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(54) **INFORMATION STREAM MANAGEMENT PUSH-PULL BASED SERVER FOR GATHERING AND DISTRIBUTING ARTICLES AND MESSAGES SPECIFIED BY THE USER**

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(52) **U.S. Cl.** **709/219**; 709/202

(57) **ABSTRACT**

An information stream management network server is disclosed that enables distributing articles to a destination in the network at times and in forms that are specified by a user, while also enabling accessing and receiving the articles from sources in the network at times and in forms that are independent of the user. The network server handles both information pull articles and information push articles. The information push articles use declarative addressing to specified groups of users, thereby masking recipient endpoint identities and delivery preferences from sources and enabling broadcast communication to members of such a group.

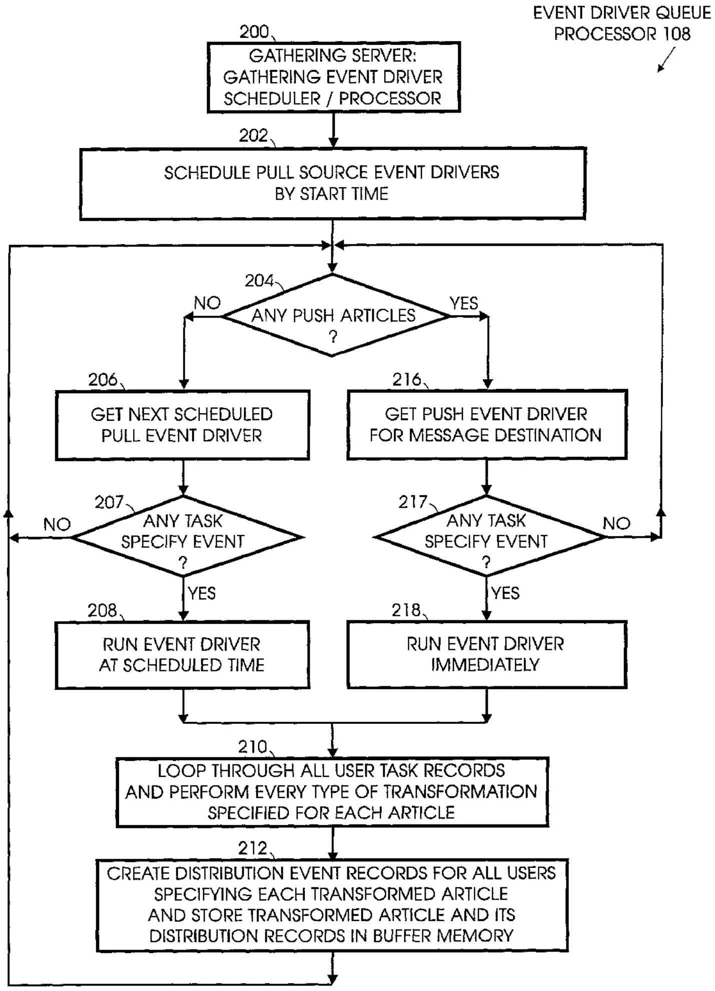

EVENT DRIVER QUEUE PROCESSOR 108
200
GATHERING SERVER: GATHERING EVENT DRIVER SCHEDULER / PROCESSOR
202
SCHEDULE PULL SOURCE EVENT DRIVERS BY START TIME
204
ANY PUSH ARTICLES ?
NO
YES
206
GET NEXT SCHEDULED PULL EVENT DRIVER
216
GET PUSH EVENT DRIVER FOR MESSAGE DESTINATION
207
ANY TASK SPECIFY EVENT ?
NO
YES
217
ANY TASK SPECIFY EVENT ?
NO
YES
208
RUN EVENT DRIVER AT SCHEDULED TIME
218
RUN EVENT DRIVER IMMEDIATELY
210
LOOP THROUGH ALL USER TASK RECORDS AND PERFORM EVERY TYPE OF TRANSFORMATION SPECIFIED FOR EACH ARTICLE
212
CREATE DISTRIBUTION EVENT RECORDS FOR ALL USERS SPECIFYING EACH TRANSFORMED ARTICLE AND STORE TRANSFORMED ARTICLE AND ITS DISTRIBUTION RECORDS IN BUFFER MEMORY

