012] A system relating to a fourth aspect of this technique includes: (A) a first information processing apparatus having a first data storage unit storing data of a plurality of contents; (B) a plurality of display apparatuses, each including a function to read an identifier of a user; (C) a plurality of second information processing apparatuses, each of which identifies data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses based on an identifier of a user or an identifier of contents, and obtains and caches the identified data of the contents from the first information processing apparatus, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus; and (D) a plurality of third information processing apparatuses; (E) a fourth information processing apparatus comprising a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents and second correlation data to correlate an identifier of contents with one of the plurality of third information processing apparatuses. When detecting a predetermined event, including an identifier of a user, the fourth information processing apparatus identifies, from the first correlation data, an identifier of contents, which is correlated with the identifier of the user, which is included in the detected predetermined event, and identifies an identifier of a third information processing apparatus, which is correlated with the identified identifier of the contents, from the second correlation data, and transmits data including the identifier of the user, which is included in the detected predetermined event, and the identified identifier of the contents or data including the identifier of the user, which is included in the detected predetermined event, to the third information processing apparatus whose identifier is identified. Each of the plurality of third information processing apparatuses comprises a third data storage unit storing second correlation data to correlate an identifier of a user with an identifier of a display apparatus and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses. Each of the plurality of third information processing apparatuses stores data to correlate the identifier of the user, which is included in the data received from the fourth information processing apparatus with the identifier of the contents, which is included in the data received from the fourth information processing apparatus in a fourth data storage unit, or identifies an identifier of contents, which corresponds to the identifier of the user, which is included in the data received from the fourth information processing apparatus to store data to correlate the identifier of the user with the identified identifier of the contents, into the fourth data storage unit. When the fourth data storage unit stores data to correlate plural identifiers of plural users with a same identifier of contents, each of the plurality of third information processing apparatuses identifies, from the second correlation data, an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, and extracts, from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatuses. When a same identifier of a second in formation processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, each of the plurality of third information processing apparatuses

transmits the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0013] The object and advantages of the embodiment will be realized and attained by means of the elements and combinations particularly pointed out in the claims.

[0014] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are not restrictive of the embodiment, as claimed.

BRIEF DESCRIPTION OF DRAWINGS

[0015] FIG. **1** is a diagram depicting an outline of a system relating to a first embodiment;

[0016] FIG. **2** is a functional block diagram of a display apparatus relating to the first embodiment;

[0017] FIG. **3** is a functional block diagram of a center server relating to the first embodiment;

[0018] FIG. **4** is a functional block diagram of an event collection and delivery apparatus relating to the first embodiment;

[0019] FIG. **5** is a diagram depicting an example of data stored in a first management table in the event collection and delivery apparatus;

[0020] FIG. **6** is a diagram depicting an example of data stored in a second management table in the event collection and delivery apparatus;

[0021] FIG. **7** is a functional block diagram of a cache server relating to the first embodiment;

[0022] FIG. **8** is a diagram depicting an example of data in a first management table in the cache server;

[0023] FIG. **9** is a diagram depicting an example of data stored in a second management table in the cache server;

[0024] FIG. **10** is a diagram depicting a processing flow relating to the first embodiment;

[0025] FIG. **11** is a diagram depicting an example of setting data relating to the first embodiment;

[0026] FIG. **12** is a diagram depicting a processing flow relating to the first embodiment;

[0027] FIG. **13** is a diagram depicting a processing flow relating to a second embodiment;

[0028] FIG. **14** is a diagram depicting a processing flow relating to the second embodiment;

[0029] FIG. **15** is a functional block diagram of an event collection and delivery apparatus relating to a third embodiment;

[0030] FIG. **16** is a functional block diagram of a center server relating to the third embodiment;

[0031] FIG. **17** is a diagram depicting an example of data stored in a first management table in the center server;

[0032] FIG. **18** is a diagram depicting an example of data stored in a user access list in the center server;

[0033] FIG. **19** is a diagram depicting an example of data stored in a third management table in the center server;

[0034] FIG. **20** is a diagram depicting an example of data stored in a fourth management table in the center server;

[0035] FIG. **21** is a diagram depicting an example of data stored in a fifth management table in the center server;

[0036] FIG. **22** is a functional block diagram of a cache server relating to the third embodiment;

[0037] FIG. **23** is a diagram depicting a processing flow in the third embodiment;

[0038] FIG. **24** is a diagram depicting a processing flow in the third embodiment;

[0039] FIG. **25** is a diagram depicting a processing flow of a single user processing;

[0040] FIG. **26** is a diagram depicting a processing flow of a plural-user processing;

[0041] FIG. **27** is a system outline diagram schematically depicting a specific example;

[0042] FIG. **28** is a diagram depicting an example of a combination list;

[0043] FIG. **29** is a diagram depicting a processing flow of the plural-user processing;

[0044] FIG. **30** is a diagram depicting a processing flow of the plural-user processing;

[0045] FIG. **31**A is a diagram depicting a state after processing a combination list;

[0046] FIG. **31**B is a diagram depicting a processing flow of the display apparatus;

[0047] FIG. **32** is a functional block diagram of an event collection and delivery apparatus relating to a fourth embodiment;

[0048] FIG. **33** is a diagram depicting a processing flow in the fourth embodiment;

[0049] FIG. **34** is an outline diagram of a system con figuration relating to a fifth embodiment;

[0050] FIG. **35** is a functional block diagram of an event collection and delivery apparatus in the fifth embodiment;

[0051] FIG. **36** is a diagram depicting an example of data stored ins a third management table in the event collection, and delivery apparatus relating to the fifth embodiment;

[0052] FIG. **37** is a diagram depicting an example of data stored in a fourth management table in the event collection and delivery apparatus relating to the fifth embodiment;

[0053] FIG. **33** is a functional block diagram of a contents delivery destination determination server;

[0054] FIG. **39** is a diagram depicting a processing flow relating to the fifth embodiment;

[0055] FIG. **40** is a diagram depicting an example of data stored in a sixth management table relating to a sixth embodiment;

[0056] FIG. **41** is a diagram depicting a processing flow relating to the sixth embodiment; and

[0057] FIG. **42** is a functional block diagram of a computer.

DESCRIPTION OF EMBODIMENTS

Embodiment 1

[0058] FIG. **1** illustrates a system of this embodiment. In the example illustrated in FIG. **1**, a center server **3** that contains contents data that is used by the system, event collection and delivery apparatuses **5** (**5***a* and **5***b* in FIG. **1**) and cache servers **7** (**7***a* and **7***b* in FIG. **1**) are connected to a network **1***a*. Moreover, the event collection and delivery apparatuses **5***a* and **5***b* and plural sensors **8** (sensors **9***a*, **9***b* and **9***c* in FIG. **1**) are connected to a network **1***b*. Furthermore, cache servers **7***a* and **7***b* and display apparatuses **11** (**11***a*, **11***b* and **11***c* in FIG. **1**) are connected to a network **1***c*.

[0059] The sensors **9***a* to **9***c* are located at the entrances and exits of a building or facility, for example. The sensors **9***a* to **9***c* may be used together with an apparatus for entrance and exit management, or may be used independently in the case where the entrance and exit management is not performed. Moreover, the display apparatuses **11***a* to **11***c* are distributedly placed inside the building or facility. Furthermore, the

cache servers **7***a* and **7***b* are located at positions such that the response time for displaying contents on the display apparatuses **11***a* to **11***c* can be kept within a predetermined amount of time according to the disposition of the display apparatuses **11***a* to **11***c*.

[0060] The sensors **9***a* to **9***c* are correlated with one or more event collection and delivery apparatuses **5**. The display apparatuses **11***a* to **11***c* are also correlated with one or more cache servers **7**. One center server **3** is installed in one building or facility, for example.

[0061] Each of the sensors **9***a* to **9***c* reads a user ID from an IC card or the like, which is carried by the user and which stores the user ID, and transmits event data that includes that user ID to an event collection and delivery apparatus **5** that corresponds to itself. The event collection and delivery apparatus **5***a* carries out a processing that will be described below and transfers event data to a cache server **7**. The cache server **7** receives the event data flora the event collection and delivery apparatuses **5**, and when the cache server **7** does nor have contents data to be displayed by the display apparatuses **11**, the cache server **7** acquires and caches contents data from the center server **3**. When a user, for example, visits a display apparatus **11***a* and presents an IC card, a first sensor of the display apparatus **11***a* reads the user ID, and a second sensor, such as a temperature sensor, measures the temperature, and the display apparatus **11***a* transmits data that includes the user ID and temperature to its corresponding cache server **7**. The cache server **7** outputs contents data that corresponds to the data received from the display apparatus **11***a* to the display apparatus **11***a*, and the display apparatus **11***a* displays that contents data.

[0062] FIG. **2** illustrates a configuration example of the display apparatus **11***a*. As illustrated in FIG. **2**, the display apparatus, **11***a* has an IC card reader **111**, a temperature sensor **112**, a transmitter **113**, a receiver **114**, a buffer **115**, an output unit **116** and a display unit **117**. The IC card reader **111** reads a user ID from an IC card that is carried by the user, and outputs that user ID to the transmitter **113**. The temperature sensor **112** outputs a measurement value of the temperature to the transmitter **113** in response to a request from the transmitter **113**. The temperature sensor is a mere example, and may be another kind of sensor. For example, the sensor may be a device that takes an image of a user's face with a camera, and processes that face image to recognize his or her expression. The transmitter **113** transmits a contents request that includes the user ID and temperature to a pre-registered cache server **7**. When plural cache servers **7** are registered, a priority may be set for each cache server **7**, for example, and the contents request may be transmitted in order of the priority.

[0063] The receiver **114** receives contents data from the cache server **7** and stores that data in the buffer **115**. The output unit **116** outputs the content data that is stored in the buffer **115** to the display unit **117**. The display apparatus may be combined with an apparatus that has other functions, such as a vending machine or kiosk terminal, or may be installed as just a display apparatus.

[0064] FIG. **3** illustrates a configuration example of the center server **3**. The center server **3** has a communication unit **31** that performs communication with the cache servers **7**, a data extractor **32** and a contents storage unit **33** that stores data for the contents to be displayed by the display apparatuses **11**. After receiving a contents request that includes a contents ID from the cache server **7**, the communication unit **31** outputs the contents ID to the data extractor **32**. The data extractor **32** reads the contents data for the contents ID that was requested by the cache server **7** from the contents storage unit **33**, and outputs that contents data to the communication unit **31**. The communication unit **31** transmits the contents data received from the data extractor **32** to the cache server **7** that requested the data.

[0065] Next, FIG. **4** illustrates a configuration example of the event collection and delivery apparatus **5**. The event collection and delivery apparatus **5** has an event receiver **51**, a transfer destination determination unit **52**, an event transfer unit **54** and a data storage unit **53**. The data storage unit **53** stores a first management table **531** and a second management table **532**. The event receiver **51** receives event data that includes a user ID from a sensor **9**, and outputs the event data to the transfer destination determination unit **52**. The transfer destination determination unit **52** determines the address of the cache server **7** (may be abbreviated as CS) as the transfer destination of the event data, from the first management table **531** and second management table **532** that are stored in the data storage unit **53**, and outputs that address together with the event data to the event transfer unit **54**. The event transfer unit **54** transmits the event data to the determined cache server **7**.

[0066] The event data not only includes a user ID, but also, for example, includes the type of an event (entrance, exit or the like), the time when the event occurred, the sensor ID and the like.

[0067] The first management table **531** stores data such as illustrated in FIG. **5**. In the example in FIG. **5**, one or plural display apparatus IDs are registered in association with the user ID. In this way, the display apparatus that a user often uses is identified in advance, and the display apparatus ID of that display apparatus is registered in association with the user ID in advance.