FIG. 1

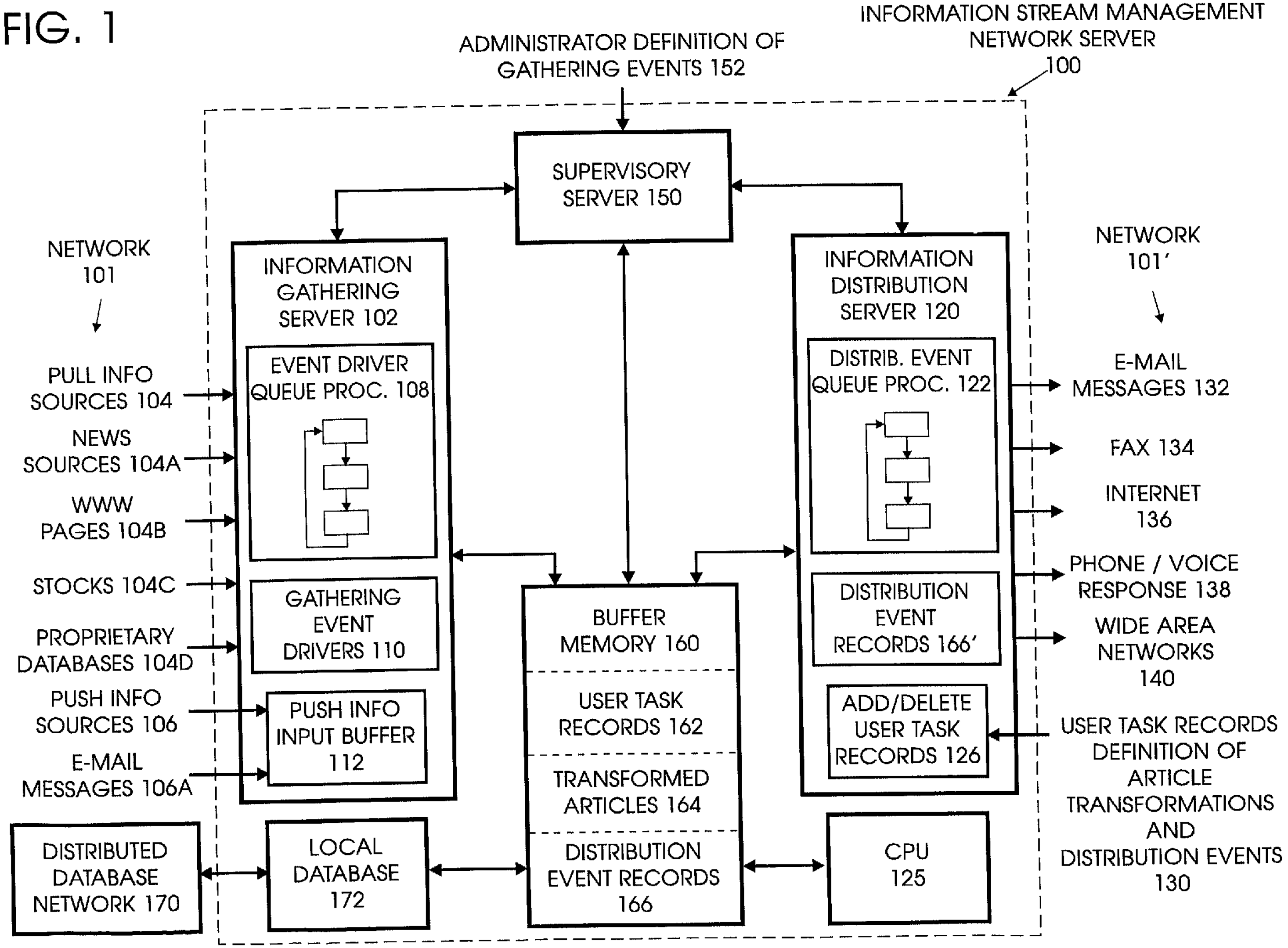

INFORMATION STREAM MANAGEMENT NETWORK SERVER 100
ADMINISTRATOR DEFINITION OF GATHERING EVENTS 152
SUPERVISORY SERVER 150
NETWORK 101
PULL INFO SOURCES 104
NEWS SOURCES 104A
WWW PAGES 104B
STOCKS 104C
PROPRIETARY DATABASES 104D
PUSH INFO SOURCES 106
E-MAIL MESSAGES 106A
INFORMATION GATHERING SERVER 102
EVENT DRIVER QUEUE PROC. 108
GATHERING EVENT DRIVERS 110
PUSH INFO INPUT BUFFER 112
DISTRIBUTED DATABASE NETWORK 170
LOCAL DATABASE 172
BUFFER MEMORY 160
USER TASK RECORDS 162
TRANSFORMED ARTICLES 164
DISTRIBUTION EVENT RECORDS 166
CPU 125
INFORMATION DISTRIBUTION SERVER 120
DISTRIB. EVENT QUEUE PROC. 122
DISTRIBUTION EVENT RECORDS 166'
ADD/DELETE USER TASK RECORDS 126
NETWORK 101'
E-MAIL MESSAGES 132
FAX 134
INTERNET 136
PHONE / VOICE RESPONSE 138
WIDE AREA NETWORKS 140
USER TASK RECORDS DEFINITION OF ARTICLE TRANSFORMATIONS AND DISTRIBUTION EVENTS 130

FIG. 1A

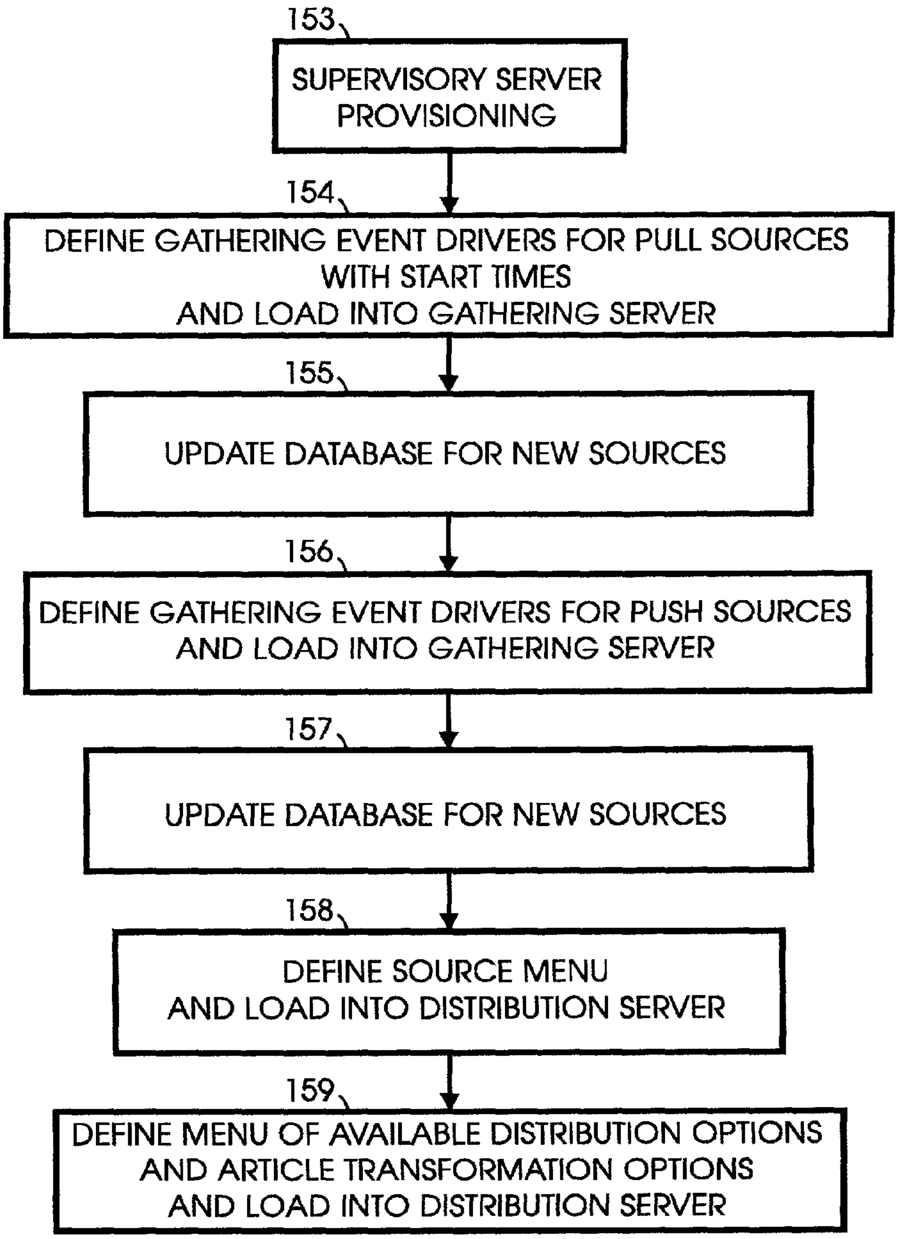

153
SUPERVISORY SERVER PROVISIONING
154
DEFINE GATHERING EVENT DRIVERS FOR PULL SOURCES WITH START TIMES AND LOAD INTO GATHERING SERVER
155
UPDATE DATABASE FOR NEW SOURCES
156
DEFINE GATHERING EVENT DRIVERS FOR PUSH SOURCES AND LOAD INTO GATHERING SERVER
157
UPDATE DATABASE FOR NEW SOURCES
158
DEFINE SOURCE MENU AND LOAD INTO DISTRIBUTION SERVER
159
DEFINE MENU OF AVAILABLE DISTRIBUTION OPTIONS AND ARTICLE TRANSFORMATION OPTIONS AND LOAD INTO DISTRIBUTION SERVER