[0068] The second management table **532** stores data such as illustrated in FIG. **6**. In the example in FIG. **6**, the address (CS address) of the cache server **7** is registered in association with the display apparatus ID. In this way, the correlations between the display apparatus **11** and the corresponding cache server **7**, which is in charge of that display apparatus **11**, are registered.

[0069] FIG. **7** illustrates a configuration example of the cache server **7**. The cache server **7** has a message receiver **71**, a cache confirming unit **72**, a contents obtaining unit **73**, a first data storage unit **74**, a contents request processing unit **75**, and a second data storage unit **76**. The first data storage unit **74** stores a first management table **741** and a second management table **742**.

[0070] The message receiver **71** receives event data from an event collection and delivery apparatus **5**, and outputs the event data to the cache confirming unit **72**. The cache confirming unit **72** determines, from the data stored in the first data storage unit **74**, whether or not contents data that is to be outputted to the display apparatus **11** is already stored in the second data storage unit **76**. When the contents data that is to be outputted to the display apparatus **11** is already stored in the second data storage unit **76**, the processing ends here. On the other hand, when the contents data that is to be outputted to the display apparatus **11** is not stored in the second data storage unit **76**, the cache confirming unit **72** outputs the contents ID to the contents obtaining unit **73**. After receiving the contents ID from the cache confirming unit **72**, the contents obtaining unit **73** transmits a contents request that includes that contents ID to the center server **3**, and after

receiving the contents data from the center server **3**, the contents obtaining unit **73** stores the contents data in the second data storage unit **76** and updates the data that is stored in the first data storage unit **74**.

[0071] Moreover, when receiving a contents request from a display apparatus **11**, the contents request processing unit **75** identifies the contents to be outputted, based on the data that is stored in the first data storage unit **74**, and when that contents data is stored in the second data storage unit **76**, the contents request processing unit **75** reads that contents data from the second data storage unit **76**, and outputs that contents data to the display apparatus **11**. On the other hand, when the contents data that is to be outputted is not stored in the second data storage unit **76**, the contents request processing unit **75** outputs the contents ID to the contents obtaining unit **73**, and causes the contents obtaining unit **73** to obtain the contents data having that contents ID.

[0072] FIG. **8** illustrates an example of data that is stored in the first management table **741**. In the example in FIG. **8**, the contents ID of contents suitable for a user is registered in association with the user ID of that user.

[0073] FIG. **9** illustrates an example of data that is stored in the second management table **742**. In the example in FIG. **9**, one or plural output conditions, the storage destination of actual contents data for each output condition, the user ID of a user who lastly used the actual contents data, and the last utilization date are registered in association with the contents ID. For example, when the contents ID of the contents to be outputted is identified to be "c20", and the temperature is 15 degrees, "a2.mpg" is outputted to the display apparatus.

[0074] The processing contents of the system will be explained in detail using FIG. **10** to FIG. **12**. When the event receiver **51** of the event collection and delivery apparatus **5** receives event data (for example, entrance event) that includes a user ID from a sensor **9** at the entrance (FIG. **10**: step S**1**), for example, the event receiver **51** outputs that event data to the transfer destination determination unit **52**. When receiving the event data, the transfer destination determination unit **52** searches the first management table **531** using the user ID that is included in the event data to identify the correlated display apparatus ID, and also searches the second management table **532** with this display apparatus ID to identify the address (CS address) of the correlated cache server **7** (step S**3**).

[0075] In this embodiment, it is presumed that display apparatus ID that corresponds to the user ID is registered in advance in the first management table **531**, however, there may be cases in which registration is not in time. In that case, the user ID that is included in the event data is not found in the first management table **531**, so it is not possible to identify the address of the cache server **7**. However, for cases such as this, setting data such as illustrated in FIG. **11** may be stored in the data storage unit **53**, and the processing may be carried out according to that setting data. In the example in FIG. **11**, "A11" or "(0) Zero" is registered according to an error processing flag. In other words, in the case of "A11", all of the cache servers **7** that are registered in the second management table **532**, for example, are set as the transfer destination. Moreover, in the case of "0", it means that it was not possible to identify any cache server **7**.

[0076] When it was not possible to identify an address of the cache server **7** (step S**5**: NO route), the processing ends as an error (step S**9**).

[0077] On the other hand, when it is possible to identify the address of the cache server **7**, the transfer destination determination unit **52** outputs the address of the identified cache server **7** and the event data to the event transfer unit **54**.

[0078] The event transfer unit **54** transfers the event data that includes the user ID (for example, event data of an entrance event) to the identified cache server **7** (step S**7**).

[0079] The message receiver **71** of the cache server **7** receives the event data (event data of an entrance event) from the event collection and delivery apparatus **5** (step S**11**), and outputs that event data to the cache confirming unit **72**.

[0080] The cache confirming unit **72** searches the first management table **741** that is stored in the first data storage unit **74** by using the user ID that is included in the event data to identify the correlated contents ID, and further searches the second management table **742** by using that contents ID to determine whether or not an entry for that contents ID is registered in the second management table **742**, or in other words, determine whether or not contents data is stored in the second data storage unit **76** (step S**13**). Similar to the case described above, the registration of the user ID in the first management table **741** may be delayed. In such a case, the contents ID cannot be identified, so the processing ends here. Moreover, when the identified contents ID has been registered in the second management table **742**, the processing ends here. In the second management table **742**, the user ID of the user who lastly used the contents, which is associated with the identified contents ID, may be updated with the user ID that is included in the received event data, and the date of the last utilization, which is also correlated with the identified contents ID, may be updated with the current time.

[0081] On the other hand, when the identified contents ID has not been registered in the second management table **742**, the cache confirming unit **72** outputs the contents ID and user ID to the contents obtaining unit **73**, and the contents obtaining unit **73** transmits a contents request that includes the contents ID to the center server **3** (step S**15**).

[0082] The communication unit **31** of the center server **3** receives the contents request that includes the contents ID (step S**17**) and outputs the contents ID to the data extractor **32**, then the data extractor **32** reads the contents data for the received contents ID from the contents storage unit **33**, and outputs that contents data to the communication unit **31**. The communication unit **31** then transmits the contents data that corresponds to the contents ID to the cache server **7** (step S**19**). The contents data includes data about the output conditions, and contents data that corresponds to each of the output conditions.

[0083] When receiving the contents data from the center server **3**, the contents obtaining unit **73** of the cache server **7** stores the contents data in the second data storage unit **76**, as wall as registers the data of the output conditions and data concerning the storage destination of the contents data in the second management table **742** of the first data storage unit **74** in association with the contents ID of that contents (step S**21**).

[0084] In the second management table **742**, the user ID of the user who lastly used, which is associated with the contents ID, may be updated with the user ID included in the received event data, and the date of the last utilization, which is correlated with the contents ID, may be updated with the current date.

[0085] The processing described above is a processing that is carried out when the user's IC card is read at the entrance by the sensor **9**, and before the user goes to one of the display apparatuses **11**.

[0086] Next, a processing that is carried out when the user goes to an area where the display apparatus **11** is installed, and has the IC card read by the IC card reader **111** will be explained using FIG. **12**.

[0087] When the IC card reader **111** of the display apparatus **11** reads the user ID from the IC card, and a temperature sensor **112** measures the temperature, the transmitter **113** transmits a contents request that includes the user ID and temperature (generally, the sensor value) to the cache server **7** (FIG. **12**: step S**31**). When the contents request processing unit **75** of the cache server **7** receives the contents request that includes the user ID and temperature from the display apparatus **11** (step S**33**), contents request processing unit **75** searches the first management table **741** using the user ID that is included in the contents request to read the contents ID, then searches the second management table **742** using the contents ID and the temperature, which are included in the contents request, to determine whether or not corresponding contents data is stored in the second data storage unit **76** (step S**35**). For example, when the temperature is 15 degrees, the contents request processing unit **75** searches the second management table **742** using the identified contents ID and the condition of the temperature of 15 degrees, to determine whether or not the storage destination of the contents data is registered.

[0088] When the user ID is not registered in the first management table **741**, the contents request processing unit **75** transmits an error notification to the display apparatus **11**, and the display apparatus **11**, for example, outputs general contents.

[0089] When the corresponding contents data is stored in the second data storage unit **76** (step S**37**: YES route), the processing moves to step S**45**. On the other hand, when the corresponding contents data is not stored in the second data storage unit **76** (step S**37**: NO route), the contents request processing unit **75** outputs the contents ID and user ID to the contents obtaining unit **73**. As a result, the contents request processing unit **75** transmits a contents request that includes the contents ID that corresponds to the user ID to the center server **3** (step S**39**).

[0090] The communication unit **31** of the center server **3** receives the contents request that includes the contents ID and outputs the contents ID to the data extractor **32**, the data extractor **32** then reads the contents data of the received contents ID from the contents storage unit **33**, and outputs that contents data to the communication unit **31**. The communication unit **31** then transmits the contents data that corresponds to the contents ID to the cache server **7** (step S**41**). The contents data includes data about the output conditions, and contents data that corresponds to each of the output conditions.

[0091] When the contents obtaining unit **73** of the cache server **7** receives the contents data from the center server **3**, the contents obtaining unit **73** then stores the contents data in the second data storage unit **76**, and registers the data regarding the output conditions and data regarding the storage destination of the contents data in association with the contents ID of that contents data in the second management table **742** of the first data storage unit **74** (step S**43**). The processing then moves to the step S**45**.

[0092] In the second management table **142**, the user ID of the user who lastly used, which is correlated with the contents ID, may be updated with the user ID that is included in the received event data, and the time of the last utilization, which is correlated with the contents ID, may be updated with the current date and time.

[0093] After that, the contents request processing unit **75** of the cache server **7** reads contents data that corresponds to the user ID and the temperature from the second data storage unit **76**, and outputs that contents data to the display apparatus **11** that is the request source (step S**45**).

[0094] The receiver **114** of the display apparatus **11** receives the contents data from the cache server **7** and stores the contents data in the buffer **115**. The output unit **116** outputs the contents data that is stored in the buffer **115** to the display unit **117** (step S**47**).

[0095] By performing the processing described above, it is possible to output contents data to the display apparatus **11** that is suitable for the user without directly transmitting plural event data to the center server **3** and causing the center server **3** to carry out the processing. In other words, the processing is carried out in a distributed manner among the cache servers **7** that are distributed such that there is no slow response from the center server **3**. Then, also in the overall system, the processing can be performed efficiently.

Embodiment 2

[0096] In the first embodiment as well, garbage collection in the second data storage unit **76** of the cache server **7** is carried out by a typical algorithm. However, for example, after contents data for a specific user has been stored in the second data storage unit **76** of the cache server **7**, when that specific user exits, there are cases in which the contents data for that specific user may not be used for other general users. In such a case, the capacity of the second data storage unit **76** is wastefully used, so in this embodiment, the capacity of the second data storage unit **76** of the cache server **7** becomes effectively used in such cases.

[0097] The system configuration of this embodiment is the same as the system configuration of the first embodiment, and only the portion of the processing contents described below is different. Therefore, an explanation of the system configuration is omitted, and only the portion of the processing contents that is different will be explained using FIG. **13** and FIG. **14**.

[0098] When the event receiver **51** of the event collection and delivery apparatus **5** receives entrance event data that includes a user ID from a sensor **9** at an entrance, for example (FIG. **13**: step S**51**), the event receiver **51** outputs that entrance event data to the transfer destination determination unit **52**. When the "transfer" destination determination unit **52** receives the entrance event data, the transfer destination determination unit **52** searches the first management table **531** by using the user ID that is included in that entrance event data to identify a correlated display apparatus ID, then searches the second management table **532** by using that display apparatus ID to identify the address (CS address) of the correlated cache server **7** (step S**53**).