FIG. 2A

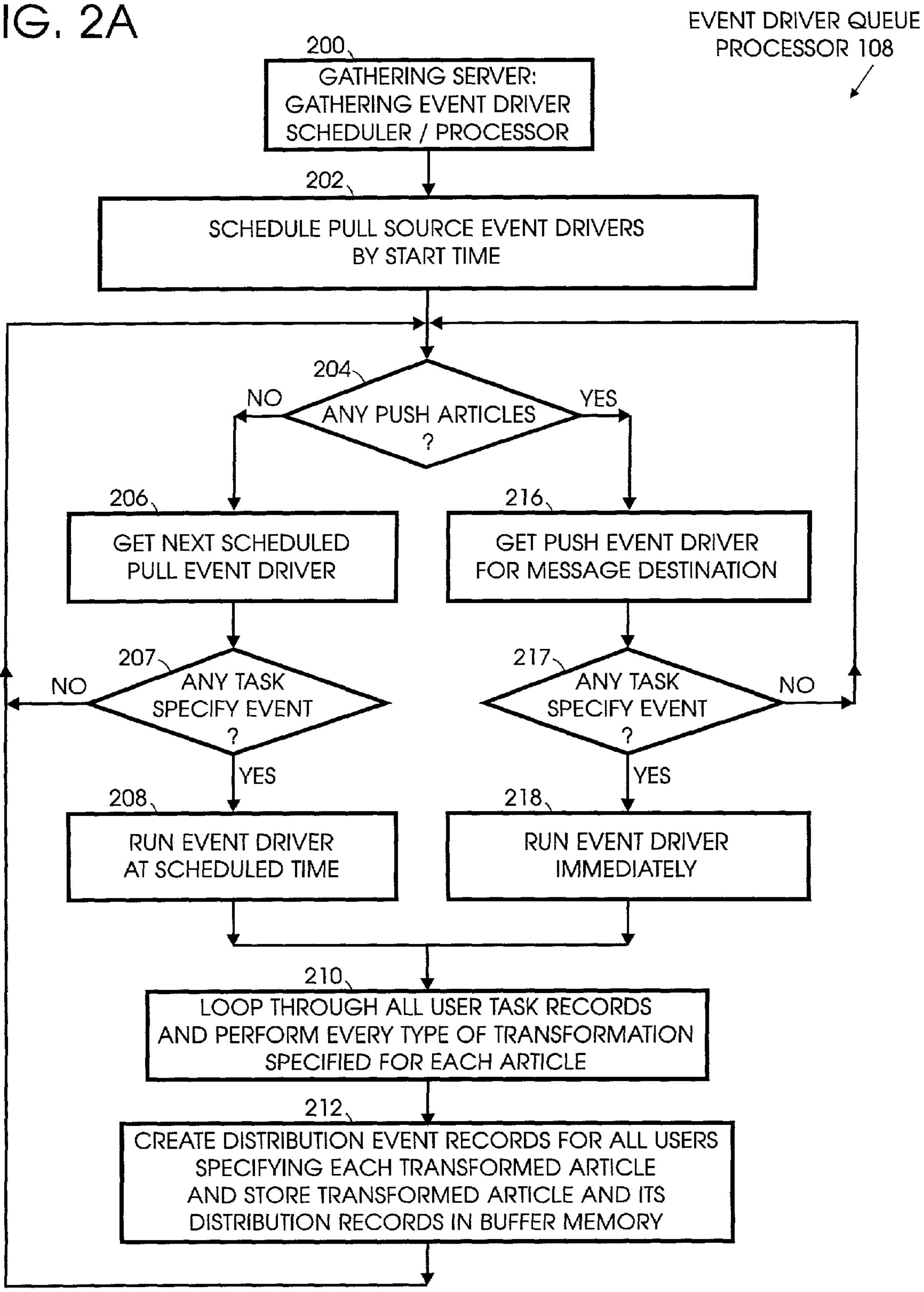

EVENT DRIVER QUEUE PROCESSOR 108
200
GATHERING SERVER: GATHERING EVENT DRIVER SCHEDULER / PROCESSOR
202
SCHEDULE PULL SOURCE EVENT DRIVERS BY START TIME
204
ANY PUSH ARTICLES ?
NO
YES
206
GET NEXT SCHEDULED PULL EVENT DRIVER
216
GET PUSH EVENT DRIVER FOR MESSAGE DESTINATION
207
ANY TASK SPECIFY EVENT ?
NO
YES
217
ANY TASK SPECIFY EVENT ?
NO
YES
208
RUN EVENT DRIVER AT SCHEDULED TIME
218
RUN EVENT DRIVER IMMEDIATELY
210
LOOP THROUGH ALL USER TASK RECORDS AND PERFORM EVERY TYPE OF TRANSFORMATION SPECIFIED FOR EACH ARTICLE
212
CREATE DISTRIBUTION EVENT RECORDS FOR ALL USERS SPECIFYING EACH TRANSFORMED ARTICLE AND STORE TRANSFORMED ARTICLE AND ITS DISTRIBUTION RECORDS IN BUFFER MEMORY

FIG. 2B

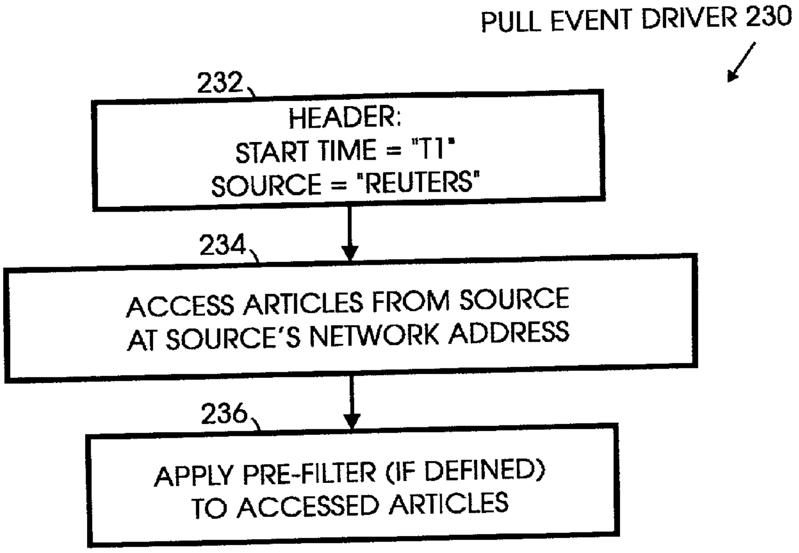

PULL EVENT DRIVER 230
232
HEADER:
START TIME = "T1"
SOURCE = "REUTERS"
234
ACCESS ARTICLES FROM SOURCE
AT SOURCE'S NETWORK ADDRESS
236
APPLY PRE-FILTER (IF DEFINED)
TO ACCESSED ARTICLES

FIG. 2C

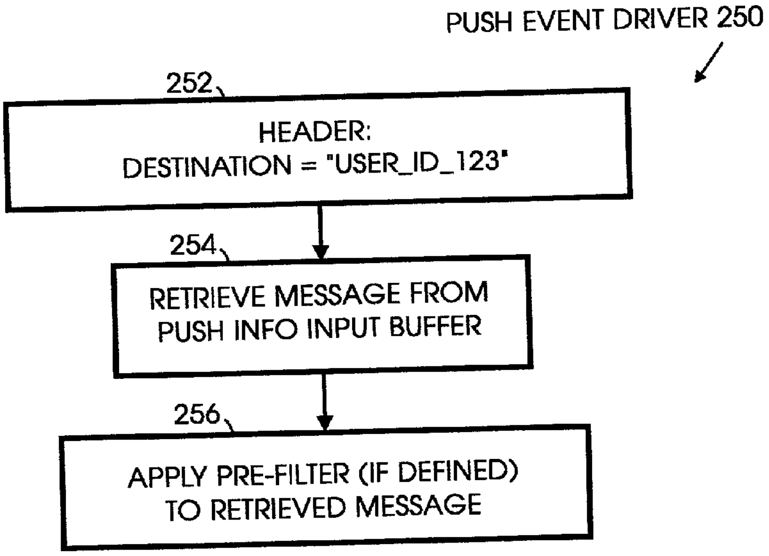

PUSH EVENT DRIVER 250
252
HEADER:
DESTINATION = "USER_ID_123"
254
RETRIEVE MESSAGE FROM
PUSH INFO INPUT BUFFER
256
APPLY PRE-FILTER (IF DEFINED)
TO RETRIEVED MESSAGE