[0099] The processing in the case when the user ID is not registered in the first management table **531** is the same as in the first embodiment, and an explanation will be omitted here.

[0100] The transfer destination determination unit **52** then outputs the address of the identified cache server **7** and the entrance event data to the event transfer unit **54**.

[0101] The event transfer unit **54** transfers the entrance event data that includes the user **10** to the identified cache server **7** (step S**55**).

[0102] When the message receiver **71** of the cache server **7** receives the entrance event data from the event collection and delivery apparatus **5** (step S**57**), the message receiver **71** outputs that entrance event data to the cache confirming unit **72**.

[0103] The cache confirming unit **72** searches the first management table **741** that is stored in the first data storage unit **74** by using the user ID that is included in the entrance event data to identify a correlated contents ID, and then searches the second management table **742** by using that contents ID to determine whether or not an entry for that contents ID is registered in the second management table **742**, or in other words, whether or not contents data is stored in the second data storage unit **76** (step S**59**). There is also a case where the user ID is not registered in the first management table **741**, however, the processing in that case is the same as in the first embodiment, so an explanation is omitted here. Moreover, in the case where an entry for the contents ID is registered in the second management table **142** (step S**61**: YES route), the cache confirming unit **72** updates, in the second management table **742**, the user ID of the user who used lastly, which is correlated with the contents ID with the user ID that is included in the received entrance event data, and updates the date and time of the last utilization with the current date and time (step S**70**).

[0104] On the other hand, when an entry for the contents ID is not registered in the second management table **742** (step S**61**: NO route), the cache confirming unit **72** outputs the contents ID and user ID to the contents obtaining unit **73**, and the contents obtaining unit **73** transmits a contents request that includes the contents ID to the center server **3** (step S**63**).

[0105] The communication unit **31** of the center server **3** receives the contents request that includes the contents ID (step S**65**), and outputs the contents ID to the data extractor **32**, then the data extractor **32** reads the contents data of the received contents ID from the contents storage unit **33**, and outputs the contents data to the communication unit **31**. The communication unit **31** then transmits the contents data that corresponds to the contents ID to the cache server **7** (step S**67**). The contents data includes data about the output conditions, and contents data that corresponds to each of the output conditions.

[0106] When the contents obtaining unit **73** of the cache server **7** receives the contents data from the center server **3**, the contents obtaining unit **73** stores the contents data in the second data storage unit **76**, registers, in the second management table **742** of the first data storage unit **74**, the data regarding the output conditions, data regarding the storage destination of the contents data, the user ID that is included in the entrance event data and the current date and time in association with the contents ID of the contents data (step S**69**).

[0107] The processing described above is a processing that is carried out after the user has the IC card read by the sensor **9** at the entrance, and before he or she goes to any one of the display apparatuses **11**.

[0108] Next, the processing that is carried out when the user exits from the exit of the building or the like will be explained using FIG. **14**.

[0109] When the event receiver **51** of the event collection and delivery apparatus **5** receives exit event data that includes a user ID from the sensor **9** at the exit, for example (FIG. **14**: step S**71**), the event receiver **51** outputs that exit event data to the transfer destination determination unit **52**. When the transfer destination determination unit **52** receives the exit event data, the transfer destination determination unit **52** searches the first management table **531** by using the user ID that is included in the exit event data to identify a correlated display apparatus ID, and then searches the second management table **532** by using that display apparatus ID to identify the address (CS address) of a correlated cache server **7** (step S**73**).

[0110] The processing that is carried out when the user ID is not registered in the first management table **531** is the same as in the first embodiment, so an explanation is omitted here.

[0111] The transfer destination determination unit **52** then outputs the address of the identified cache server **7** and the exit event data to the event transfer unit **54**.

[0112] The event transfer unit **54** transfers the exit event data that includes the user ID to the identified cache server **7** (step S**75**).

[0113] When the message receiver **71** of the cache server **7** receives the exit event data from the event collection and delivery apparatus **5** (step S**77**), the message receiver **71** outputs that exit event data to the cache confirming unit **72**.

[0114] The cache confirming unit **72** searches the first management table **741** that is stored in the first data storage unit **74** by using the user ID that is included in the exit event data to identify the correlated contents ID (step S**79**). Then, the cache confirming unit **72** searches the second management table **742** by using the identified contents ID to identify a corresponding entry. When there is no corresponding entry, the processing ends here. However, when there is a corresponding entry, the cache confirming unit **72** determines whether or not the user ID of the user who lastly used in that entry coincides with the user ID that is included in the exit event data (step S**81**).

[0115] Here, when the user ID of the user who lastly used in that entry does not coincide with the user ID that is included in the exit event data, the processing ends here.

[0116] On the other hand, when the user ID of the user who lastly used in that entry coincides with the user ID that is included in the exit event data, the cache confirming unit **72** deletes that entry from the second management table **742**, and deletes the contents data at the storage destination included in that entry from the second data storage unit **76** (step S**83**). This processing may be carried out by the contents obtaining unit **73**.

[0117] When a second user who is correlated with contents data that is the same as the contents data, which was stored in the cache server **7** when a first user entered, enters the building or the like, the user ID of the user who lastly used in the entry for the contents data is replaced with the user ID of the second user in the second management table **742**. Therefore, the contents data is not deleted at the step S**83**. However, when another user that is correlated with the same contents data does not enter between the times that the first user enters and exits, it is not efficient in the capacity to maintain this contents data. Therefore, by deleting the contents data with this processing, the second data storage unit **76** is effectively utilized.

Embodiment 3

[0118] In the first and second embodiments, the problem in which the event data becomes concentrated at the center

server **3** was handled, however, this embodiment includes a configuration example for improving the utilization efficiency of the capacity in the cache server **7**.

[0119] In this embodiment as well, the overall system is the same as that of the first embodiment explained using FIG. **1**. Moreover, the configuration of the display apparatus **11** is also the same as that in the first embodiment.

[0120] FIG. **15** illustrates a configuration example of an event collection and delivery apparatus **5**. As illustrated in FIG. **15**, the event collection and delivery apparatus **5** of this embodiment has an event receiver **51** and an event transfer unit **54**. In other words, when the event receiver **51** receives event data from a sensor **3**, the event receiver **51** outputs that event data to the event transfer unit **54**, then the event transfer unit **54** transmits that event data to the center server **3**.

[0121] Next, FIG. **16** illustrates a configuration example of a center server **3** in this embodiment. The center sever **3** has an event receiver **311**, a contents determination unit **312**, a first data storage unit **313**, a second data storage unit **314**, a third data storage unit **315**, a transmission destination determining unit **316**, a contents storage unit **318**, and a contents delivery unit **317**. The first data storage unit **313** stores a first management table **3131**. The second data storage unit **314** stores a user access list **3141**. The third data storage unit **315** stores a third management table **3151**, a fourth management table **3152** and a fifth management table **3153**. The contents storage unit **318** stores contents data that is to be delivered to the display apparatuses **11** included in the system.

[0122] FIG. **17** illustrates an example of data that is stored in the first management table **3131**. In the example in FIG. **17**, a contents ID of contents suitable for a user of a user ID is registered in association with that user ID.

[0123] FIG. **18** illustrates an example of data that is stored in the user access list **3141**. In the example in FIG. **18**, pairs of the contents ID and user ID are stored. An entry in the user access list **3141** is registered by the contents determination unit **312**, and fetched by the transmission destination determining unit **316**.

[0124] FIG. **19** illustrates an example of data that is stored in the third management table **3151**. In the example in FIG. **19**, the display apparatus IDs of one or more display apparatuses that are often used by a user are registered in association with the user ID of that user.

[0125] FIG. **20** illustrates an example of data that is stored in the fourth management table **3152**. In the example in FIG. **20**, the address (CS address) of a cache server **7** that is accessed by a display apparatus **11** having a display apparatus ID, and the average throughput (for example, hits per second) between that display apparatus **11** and the cache server **7** are registered in association with the display apparatus ID. In this example, the display apparatus d100 accesses two cache servers **7**, and the display apparatus d101 also accesses the same two cache servers **7**. However, when a pair of the display apparatus **11** and cache server **7** is different, the network path is also different, so the average throughput may also be different.

[0126] FIG. **21** illustrates an example of data that is stored in the fifth management table **3153**. In the example in FIG. **21**, for each contents ID, one or more output condition, the storage destination of the contents data corresponding to each output condition, and the size of the contents data are stored. As illustrated in FIG. **21**, when plural files are correlated with a contents ID, those files are handled as a set with the output conditions.

[0127] When the event receiver **311** receives event data from the event collection and delivery apparatus **5**, the event receiver **311** outputs that event data to the contents determination unit **312**. The contents determination unit **312** reads data from the first management table **3131** that is stored in the first data storage unit **313**, and updates the user access list **3141** in the second data storage unit **314**. The transmission destination determining unit **316** reads an entry from the user access list **3141**, for example, periodically, and then by using the third to fifth management tables **3151** to **3153** that are stored in the third data storage unit **315**, the transmission destination determining unit **316** identifies the contents ID and the cache server **7** that is the delivery destination for the contents data having that contents ID, and outputs the identified data to the contents delivery unit **317**. The contents delivery unit **317** reads the contents data having the contents ID from the contents storage unit **318**, and delivers the contents data to the cache server **7** that is the delivery destination.

[0128] When a contents request is received from a cache server **7**, the contents delivery unit **317** reads the data for the contents from the contents storage unit **318** and transmits the read data to the cache server **7** that is the request source.

[0129] Next, FIG. **22** illustrates a configuration example of the cache server **7** relating to this embodiment. As illustrated in FIG. **22**, the cache server **7** relating to this embodiment has an almost similar configuration to that of the cache server **7** in the first embodiment, except for the message receiver **71** and the cache confirming unit **72** being removed. However, a following point is different, namely, the contents obtaining unit **73** receives delivered contents data from the center server **3** and stores that contents data in the second data storage unit **76**, registers data concerning that contents data in the second management table **742** without correlating that data with the user ID. The data formats of the first management table **741** and the second management table **742** are the same as those data formats in the first embodiment.

[0130] Next, the processing in this embodiment will be explained using FIG. **23** to FIG. **31**B.

[0131] The event receiver **51** of the event collection and delivery apparatus **5** receives event data A that includes a user ID (for example, "u123") from a sensor **9** (FIG. **23**: step S**91**), and outputs that event data A to the event transfer unit **54**. The event transfer unit **54** transmits that event data A to the center server **3** (step S**92**). The event receiver **311** of the center server **3** receives the event data A from the event collection and delivery apparatus **5** (step S**93**), and outputs that event data A to the contents determination unit **312**.

[0132] When the contents determination unit **312** receives the event data A, the contents determination unit **312** extracts the contents ID (for example, "c20") that corresponds to the user ID that is included in the event data A from the first management table **3131** (step S**95**). Then, the contents determination unit **312** registers a pair of the user ID and contents ID in the user access list **3141** (step S**97**).

[0133] Moreover, the event receiver **51** of the event collection and delivery apparatus **5** receives event data B that includes a user ID (for example, "u222") from a sensor **3** (step S**99**), and outputs that event data B to the event transfer unit **54**. The event transfer unit **54** transmits the event data B to the center server **3** (step S**100**). The event receiver **311** of the center server **3** receives the event data B from the event collection and delivery apparatus **5** (step S**101**), and outputs that event data B to the contents determination unit **312**.

[0134] When the contents determination unit **312** receives the event data B, the contents determination unit **312** extracts the contents ID (for example, "c20") that corresponds to the user ID that is included in that event data B from the first management table **3131** (step S**103**). Then, the contents determination unit **312** registers a pair of the user ID and contents ID in the user access list **3141** (step S**105**).

[0135] By carrying out this processing, the first two entries such as illustrated in FIG. **18** are stored in the user access list **3141**. In addition, such a processing is repeated.

[0136] Next, the processing executed by the transmission destination determining unit **316** or the like will be explained using FIG. **24** to FIG. **30**. This processing is carried out asynchronously to the processing in FIG. **23**, for example, at fixed intervals (1 second intervals or the like).

[0137] The transmission destination determining unit **316** reads all of the currently registered entries from the user access list **3141** (FIG. **24**: step S**111**). The data of the read entries is deleted from the user access list **3141**.

[0138] Then, the transmission destination determining unit **316** identifies one unprocessed entry from among a set of read entries (step S**113**). The identified entry is deleted from the set of entries. The transmission destination determining unit **316** then extracts other entries that include the same contents ID as the contents ID that is included in the identified entry from the set of entries (step S**115**).

[0139] For example, when three entries are registered in the user access list **3141** as illustrated in FIG. **18**, these three entries are registered in the set of entries, and other entries that include the same contents ID as the contents ID "c20" that is included in the first entry ("c20" and "u123") are the second entry ("c20" and "u222") and the third entry ("c20" and "u333"). When other entries have been extracted at the step S**115**, these other entries are also deleted from the set of entries.

[0140] When other entries are not extracted at the step S**115** (step S**117**: NO route), there is only one user to whom the same contents data is to be delivered at this timing, so the transmission destination determining unit **316** carries out a single user processing (step S**119**). Then, the processing then moves to step S**123**.

[0141] On the other hand, when other entries are extracted at the step S**115** (step S**117**: YES route), there are more than one user to whom the same contents data is to be delivered at this timing, so the transmission destination determining unit **316** carries out a plural-user processing (step S**121**).

[0142] After the step S**119** or step S**121**, the transmission destination determining unit **316** determines whether or not there is an unprocessed entry in the set of entries (step S**123**). When there is an unprocessed entry in the set of entries, the processing returns to the step S**113**. On the other hand, when there is no unprocessed entry in the set of entries, the processing at this timing ends.

[0143] Next, the single user processing will be explained using FIG. **25**. The transmission destination determining unit **316** searches the third management table **3131** by using the user ID that is included in the identified entry to obtain the display apparatus ID that corresponds to the user ID (FIG. **25**: step S**131**). Then, the transmission destination determining unit **316** searches the fourth management table **3152** by using the display apparatus ID that was obtained to select one address of a cache server **7** that corresponds to the display apparatus ID (step S**133**). In the example in FIG. **20**, two cache servers **7** are registered in association with the display apparatus ID "d100", so a cache server **7** may be selected randomly, for example, or the cache server **7** having the greatest value of the average throughput may be selected.

[0144] After selecting the address of the cache server **7**, the transmission destination determining unit **316** outputs the contents ID and the address of the cache server **7** to the contents delivery unit **317**. When the contents delivery unit **317** receives the contents ID and address of the cache server **7**, the contents delivery unit **317** reads the contents data (including the output conditions and actual contents data) that corresponds to the contents ID from the contents storage unit **310**, and delivers the contents data to the selected cache server **7** (step S**135**).

[0145] Therefore, when the contents obtaining unit **73** of the cache server **7** receives the contents data from the center server **3**, the contents obtaining unit **73** stores the contents data in the second data storage unit **76**. Then, the contents obtaining unit **73** registers the contents ID, the output conditions and the storage destination of the contents data in the second management table **742**.

[0146] The plural-user processing will be explained using FIG. **26** to FIG. **31**A.

[0147] First, the transmission destination determining unit **316** searches the third management table **3151** by using the user ID that is included in the entry identified at the step S**113** and the entries extracted at the step S**115** (hereafter, called the processing target entries) to identify the display apparatus ID that corresponds to the user ID (step S**141**). The transmission destination determining unit **316** their generates a display apparatus list that includes the identified display apparatus ID, and stores that list in the third data storage unit **315**, for example.

[0148] The transmission destination determining unit **316** then searches the fourth management table **3152** by using the identified display apparatus ID to obtain the address and average throughput of the cache server **7** that corresponds to the display apparatus ID (step S**143**).

[0149] When the three entries illustrated in FIG. **18** are processed, data such as illustrated in FIG. **20** is obtained at the step S**143**. Display apparatuses d100 and d101 are connected to both cache server "10.25.25.10" and cache server "10.25.25.11". In other words, as seen from the display apparatuses d100 and d101, there is a common cache server "10.25.25.10", and there is also another common cache server "10.25.25.11". On the other hand, as for the extracted third entry having the same contents ID, the display apparatus d201 is extracted, and the cache server **7** to which that display apparatus d201 is connected is "10.25.25.19", and this cache server **1** is not connected to the display apparatuses d100 and d101. When illustrated schematically, a connection relationship such as illustrated in FIG. **27** is obtained. In such a case, the contents data "c20" is delivered to one of the common cache servers "10.25.25.10" and "10.25.25.11", and by having the display apparatuses d100 and d101 access that one cache server, utilization efficiency of the second data storage unit **76** in the cache server **7** is improved. Which of the common cache servers to select is determined by taking into consideration the response time to the user on the display apparatus. In other words, as many display apparatuses as possible share a common cache server, and the communication time between the display apparatus and cache server, which affects the response time, is kept below a threshold value.

[0150] On the other hand, the display apparatus d201 has to use the cache server "10.25.25.19", so the contents data "c20" is transmitted to the cache server "10.25.25.19".

[0151] Moreover, the transmission destination determining unit **316** searches the fifth management table **3153** by using the contents ID of the processing target to obtain the file size (step S**145**). For example, here, as for contents ID "c20", it is assumed that a file size of "20M" is obtained.

[0152] The transmission destination determining unit **316** then calculates the communication time by "file size/average throughput" for each combination of the display apparatus whose display apparatus ID is registered in the display apparatus list and the cache server **7** whose address is identified at the step S**143**, and registers that communication time in a combination list (step S**147**).

[0153] An example of the combination list is illustrated in FIG. **28**. When combining three cache servers and three display apparatuses, nine combinations are generated, however, in the case of a connection relationship as illustrated in FIG. **27**, the average throughput for the combinations of the cache servers "10.25.25.10" and "10.25.25.11" and the display apparatus "d201" are not registered in the fourth management table **3152**, so the communication times cannot be calculated. In addition, the average throughput for the combinations of the cache servers "10.25.25.19" and the display apparatuses d100 and d101 are also not registered in the fourth management table **3152**, so the communication times cannot be calculated.

[0154] The transmission destination determining unit **316** then identifies the combination having the longest communication time from among the communication times that do not exceed a threshold value (for example "1.0") (step S**149**). In the example in FIG. **28**, the combination of the display apparatus d101 and the cache server "10.25.25.11", which has the communication time of "1.0", is identified.

[0155] Here, when it is possible to identify a combination that satisfies the conditions of the step S**149** (step S**151**: YES route), the processing moves to the processing in FIG. **23** by way of a terminal A. On the other hand, when it is not possible to identify a combination that satisfies the conditions of the step S**149** (step S**151**: NO route), the transmission destination determining unit **316** selects the cache server **7** having the shortest communication time for each display apparatus ID in the display apparatus list (step S**153**). In the case where the cache server **7** having the priority for each display apparatus is known, that cache server **7** may be selected. The processing then moves to step S**171** in FIG. **30** by way of a terminal B.

[0156] Moving to an explanation of the processing in FIG. **29**, the transmission destination determining unit **216** identifies one unprocessed display apparatus ID from among the display apparatus IDs that are included in the display apparatus list identified at the step S**141** (step S**155**). The transmission destination determining unit **316** then identifies, from the combination list, the communication time between the cache server **7** for the combination identified at the step S**149** and the display apparatus having the identified display apparatus ID (step S**157**). In checking a table in FIG. **28** for the communication times corresponding to the combinations of the cache server "10.25.25.11" and the display apparatuses d100, d101 and d201, the communication time for the display apparatus d100 is "1.33", and "-" is set for the display apparatus d201.

[0157] The transmission destination determining unit **316** determines whether or not the communication time is within a threshold value (step S**159**). When the communication time is within the threshold value, the transmission destination determining unit **316** adds the display apparatus ID to a second list (step S**160**). The processing then moves to step S**163**. On the other hand, when the communication time exceeds the threshold value, the transmission destination determining unit **316** adds the display apparatus ID to a first list (step S**161**). The processing then moves to the step S**163**.

[0158] By doing so, "d100" and "d201" are registered in the first list, and "d101" is registered in the second list.

[0159] The transmission destination determining unit **316** then determines whether or not there is an unprocessed display apparatus ID (step S**163**), and when there is an unprocessed display apparatus ID, the processing returns to the step S**155**. On the other hand, when there is no unprocessed display apparatus ID, the transmission destination determining unit **316** determines whether or not there is an unprocessed combination for which the communication time does not exceed the threshold value and that is for a different cache server (step S**165**).

[0160] When there is an unprocessed combination for which the communication time does not exceed the threshold value and that is for a different cache server, the transmission destination determining unit **315** identifies a combination having the next longer communication time (step S**167**). In the example in FIG. **28**, the communication time of the combination of the display apparatus "d100" and the cache server "10.25.25.10" is "0.8", so this combination is identified. The processing then returns to the step S**155**. The first list and second list are stored in association with the addresses of the cache servers **7**, for example, in the third data storage unit **315**.

[0161] When the processing is carried out for the next combination, "d201" is registered in the first list, and "d100" and "d101" are registered in the second list.

[0162] In the example of FIG. **28**, there is a combination (the display apparatus "d101" and the cache server "10.25.25.10") having a communication time of "0.67", however, the processing has already been carried out for the cache server "10.25.25.10", so the processing is not carried out for this combination.

[0163] On the other hand, when there is no unprocessed combination for which the communication time does not exceed the threshold value and that is for a different cache server, the transmission destination determining unit **316** identifies a cache server **7** for which the most display apparatus IDs are registered in the second list, and holds the first list for that cache server **7** (step S**169**). In the case where there are cache servers **7** for which the number of display apparatus IDs is the same, one cache server is selected randomly or by other methods. The processing then moves to the processing in FIG. **30** by way of the terminal **8**.

[0164] By doing so, a common cache server **7** is identified for which the communication time is a predetermined time or less and that can be accessed by as many display apparatuses as possible. Display apparatus IDs of the display apparatuses that cannot be coped with thus cache server are included in the first list.

[0165] In the embodiment described above, the cache server "10.25.25.10" is identified, and "d201" is registered in the first list.

[0166] Moving to an explanation of the processing in FIG. **30**, the transmission destination determining unit **316** outputs the address of the cache server **7** that was identified at the step

S169 or the cache server 7 that was selected at the step S153, and the contents ID to be processed to the contents delivery unit 317. When the contents delivery unit 317 receives the address of the cache server 7 and the contents ID, the contents delivery unit 317 reads the contents data that corresponds to that contents ID from the contents storage unit 318, and transmits that contents data to the address of the cache server 7 (step S171).

[0167] The transmission destination determining unit 316 then determines whether or not there is a first list (step S173). When there is no first list, for example, when this step was arrived at by way of the step S153, there is no first list. Therefore, the processing returns to the calling-source processing.