FIG. 2D

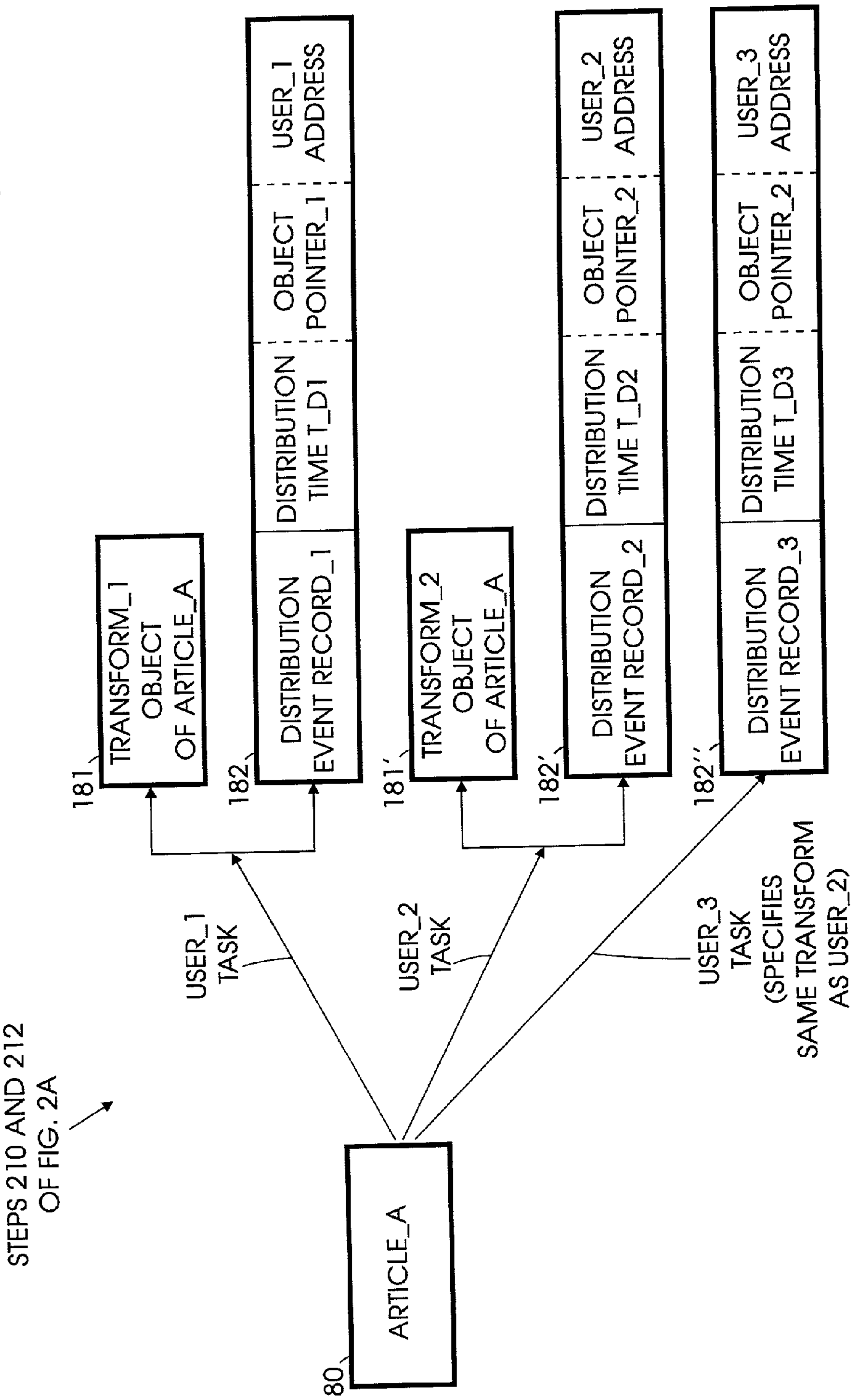

STEPS 210 AND 212 OF FIG. 2A
180
ARTICLE_A
USER_1 TASK
USER_2 TASK
USER_3 TASK (SPECIFIES SAME TRANSFORM AS USER_2)
181
TRANSFORM_1 OBJECT OF ARTICLE_A
182
DISTRIBUTION EVENT RECORD_1
DISTRIBUTION TIME T_D1
OBJECT POINTER_1
USER_1 ADDRESS
181'
TRANSFORM_2 OBJECT OF ARTICLE_A
182'
DISTRIBUTION EVENT RECORD_2
DISTRIBUTION TIME T_D2
OBJECT POINTER_2
USER_2 ADDRESS
182''
DISTRIBUTION EVENT RECORD_3
DISTRIBUTION TIME T_D3
OBJECT POINTER_2
USER_3 ADDRESS