[0168] On the other hand, when there is a first list, the transmission destination determining unit 316 deletes the combinations for the transmission destination cache server of the contents data from the combinations of the cache servers 7 and the display apparatuses 11 (the combination list in FIG. 28), and further limits the processing target to the combinations for the display apparatus IDs included in the first list (step S175). The processing then returns to the step S149 in FIG. 26 by way of a terminal C.

[0169] In the embodiment described above, when deleting combinations for the cache server "10.25.25.10" and limiting the processing target to combinations for the display apparatus "d201", the processing target is limited to a combination such as illustrated in FIG. 31A.

[0170] After returning to the step S149 by way of the terminal C in this processing, the processing then moves to the step S153 and advances. In other words, the contents data is transmitted to the cache server "10.25.25.19".

[0171] Each display apparatus 11 carries out a processing such as illustrated in FIG. 31B. The IC card reader 111 of the display apparatus 11 reads the user ID from the IC card of the user, and outputs that user ID to the transmitter 113. In response to a request from the transmitter 113, for example, the temperature sensor 112 outputs a measured value of the temperature to the transmitter 113. When the transmitter 113 obtains the user ID and a sensor value (temperature) (step S401), the transmitter 113 transmits a contents request that includes the user ID and the sensor value to the cache server 7 of this display apparatus 11, which has the highest priority (step S403). The receiver 114 determines whether or not the contents data could be received within a predetermined amount of time (step S405). When the contents data could not be received within the predetermined amount of time, the receiver 114 notifies the transmitter 113 of that. On the other hand, when the contents data could be received within the predetermined amount of time, the display unit 117 displays the contents (step S407). After receiving a notification from the receiver 114, the transmitter 113 checks whether or not there is a cache server 7 having next higher priority (step S409). In this embodiment, access destination cache servers 7 are ranked, and the contents requests are transmitted in order from the cache server having the highest priority. When there is no cache server 7 having next higher priority, the transmitter 113 notifies the receiver 114 that a contents request could not be transmitted, and in response to this notification, the receiver 114 instructs the output unit 116 to output general contents. The output unit 116 outputs general contents that are stored in the buffer 115 to the display unit 117 (step S411).

[0172] On the other hand, when there is a cache server 7 having the next higher priority, the transmitter 113 transmits a contents request to the cache server 7 having the next higher priority (step S413). The processing then returns to the step S405.

[0173] In this way, even when there is no contents data in the cache server 7 having the highest priority, it is possible to obtain contents data from another accessible cache server 7. In this embodiment, when the cache server 7 does not have contents data relating to the contents request from the display apparatus 11, a contents request may not be transmitted to the center server 3. This is because the processing load on the center server 3 is lowered and, when the display apparatus 11 accesses a cache server 7 that is not the cache server 7 having the highest priority and obtains the contents data, there is a possibility that the contents data that is cached may become useless.

[0174] By carrying out a processing such as described above, the delivery destination of the contents data is reduced, so the amount of data that is cached in the cache server 7 can be reduced for the overall system.

[0175] An example was given of transmitting contents data at the step S171, however, a contents ID may be transmitted, and after the contents obtaining unit 73 of the cache server 7 checks whether or not the contents data corresponding to this contents ID is cached in the second data storage unit 76 and when it is found that the contents data is not cached, a request may be sent. By doing so, it is possible to reduce the amount of delivered data.

[0176] Furthermore, the center server 3 may manage the contents ID of the contents cached by each cache server 7, and the center server 3 may deliver the contents data after checking the management data as to whether or not data is to be actually delivered. In this way, it is also possible to reduce the amount of data to be delivered.

Embodiment 4

[0177] In the third embodiment, an example in which the center server 3 carries out the main processing was explained. This is because collecting the event data from plural event collection and delivery apparatuses 5 has an advantage in that it is easy to find users to which the same contents are to be delivered. On the other hand, when the event data is transmitted to the center server 3, there is a possibility that the processing load on the center server 3 will become high.

[0178] Therefore, in this embodiment, a processing that was carried out by the center server 3 in the third embodiment is conducted by the event collection and delivery apparatuses 5.

[0179] The system configuration of this embodiment is the same as the system configuration of the first and second embodiments, so an explanation here is omitted. The configuration of the center server 3 and the display apparatuses 11 is also the same as in the first embodiment, so and explanation here is omitted.

[0180] The configuration of the event collection and delivery apparatus 5 relating to this embodiment is illustrated in FIG. 32. The configuration of the center server 3 relating to this embodiment is mainly the same as the construction of the center server 3 in the third embodiment, so in the explanation, is added to reference numbers for component elements that are mostly the same in FIG. 16.

[0181] The event collection and delivery apparatus 5 has an event receiver 311*b*, a contents determination unit 312*b*, a first data storage unit 313*b*, a second data storage unit 314*b*, a third data storage unit 315*b*, a transmission destination deter-

mining unit **316***b*, and an event transfer unit **56**. The difference with the configuration illustrated in FIG. **16** is that there is no contents storage unit **318**, and instead of the contents delivery unit **317**, there is an event transfer unit **56**.

[0182] Moreover, the first data storage unit **313***b* stores a first management table **3131***b*. The second data storage unit **314***b* stores a user access list **3141***b*. The third data storage unit **315***b* stores a third management table **3151***b*, a fourth management table **3152***b* and a fifth management table **3153***b*.

[0183] When the event receiver **311***b* receives the event data from a sensor **9**, the event receiver **311***b* outputs that event data to the contents determination unit **312***b*. The contents determination unit **312***b* reads data from the first management table **3131***b* that is stored in the first data storage unit **313***b*, and updates the user access list **3141***b* in the second data storage unit **314***b*. The transmission destination determining unit **316***b* roads an entry from the user access list **3141***b*, for example, periodically, and identifies a cache server **7** as the transfer destination of the event data by using the third to fifth management tables **3151***b* to **3153***b* stored in the third data storage unit **315***b*, and outputs data of the identified cache server **7** to the event transfer unit **56**. The event transfer unit **56** transmits the event data that includes a user ID to foe processed to the identified cache server **7**.

[0184] The detailed contents of the processing in this embodiment mainly follow the processing flow explained in the third embodiment. Each step is carried out by each of the component elements in the event collection and delivery apparatus **5** illustrated in FIG. **32**, and the transmission source of the event data is a sensor **9**.

[0185] The different portion of the processing is the portion in FIG. **30** in the third embodiment, which is replaced with a processing such as illustrated in FIG. **33**.

[0186] More specifically, the transmission destination determining unit **316***b* outputs the address of the cache server **7** that was identified at the step S**169** or the cache server **7** that was selected at the step S**153**, and the user ID with which the display apparatus that is associated with the identified or selected cache server **7** is correlated, to the event transfer unit **56**. When the event transfer unit **56** receives the address of the cache server **7** and the user ID, the event transfer unit **56** transmits the event data that includes that user ID to the address of the cache server **7** (step S**181**).

[0187] In the example used for the third embodiment, the display apparatuses "d100" and "d101" correspond to the cache server "10.25.25.10", and user IDs "u123" and "u222" are correlated with these display apparatuses. Therefore, the event data that includes "u123" and "u222" is transmitted to the cache server "10.25.25.10".

[0188] Similarly, the display apparatus "d201" is correlated with the cache server "10.25.25.19", and the user ID "u333" is correlated with this display apparatus. Therefore, event data that includes "u333" is transmitted to the cache server "10.25.25.19".

[0189] Then, the transmission destination determining unit **316***b* determines whether or not there is a first list (step S**183**). When there is no first list, for example, when this step is arrived at by way of the step S**153**, there is no first list, so the processing returns to the calling-source processing.

[0190] However, when there is a first list, the transmission destination determining unit **316***b* deletes the combination for the transmission destination cache server of the contents data from the combinations of the cache servers **7** and the display apparatuses (the combination list in FIG. **28**), and further limits the processing target to the combinations for the display apparatus IDs included in the first list (step S**185**). The processing then returns to the step S**149** in FIG. **26** by way of the terminal C.

[0191] By performing the processing described above, a processing is performed in a distributed manner by the event collection and delivery apparatuses **5**, so it is possible to reduce the processing load on the center server **3**.

[0192] The contents ID itself is also identified by the event collection and delivery apparatus **5**, so by transmitting the contents ID together with the user ID to the cache server **7**, it is possible to reduce the amount of processing by the cache server **7**.

Embodiment 5

[0193] In the third embodiment, by using the contents ID as a key, when there is a schedule to deliver the contents of that contents ID to plural users, whether or not a cache server **7** can be shared is determined. Therefore, when causing a computer other than the center server **3** to carry out the processing relating to the third embodiment, chances to share the cache server **7** increase by collecting event data based on the contents ID. In this embodiment, contents deployment destination determination servers are newly introduced.

[0194] In other words, a system such as illustrated in FIG. **34** is employed. In the example in FIG. **34**, a center server **3** that stores contents data used in the system, event collection and delivery apparatuses **5** (**5***a* and **5***b* in FIG. **34**), cache servers **7** (**7***a* and **7***b* in FIG. **34**) and newly employed contents deployment destination determination servers **13** (**13***a* and **13***b* in FIG. **34**) are connected to a network **1***a*. The event collection and delivery apparatuses **5***a* and **5***b* and plural sensors **9** (**9***a*, **9***b* and **9***c* in FIG. **34**) are connected to a network **1***b*. The cache servers **7***a* and **7***b* and display apparatuses **11** (**11***a*, **11***b* and **11***c* in FIG. **34**) are connected to a network **1***c*.

[0195] For example, the event collection and delivery apparatuses **5** and the contents deployment destination determination servers **13** are in a many-to-many relationship. However, there are cases in which there is only one contents deployment destination determination server **13**.

[0196] In this embodiment, the configuration of the center server **3** is the same as the configuration in the first embodiment. Moreover, the configurations of the sensors **9**, cache servers **7** and display apparatuses **11** are the same as those in the first embodiment.

[0197] A configuration example of an event collection and delivery apparatus **5** is illustrated in FIG. **35**. The event collection and delivery apparatus **5** relating to this embodiment has an event receiver **51**, a server selector **58**, a message transmitter **59**, and a data storage unit **53**. The data storage unit **53** stores a third management table **533** and a fourth management table **534**.

[0198] Thus, the server selector **58** and the message transmitter **59** are newly employed. The third management table **533** and fourth management table **534** are also newly employed in the data storage unit **53**.

[0199] The event receiver **51** receives event data that includes user ID from a sensor **9**, and outputs that event data to the server selector **58**. The server selector **58** identifies, from the third management table **533** and fourth management table **534** that are stored in the data storage unit **53**, a contents deployment destination determination server **13**, which will

be the message transmission destination, and outputs data for the message to be transmitted and the address of the contents deployment destination determination server **13** to the message transmitter **55**. The message transmitter **59** transmits a message to the designated contents deployment destination determination server **13**.

[0200] Data such as illustrated, for example, in FIG. **36** is stored in the third management table **533**, In the example in FIG. **36**, a contents ID is registered in association with a user ID.

[0201] Furthermore, data such as illustrated in FIG. **37**, for example, is stored in the fourth management table **534**. in the example in FIG. **37**, the address of the contents deployment destination determination server **13** is registered in association with the contents IDs. For the contents ID, a range of the contents IDs may be designated with a wildcard.

[0202] A configuration example of the contents deployment destination determination server **13** relating to this embodiment is illustrated in FIG. **38**. As for component elements that are the same as those in the center server **3** illustrated in FIG. **16**, a "c" is added to the same reference numbers for distinction.

[0203] The contents deployment destination determination server **13** has a message receiver **1303**, a registration unit **1301**, a second data storage unit **314***c*, a third data storage unit **315***c*, a transmission destination determining unit **316***c*, and a message transmitter **1302**. The second data storage unit **314***c* stores a user access list **3141***c*. The third data storage unit **315***c* stores a third management table **3151***c*, a fourth management table **3152***c* and a fifth management table **3153***c*.

[0204] When the message receiver **1303** receives a message that includes a user ID and a contents ID from an event collection and delivery apparatus **5**, the message receiver **1303** outputs that message to the registration unit **1301**. The registration unit **1301** updates the user access list **3141***c* in the second data storage unit **314***c* with the user ID and contents ID that are included in the message. The transmission destination determining unit **316***c* reads an entry from the user access list **3141***c*, for example, periodically, and uses the third to fifth management tables **3151***c* to **3153***c* that are stored in the third data storage unit **315***c* to identify a cache server **7** as the delivery destination for the contents ID and contents data of that contents ID, and outputs data concerning the identified cache server **7** to the message transmitter **1302**. The message transmitter **1302** transmits a message that includes the contents ID to the identified cache server **7**. The user ID may be transmitted, additionally.

[0205] Next, in this embodiment, the portion of the processing, which differs from that of the third embodiment, will be explained. More specifically, when the event receiver **51** of the event collection and delivery apparatus **5** receives event data (entrance event) that includes a user ID from a sensor **9** at an entrance, for example (FIG. **39**: step S**201**), the event receiver **51** outputs that event data to the server selector **58**. When the server selector **58** receives the event data, the server selector **58** searches the third management table **533** by using the user ID that is included in the event data to identify a correlated contents ID (step S**203**).

[0206] In this embodiment, display apparatus IDs that correspond to a user ID are registered beforehand, in the third management table **533**, however, there are cases in which registration is not performed in time. In such a case, the user ID that is included in the event data is not found in the third management table **533**, so it is not possible to identify a contents ID. In such a case (step S**205**: NO route), in this embodiment, the processing ends as an error (step S**213**).

[0207] On the other hand, when a contents ID can be identified (step S**205**: YES route), the server selector **58** searches the fourth management table **534** with the contents ID to identify the address of the contents deployment destination determination server **13** that corresponds to the contents ID (step S**207**), and outputs the user ID, contents ID and address of the contents deployment destination determination server **13** to the message transmitter **59**. When the message transmitter **59** receives the user ID, contents ID and address of the contents deployment destination determination server **13**, the message transmitter **59** transmits a message that includes the user ID and contents ID to the address of the contents deployment destination determination server **13** (step S**209**).

[0208] When the message receiver **1303** of the contents deployment destination determination server **13** receives a message that includes the contents ID and user ID, the message receiver **1303** outputs that message to the registration unit **1301**. When the registration unit **1301** receives the message, the registration unit **1301** registers the contents ID and user ID that are included in the message in the user access list **3141***c* (step S**211**).

[0209] By performing this processing, as for a specific set of contents, the user IDs of the users that are the delivery destinations of the contents are collected in the contents deployment destination determination server **13** that is in charge of the specific set of contents, so it becomes possible to efficiently narrow down the cache server **7** in which the contents data is to be stored. In other words, it is possible to improve the efficiency of utilization in the capacity of the cache server **7**.

[0210] The following processing is the same as the processing that is performed by the cache server **7** in the third embodiment.

[0211] The processing may be changed so that only the user ID is transmitted, and the contents ID is identified by preparing and using a management table in advance in the contents deployment destination determination server **13**.

Embodiment 6

[0212] In the third to fifth embodiments, the transmission destination determining units **316** to **316***c* select a cache server **7** without taking into consideration the capacity of the second data storage unit **76** that stores the contents data in the cache server **7**.

[0213] Then, for example, a sixth management table such as illustrated in FIG. **40** is prepared in advance in the third data storage units **315** to **315***c* that the transmission destination determining units **316** to **316***c* access. In the example in FIG. **40**, the number of contents is registered in association with the CS address. As for the data of the sixth management table, the transmission destination determining units **316** to **316***c* or another special module or the like updates the data by periodically obtaining the data for the number of contents stored in the cache server **7** from each cache server **7**.

[0214] In doing so, teleprocessing by the transmission destination determining units **316** to **316***c* illustrated in FIG. **29** is changed as illustrated in FIG. **41**, for example. The portion that is different is step S**191**, in which, when the transmission destination determining units **316** to **316***c* try to identify one cache server **7** and there are plural cache servers **7** for which the most display apparatus IDs are registered in the second list, the transmission destination determining units **316** to

316*c* read the number of contents for the cache servers **7** from the sixth management table, and identify the server having the least number of contents as the cache server **7** to be used (step S**191**). By performing the processing such as described above, when there are cache servers **7** having the same rank, the cache server **7** having more empty capacity is identified.

[0215] This embodiment can be applied to the third to the fifth embodiments. Although the embodiments of this technique were explained above, this technique is not limited to the embodiments. For example, the functional block diagrams of the aforementioned servers are mere examples, and do not correspond to program module configurations. In addition, as for the processing flow, as long as the same results can be obtained, an order of the steps may be changed, or plural steps may be executed in parallel.

[0216] Furthermore, in the aforementioned example, the entrance sensor and exit sensor are provided at the entrance and exit of the building or the like. However, this application example is a mere example. For example, the embodiments may be applied to a case where the entrance and exit management is carried out at the gates in the stations. In such a case, many variations exist as to where the center server **3** should be arranged, and for example, one center server **3** may be provided for each of plural stations. In such a case, as for the third embodiment and its variations, not only the user ID but also a place ID to identify the station are managed, and when plural entries whose contents ID and place ID are the same are found, the processing is carried out.

[0217] Furthermore, each server may be implemented by not only one computer but also plural computers.

[0218] Furthermore, matters described in one embodiment may be applied to another embodiment.

[0219] In addition, the aformentioned event collection and delivery apparatus **5**, cache server **7**, center server **3** and contents deployment destination determination server **13** and the like are computer devices as illustrated in FIG. **42**. That is, a memory **2501** (storage device), a CPU **2503** (processor), a hard dish drive (HDD) **2505**, a display controller **2507** connected to a display device **2509**, a drive device **2513** for a removable disk **2511**, an input device **2515**, and a communication controller **2517** for connection with a network are connected through a bus **2519** as illustrated in FIG. **42**. An operating system (OS) and an application program for carrying out the foregoing processing in the embodiments, are stored in the HDD **2505**, and when executed by the CPU **2503**, they are read out from the HDD **2505** to the memory **2501**. As the need arises, the CPU **2503** controls the display controller **2507**, the communication controller **2517**, and the drive device **2513**, and causes them to perform predetermined operations. Moreover, intermediate processing data is stored in the memory **2501**, and if necessary, it is stored in the HDD **2505**. In this embodiment of this technique, the application program to realize the aforementioned functions is stored in the computer-readable, non-transitory removable disk **2511** and distributed, and then it is installed into the HDD **2505** from the drive device **2513**. It may be installed into the HDD **2505** via the network such as the Internet and the communication controller **2517**. In the computer as stated above, the hardware such as the CPU **2503** and the memory **2501**, the OS and the application programs systematically cooperate with each other, so that various functions as described above in details are realized.

[0220] The aforementioned embodiments are summarized as follows:

[0221] A system relating to a first aspect of the embodiments includes: (A) a first information processing apparatus having data of a plurality of contents; (B) a plurality of display apparatuses, each having a function to read an identifier of a user; (C) a plurality of second information processing apparatus, each of which identifies data of contents to be outputted at least one of the plurality of display apparatuses, based on an identifier of a user, obtains from the first information processing apparatus and caches the data of contents, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus; and (D) a third information processing apparatus having a first data storage unit storing first correlation data to correlate an identifier of a user with at least one second information processing apparatus of the plurality of second information processing apparatuses, wherein, when detecting a predetermined event including an identifier of a user, from the first data storage unit, the third information processing apparatus identifies a second information processing apparatus, which is correlated with the identifier of the user, which is included in the detected predetermined event, and transmits the identifier of the user, which is included in the detected predetermined event, to the identified second information processing apparatus.

[0222] Thus, it is possible to reduce the processing load of the first information processing apparatus, and improve the processing efficiency in the overall system.

[0223] In addition, each of the plurality of second information processing apparatuses may further include a second data storage unit storing second correlation data to correlate an identifier of a user with an identifier of contents and third correlation data to correlate an identifier of contents and an address of a storage destination of the contents with an identifier of a user who was lastly correlated with the contents. Then, when receiving first data including a first user identifier from the third information processing apparatus, each of the plurality of second information processing apparatuses may identify an identifier of contents correlated with the first user identifier from the second correlation data, and may determine whether or not data is correlated with the identified identifier of the contents in the third correlation data. When no data is correlated with the identified identifier of the contents, each of the plurality of second information processing apparatuses may obtain data of the contents from the first information processing apparatus, and may store the obtained data into a third data storage unit, and may further store second correlation data to correlate the identified identifier of the contents, the first user identifier included in the first data with an address of a storage destination of the obtained data of the contents in the second data storage unit. When the data is correlated with the identified identifier of the contents, each of the plurality of the second information processing apparatuses may update an identifier of a user, which is included in the data with the first user identified included in the first data. When receiving second data including the first user identifier from the third information processing apparatus, each of the plurality of second information processing apparatuses may determine whether or not the third correlation data includes data with which the first user identifier included in the second data is correlated. When the third correlation data includes the data with which the first user identifier included in the second data is correlated, each of the plurality of second information processing apparatuses may delete the data with which the first user identifier is correlated and may delete data of con-

tents stored at an address of a storage destination of the data of the contents, which is included in the data with which the first user identifier is correlated.

[0224] Thus, efficiency of the cache capacity in the second information processing apparatus can be improved.

[0225] A system relating to a second aspect of the embodiments includes: (A) a first information processing apparatus having a first data storage unit storing data of a plurality of contents; (B) a plurality of display apparatuses, each including a function to read an identifier of a user; (C) a plurality of second information processing apparatuses, each of which obtains from the first information processing apparatus and caches data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses, and outputs corresponding data of contents In response to a request including an identifier of a user from the at least one display apparatus; and (D) a third information processing apparatus that transmits data including an identifier of a user to the first information processing apparatus, upon detecting a predetermined event including the identifier of the user. Then, the first information processing apparatus further includes a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents, second correlation data to correlate an identifier of a display apparatus with an identifier of a user, and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses. When receiving the data including the identifier of the user from the third information processing apparatus, the first information processing apparatus identifies an identifier of contents, which is correlated with the identifier of the user, which is included in the received data, from the first correlation data, and stores data to correlate the identifier of the user, which is included in the received data, with the identified identifier of the contents in a third data storage unit. When the third data storage unit stores data to correlate a same identifier of contents with plural identifiers of plural users, the first information processing apparatus identifies an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, from the second correlation data, and extracts from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus. When a same identifier of a second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, the first information processing apparatus reads from the first data storage unit and transmits data of the contents, for which the same identifier is identified, to the second information processing apparatus for which the same identifier is extracted or transmits the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0226] By doing so, the second information processing apparatus which is the delivery destination of the contents data is narrowed without delivering the contents data for each user, when the same contents are outputted to plural users almost at the same time. In other words, it is possible to reduce the bandwidth used in the network, and to improve the efficiency of the cache capacity in the second information processing apparatus.

[0227] In addition, the identifier of the display apparatus and the one or plural identifiers of the one or plural second information processing apparatuses may be correlated in the third correlation data with a throughput between the display apparatus and the one or plural second information processing apparatuses. Moreover, the second data storage unit may further store size data of contents for each of the plurality of contents. In such a case, when the same identifier of the second information processing apparatus is extracted for the at least two identifiers of the at least two users among the plural identifiers of the plural users, and a communication time calculated by using a size of the contents for which the same identifier is identified and a throughput between a display apparatus identified for the at least two identifiers of the at least two users and the second information processing apparatus for which the same identifier is extracted is within a threshold, the first information processing apparatus may read from the first data storage unit and may transmit data of the contents, for which the same identifier is identified, to the second information processing apparatus for which the same identifier is extracted or may transmit the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0228] Thus, it is possible to avoid that the time required to output the contents for the user from the display apparatus becomes longer than a predetermined reference.

[0229] Furthermore, the second data storage unit may further store data of the number of contents cached in each of the plurality of second information processing apparatuses. When there are plural second information processing apparatuses for which the same identifier is extracted, one of the second information processing apparatuses for which the same identifier is extracted may be selected based on the number of contents, which is stored in the second data storage unit. This processing is carried out in order to avoid that large imbalance in the number of contents cached in each of the second information processing apparatuses occurs.

[0230] A system relating to a third aspect of the embodiments includes: (A) a first information processing apparatus having a first data storage unit storing data of a plurality of contents; (B) a plurality of display apparatuses, each including a function to read an identifier of a user; (C) a plurality of second information processing apparatuses, each of which identifies data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses based on an identifier of a user, and obtains and caches the identified data of the contents from the first information processing apparatus, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus; and (D) a third information processing apparatus comprising a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents, second correlation data to correlate an identifier of a display apparatus with an identifier of a user, and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses, and a third data storage unit. When a predetermined event including an identifier of a user, the third information processing apparatus identifies, from the first correlation data, an identifier of contents, which is correlated with the identifier of the user, which is included in the detected predetermined event, and stores data to correlate the identified identifier of the contents with the identifier of the user, which is included in the detected predetermined event in the third data storage unit. When the third data storage unit stores data to correlate a same identifier of contents with plural identifiers of plural

users, the third information processing apparatus identifies an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, from the second correlation data, and extracts from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus. When a same identifier of a second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, the third information processing apparatus transmits the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0231] By adopting such a system configuration, it is possible to avoid that the processing load of the first information processing apparatus becomes high, to increase the processing efficiency of the entire system, and to improve the efficiency of the cache capacity in the second information processing apparatus.

[0232] Moreover, the aforementioned second data storage unit may further store data of the number of contents cached in each of the plurality of second information processing apparatuses. When there are plural second information processing apparatuses for which the same identifier is extracted, one of the second information processing apparatuses for which the same identifier is extracted may be selected based on the number of contents, which is stored in the third data storage unit.

[0233] Thus, it is possible to avoid that large imbalance in the number of contents cached in each of the second information processing apparatuses occurs.

[0234] Furthermore, the identifier of the display apparatus and the one or plural identifiers of the one or plural second information processing apparatuses may be correlated in the third correlation data with a throughput between the display apparatus and the one or plural second information processing apparatuses. In addition, the aforementioned second data storage unit may further store size data of contents for each of the plurality of contents. In such a case, when the same identifier of the second information processing apparatus is extracted for the at least two identifiers of the at least two user's among the plural identifiers of the plural users, and a communication time calculated by using a size of the contents for which the same identifier is identified and a throughput between a display apparatus identified for the at least two identifiers of the at least two users and the second information processing apparatus for which the same identifier is extracted is within a threshold, the third information processing apparatus may transmit the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0235] Without caching the contents data for each user, the second information processing apparatus is narrowed, which caches the contents data when the same contents are outputted for plural users almost at the same time. In other words, it is possible to reduce the bandwidth being used in the network, and to improve the efficiency of the cache capacity in the second information processing apparatus.

[0236] A system relating to a fourth aspect of the embodiments includes: (A) a first in formation processing apparatus having a first data storage unit storing data of a plurality of contents; (B) a plurality of display apparatuses, each including a function to read an identifier of a user; (C) a plurality of second information processing apparatuses, each of which identifies data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses based on an identifier of a user or an identifier of contents, and obtains and caches the identified data of the contents from the first information processing apparatus, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus; (D) a plurality of third information processing apparatuses; and (E) a fourth information processing apparatus comprising a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents and second correlation data to correlate an identifier of contents with one of the plurality of third information processing apparatuses.

[0237] Then, when a predetermined event including an identifier of a user, the fourth information processing apparatus identifies, from the first correlation data, an identifier of contents, which is correlated with the identifier of the user, which is included in the detected predetermined event, and identifies an identifier of a third information processing apparatus, which is correlated with the identified identifier of the contents, from the second correlation data, and transmits data including the identifier of the user, which is included in the detected predetermined event, and the identified identifier of the contents or data including the identifier of the user, which is included in the detected predetermined event, to the third information processing apparatus whose identifier is identified. Furthermore, each of the plurality of third information processing apparatuses comprises a third data storage unit storing second correlation data to correlate an identifier of a user with an identifier of a display apparatus and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses. Each of the plurality of third information processing apparatuses stores data to correlate the identifier of the user which is included in the data received from the fourth information processing apparatus with the identifier of the contents, which is included in the data received from the fourth information processing apparatus in a fourth data storage unit, or identifies an identifier of contents, which corresponds to the identifier of the user, which is included in the data received from the fourth information processing apparatus to store data to correlate the identifier of the user with the identified identifier of the contents, into the fourth data storage unit. When the fourth data storage unit stores data to correlate plural identifiers of plural users with a same identifier of contents, each of the plurality of third information processing apparatuses identifies, from the second correlation data, an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, and extracts from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatuses. When a same identifier of a second in formation processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, each of the plurality of third information processing apparatuses transmits the at least two identifiers of the at least two user's or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0238] Thus, because data of combinations of the identifier of the contents and the identifier of the user is collected based

on the identifier of the contents, cases where plural identifiers of plural users are associated with the same identifier of the contents increase, and the aggregation of the second information processing apparatuses, which obtains the data of the contents to be outputted to the plural users, can be effective carried out. Furthermore, if is possible to avoid that the processing load of the first information processing apparatus becomes high, and to improve the efficiency of the cache capacity in the second information processing apparatus.

[0239] In addition, the identifier of the display apparatus and the one or plural identifiers of the one or plural second information processing apparatuses may be correlated in the third correlation data with a throughput between the display apparatus and the one or plural second information processing apparatuses. Moreover, the aforementioned third data storage unit may further store size data of contents for each of the plurality of contents. In such a case, when the same identifier of the second information processing apparatus is extracted for the at least two identifiers of the at least two users among the plural identifiers of the plural users, and a communication time calculated by using a size of the contents for which the same identifier is identified and a throughput between a display apparatus identified for the at least two identifiers of the at least two users and the second information processing apparatus for which the same identifier is extracted is within a threshold, each of the plurality of third information processing apparatuses may transmit the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

[0240] Incidentally, it is possible to create a program causing a computer to execute the aforementioned processing, and such a program is stored in a computer readable storage medium or storage device such as a flexible dish, CD-ROM, DVD-ROM, magneto-optic dish, a semiconductor memory, and hard disk.

[0241] All examples and conditional language recited herein are intended for pedagogical purposes to aid the reader in understanding the invention and the concepts contributed by the inventor to furthering the art, and are to be construed as being without limitation to such specifically recited examples and conditions, nor does the organization of such examples in the specification relate to a showing of the superiority and inferiority of the invention. Although the embodiments of the present inventions have been described in detail, it should be understood that the various changes, substitutions, and alterations could be made hereto without departing from the spirit and scope of the invention.

What is claimed is:

1. A system, comprising:

a first information processing apparatus having data of a plurality of contents;

a plurality of display apparatuses, each including a function to read an identifier of a user;

a plurality of second information processing apparatuses, each of which obtains and stores portion of data of the plurality of contents from the first information processing apparatus, and outputs stored data to at least one of the plurality of display apparatuses; and

a third information processing apparatus that detects a predetermined event, and

wherein the third information processing apparatus comprises a first data storage unit storing first correlation data to correlate an identifier of a user with at least one second information processing apparatus of the plurality of second information processing apparatuses,

upon detecting the predetermined event, the third information processing apparatus identifies a second information processing apparatus correlated with an identifier of a user, which is included in data of the detected predetermined event, from the first data storage unit, and transmits the identifier of the user, which is included in the detected predetermined event, to the identified second information processing apparatus,

at least one second information processing apparatus of the plurality of second information processing apparatuses identifies data of contents to be outputted to the at least one of the plurality of display apparatuses based on the identifier of the user, which is transmitted from the third information processing apparatus,

the at least one second information processing apparatus obtains and stores the identified data from the first information processing apparatus, and

upon receipt of the identifier of the user from the at least one of the plurality of display apparatuses, the at least one second information processing apparatus outputs data of contents corresponding to the identifier of the user to the at least one of the plurality of display apparatuses.

2. The system as set forth in claim **1**, wherein each of the plurality of second information processing apparatuses further comprises a second data storage unit storing second correlation data to correlate an identifier of a user with an identifier of contents and third correlation data to correlate an identifier of contents and an address of a storage destination of the contents with an identifier of a user who was lastly correlated with the contents, and

wherein, upon receipt of first data including a first user identifier from the third information processing apparatus, each of the plurality of second information processing apparatuses identifies an identifier of contents correlated with the first user identifier from the second correlation data, and determines whether or not data is correlated with the identified identifier of the contents in the third correlation data,

upon detecting that no data is correlated with the identified identifier of the contents, each of the plurality of second reformation processing apparatuses obtains data of the contents from the first information processing apparatus, and stores the obtained data into a third data storage unit, and further stores second correlation data to correlate the identified identifier of the contents, the first user identifier included in the first data with an address of a storage destination of the obtained data of the contents in the second data storage unit,

upon detecting that the data is correlated with the identified identifier of the contents, each of the plurality of the second information processing apparatuses updates an identifier of a user, which is included in the data with the first user identifier included in the first data,

upon receipt of second data including the first user identifier from the third information processing apparatus, each of the plurality of second information processing apparatuses determines whether or not the third correlation data includes data with which the first user identifier included in the second data is correlated, and

upon detecting that the third correlation data includes the data with which the first user identifier included in the

second data is correlated, each of the plurality of second information processing apparatuses deletes the data with which the first user identifier is correlated and deletes data of contents stored at an address of a storage destination of the data of the contents, which is included in the data with which the first user identifier is correlated.

3. A system, comprising:

a first information processing apparatus having a first data storage unit storing data of a plurality of contents;

a plurality of display apparatuses, each including a function to read an identifier of a user;

a plurality of second information processing apparatuses, each of which obtains from the first information processing apparatus and caches data of contents to foe outputted to at least one display apparatus of the plurality of display apparatuses, and outputs corresponding data of contents in response to a request inciting an identifier of a user from the at least one display apparatus; and

a third information processing apparatus that transmits data including an identifier of a user to the first information processing apparatus, upon detecting a predetermined event including the identifier of the user, and

wherein the first information processing apparatus comprises a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents, second correlation data to correlate an identifier of a display apparatus with an identifier of a user, and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses,

upon receipt of the data including the identifier of the user from the third information processing apparatus, the first information processing apparatus identifies an identifier of contents, which is correlated with the identifier of the user, which is included in the received data, from the first correlation data, and stores data to correlate the identifier of the user, which is included in the received data, with the identified identifier of the contents in a third data storage unit,

upon detecting that the third data storage unit stores data to correlate a same identifier of contents with plural identifiers of plural users, the first information processing apparatus identifies an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, from the second correlation data, and extracts from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus, and

upon detecting that a same identifier of a second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, the first information processing apparatus reads from the first data storage unit and transmits data of the contents, for which the same identifier is identified, to the second information processing apparatus for which the same identifier is extracted or transmits the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

4. The system as set forth in claim **3**, wherein the identifier of the display apparatus and the one or plural identifiers of the one or plural second information processing apparatuses are correlated in the third correlation data with a throughput between the display apparatus and the one or plural second information processing apparatuses,

the second data storage unit further stores size data of contents for each of the plurality of contents, and

upon detecting that the same identifier of the second information processing apparatus is extracted for the at least two identifiers of the at least two users among the plural identifiers of the plural users, and a communication time calculated by using a size of the contents for which the same identifier is identified and a throughput between a display apparatus identified for the at least two identifiers of the at least two users and the second information processing apparatus for which the same identifier is extracted is within a threshold, the first information processing apparatus reads from the first data storage unit and transmits data of the contents, for which the same identifier is identified, to the second information processing apparatus for which the same identifier is extracted or transmits the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

5. The system as set forth in claim **3**, wherein the second data storage unit further stores data of a number of contents cached in each of the plurality of second information processing apparatuses, and

one of the second information processing apparatuses for which the same identifier is extracted is selected based on the number of contents, which is stored in the second data storage unit.

6. A system, comprising:

a first information processing apparatus having a first data storage unit storing data of a plurality of contents;

a plurality of display apparatuses, each including a function to read an identifier of a user;

a plurality of second information processing apparatuses, each of which identifies data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses based on an identifier of a user, and obtains and caches the identified data of the contents from the first information processing apparatus, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus; and

a third information processing apparatus comprising a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents, second correlation data to correlate an identifier of a display apparatus with an identifier of a user, and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses, and a third data storage unit, and

wherein, upon detecting a predetermined event including an identifier of a user, the third information processing apparatus identifies, from the first correlation data, an identifier of contents, which is correlated with the identifier of the user, which is included in the detected predetermined event, and stores data to correlate the identified identifier of the contents with the identifier of the user, which is included in the detected predetermined event in the third data storage unit,

upon detecting that the third data storage unit stores data to correlate a same identifier of contents with plural identifiers of plural users, the third information processing

apparatus identifies an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, from the second correlation data, and extracts from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus, and

upon detecting that a same identifier of a second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, the third information processing apparatus transmits the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

7. The system as set forth in claim **6**, wherein the second data storage unit further stores data of a number of contents cached in each of the plurality of second information processing apparatuses, and

one of the second information processing apparatuses for which the same identifier is extracted is selected based on the number of contents, which is stored in the second data storage unit.

8. The system as set forth in claim **6**, wherein the identifier of the display apparatus and the one or plural identifiers of the one or plural second information processing apparatuses are correlated in the third correlation data, with a throughput between the display apparatus and the one or plural second information processing apparatuses,

the second data storage unit further stores size data of contents for each of the plurality of contents, and

upon detecting that the same identifier of the second information processing apparatus is extracted for the at least two identifiers of the at least two users among the plural identifiers of the plural users, and a communication time calculated by using a size of the contents for which the same identifier is identified and a throughput between a display apparatus identified for the at least two identifiers of the at least two users and the second information processing apparatus for which the same identifier is extracted is within a threshold, the third information processing apparatus transmits the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

9. A system, comprising:

a first information processing apparatus having a first data storage unit storing data of a plurality of contents;

a plurality of display apparatuses, each including a function to read an identifier of a user;

a plurality of second information processing apparatuses, each of which identifies data of contents to be output ted to at least one display apparatus of the plurality of display apparatuses based on an identifier of a user or an identifier of contents, and obtains and caches the identified data of the contents from the first information processing apparatus, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus;

a plurality of third information processing apparatuses; and

a fourth information processing apparatus comprising a second data storage unit storing first correlation data to correlate an identifier of a user with an identifier of contents and second correlation data to correlate an identifier of contents with one of the plurality of third information processing apparatuses, and

wherein, upon detecting a predetermined event including an identifier of a user, the fourth information processing apparatus identifies, from the first correlation data, an identifier of contents, which is correlated with the identifier of the user, which is included in the detected predetermined event, and identifies an identifier of a third information processing apparatus, which is correlated with the identified identifier of the contents, from the second correlation data, and transmits data including the identifier of the user, which is included in the detected predetermined event, and the identified identifier of the contents or data including the identifier of the user, which is included in the detected predetermined event, to the third information processing apparatus whose identifier is identified,

each of the plurality of third information processing apparatuses comprises a third data storage unit storing second correlation data to correlate an identifier of a user with an identifier of a display apparatus and third correlation data to correlate an identifier of a display apparatus with one or plural identifiers of one or plural second information processing apparatuses,

each of the plurality of third information processing apparatuses stores data to correlate the identifier of the user, which is included in the data received from the fourth information processing apparatus with the identifier of the contents, which is included in the data received from the fourth information processing apparatus in a fourth data storage unit, or identifies an identifier of contents, which corresponds to the identifier of the user, which is included in the data received from the fourth information processing apparatus to store data to correlate the identifier of the user with the identified identifier of the contents, into the fourth data storage unit,

upon detecting that the fourth data storage unit stores data to correlate plural identifiers of plural users with a same identifier of contents, each of the plurality of third information processing apparatuses identifies, from the second correlation data, an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, and extracts, from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatuses, and

upon detecting that a same identifier of a second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, each of the plurality of third information processing apparatuses transmits the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

10. The system as set forth in claim **9**, wherein the identifier of the display apparatus and the one or plural identifiers of the one or plural second information processing apparatuses are correlated in the third correlation data with a throughput between the display apparatus and the one or plural second information processing apparatuses,

the third data storage unit further stores size data of contents for each of the plurality of contents, and

upon detecting that the same identifier of the second information processing apparatus is extracted for the at least two identifiers of the at least two users among the plural identifiers of the plural users, and a communication time calculated by using a size of the contents for which the same identifier is identified and a throughput between a display apparatus identified for the at least two identifiers of the at least two users and the second information processing apparatus for which the same identifier is extracted is within a threshold, each of the plurality of third information processing apparatuses transmits the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

11. A computer-readable, non-transitory storage medium storing a program for causing a computer to execute a procedure, comprising:

detecting a predetermined event including an identifier of a user;

identifying an identifier of a second information processing apparatus, which is correlated with the identifier of the user, which is included in the detected predetermined event, from a data storage unit storing correlation data to correlate an identifier of a user with a second information processing apparatus that identifies, based on an identifier of a user, data of contents to be outputted to at least one of a plurality of display apparatuses, each of which has a function to read an identifier of a user, obtains from a first information processing apparatus having data of a plurality of contents and caches the data of the contents, and outputs corresponding data of contents in response to a request including an identifier of a user; and

transmitting at least the identifier of the user, which is included in the predetermined event, to the second information processing apparatus whose identifier is identified.

12. A computer-readable, non-transitory storage medium storing a program for causing a computer to execute a procedure, comprising:

receiving data including an identifier of a user from an information processing apparatus that detected a predetermined event including the identifier of the user;

identifying an identifier of contents, which is correlated with the identifier of the user, which is included in the received data, from first correlation data to correlate an identifier of a user with an identifier of contents, wherein a first data storage unit stores the first correlation data, second correlation data to correlate one or plural identifiers of one or plural display apparatuses among a plurality of display apparatuses, each of which has a function to read an identifier of a user, with an identifier of a user, and third correlation data to correlate one or plural identifiers of one or plural second information processing apparatuses among a plurality of second information processing apparatuses, with an identifier of a display apparatus, wherein each of the plurality of second information processing apparatuses obtains and caches data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus;

storing data to correlate the identifier of the user, which is included in the received data, with the identified identifier of the contents, into a second data storage unit;

upon detecting that the second data storage unit stores data to correlate plural identifiers of plural users with a same identifier of contents, identifying, from the second correlation data, an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users;

extracting, from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus; and

upon detecting that a same identifier of the second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, reading from the first data storage unit, and transmitting the data of the contents for which the same identifier is identified to the second information processing apparatus for which the same identifier is extracted, or transmitting the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

13. A computer-readable, non-transitory storage medium storing a program for causing a computer to execute a procedure, comprising:

detecting a predetermined event including the identifier of the user;

identifying an identifier of contents, which is correlated with the identifier of the user, which is included in the detected predetermined event, from first correlation data to correlate an identifier of a user with an identifier of contents, wherein a first data storage unit stores the first correlation data, second correlation data to correlate one or plural display apparatuses of a plurality of display apparatuses, each of which has a function to read an identifier of a user, with an identifier of a user, and third correlation data to correlate one or plural identifiers of one or plural second information processing apparatuses among a plurality of second information processing apparatuses with an identifier of a display apparatus, wherein each of the plurality of second information processing apparatuses obtains from a first information processing apparatus, and caches data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus;

storing data to correlate the identifier of the user, which is included in the detected predetermined event, with the identified identifier of the contents, info a second data storage unit;

upon detecting that the second data storage unit stores data to correlate plural identifiers of plural users with a same identifier of contents, identifying, from the second correlation data, an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users;

extracting, from the third correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus; and

upon detecting that a same identifier of the second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, transmitting the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

14. A computer-readable, non-transitory storage medium storing a program for causing a computer to execute a procedure, comprising:

upon receiving data including an identifier of contents and an identifier of a user from an apparatus that detected a predetermined event that includes the identifier of the user or upon receiving data including the identifier of the user from the apparatus, and identifying an identifier of contents from correlation data to correlate an identifier of a user with an identifier of contents, storing second data to correlate the identifier of the contents with the identifier of the user, which is included in the received data, into a first data storage unit;

upon detecting that the first data storage unit stores data to correlate plural identifiers of plural users with a same identifier of contents, identifying an identifier of a display apparatus, which is correlated with each of the plural identifiers of the plural users, from first correlation data to correlate one or plural identifiers of one or plural display apparatuses among a plurality of display apparatuses each having a function to read an identifier of a user, with an identifier of a user, wherein a second data storage unit stores the first correlation data, and second correlation data to correlate one or plural identifiers of one or plural second information processing apparatuses among a plurality of second information processing apparatuses, wherein each of the plurality of second information processing apparatuses obtains from a first information processing apparatus, and caches data of contents to be outputted to at least one display apparatus of the plurality of display apparatuses, and outputs corresponding data of contents in response to a request including an identifier of a user from the at least one display apparatus;

extracting, from the second correlation data, an identifier of a second information processing apparatus, which is correlated with the identified identifier of the display apparatus; and

upon detecting that a same identifier of the second information processing apparatus is extracted for at least two identifiers of at least two users among the plural identifiers of the plural users, transmitting the at least two identifiers of the at least two users or the same identifier of the contents to the second information processing apparatus for which the same identifier is extracted.

15. A system, comprising:

a first information processing apparatus that stores data;

a display apparatus that has a function to read a user identifier;

a second information processing apparatus; and

a plurality of third information processing apparatuses, and

wherein the second information processing apparatus comprises:

a data storage unit storing first correlation data to correlate a user identifier with at least one third information processing apparatus that is included in the plurality of third information processing apparatuses; and

a controller that refers to the first correlation data upon detecting a predetermined event data, identifies a third information processing apparatus correlated with a first user identifier included in the predetermined event data, and transmits the first user identifier to the identified third information processing apparatus, and

each of the plurality of third information processing apparatuses comprises:

a receiving unit that receives the first user identifier transmitted from the second information processing apparatus;

a storing unit that obtains from the first information processing apparatus, and stores in a storage unit, data identified based on the received first user identifier; and

a controller that controls to transmit data that corresponds to a second user identifier, which was read by the display apparatus and was received from the display apparatus, and is stored in the storage unit, based on the second user identifier.

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