FIG. 3A

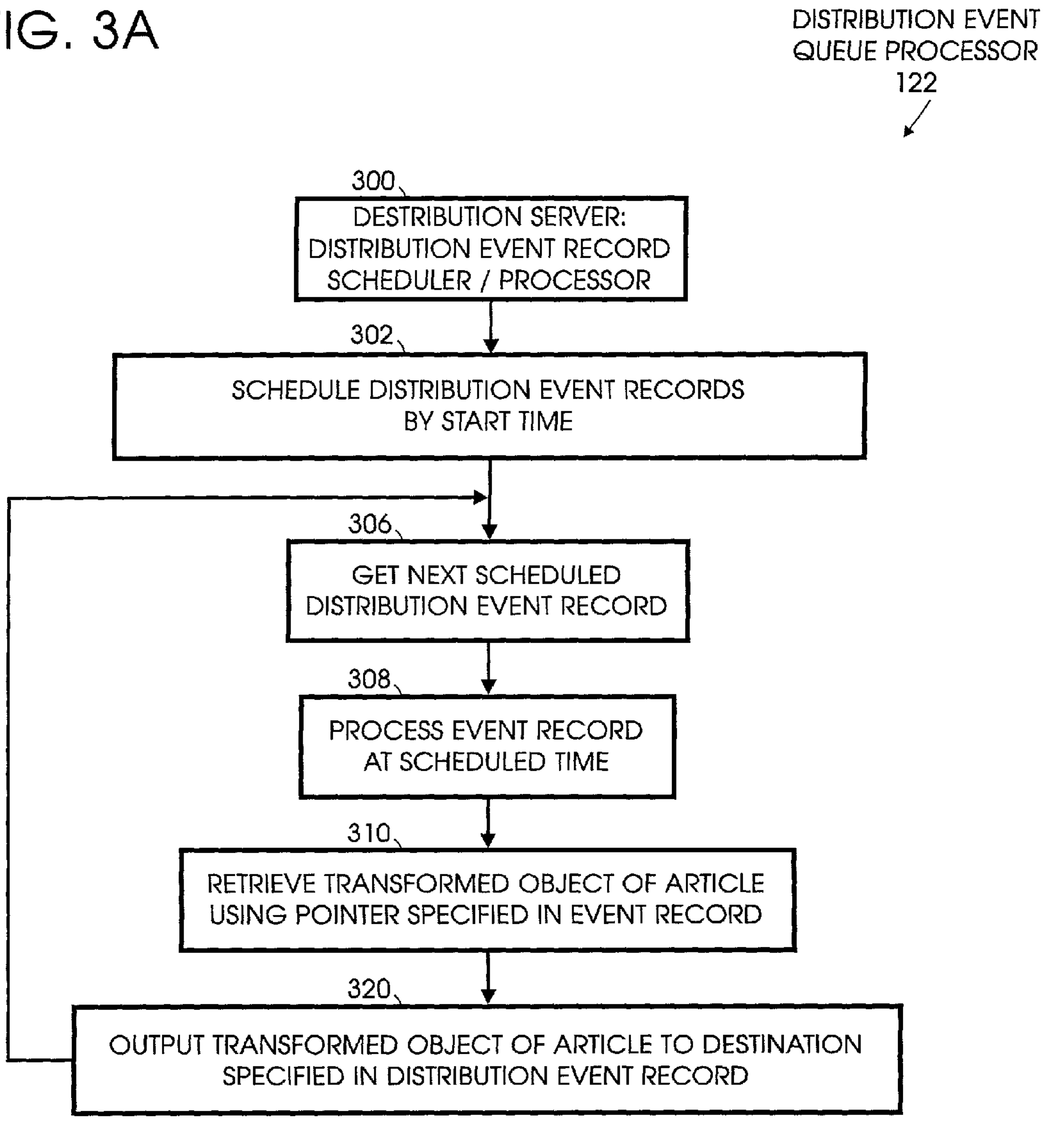
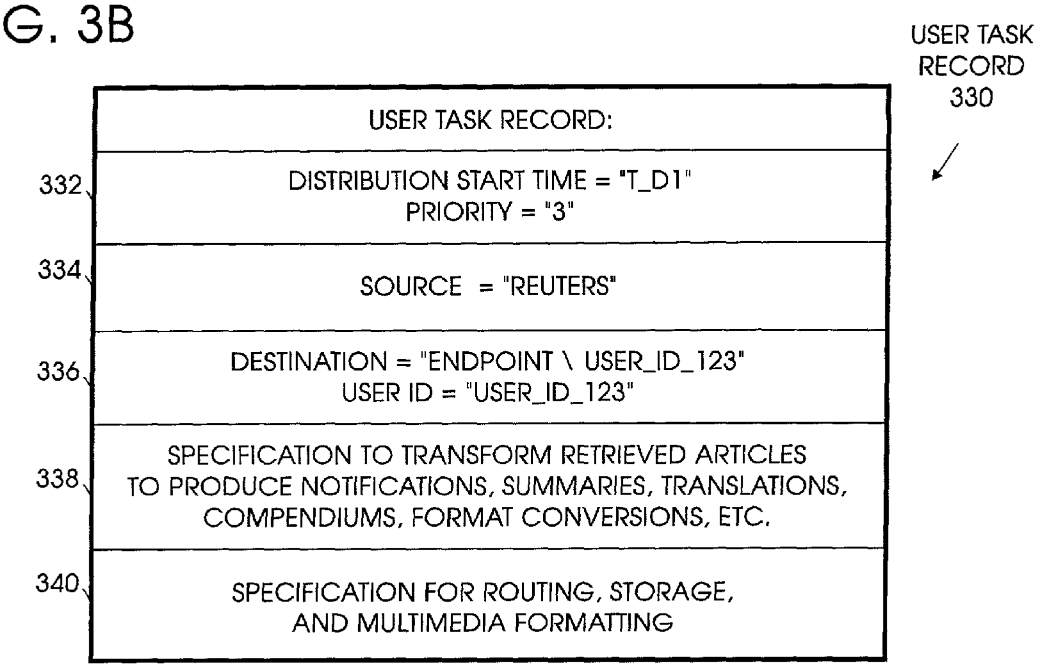

DISTRIBUTION EVENT
QUEUE PROCESSOR
122
300
DESTRIBUTION SERVER:
DISTRIBUTION EVENT RECORD
SCHEDULER / PROCESSOR
302
SCHEDULE DISTRIBUTION EVENT RECORDS
BY START TIME
306
GET NEXT SCHEDULED
DISTRIBUTION EVENT RECORD
308
PROCESS EVENT RECORD
AT SCHEDULED TIME
310
RETRIEVE TRANSFORMED OBJECT OF ARTICLE
USING POINTER SPECIFIED IN EVENT RECORD
320
OUTPUT TRANSFORMED OBJECT OF ARTICLE TO DESTINATION
SPECIFIED IN DISTRIBUTION EVENT RECORD

FIG. 3B



USER TASK RECORD:

DISTRIBUTION START TIME = "T_D1"
PRIORITY = "3"

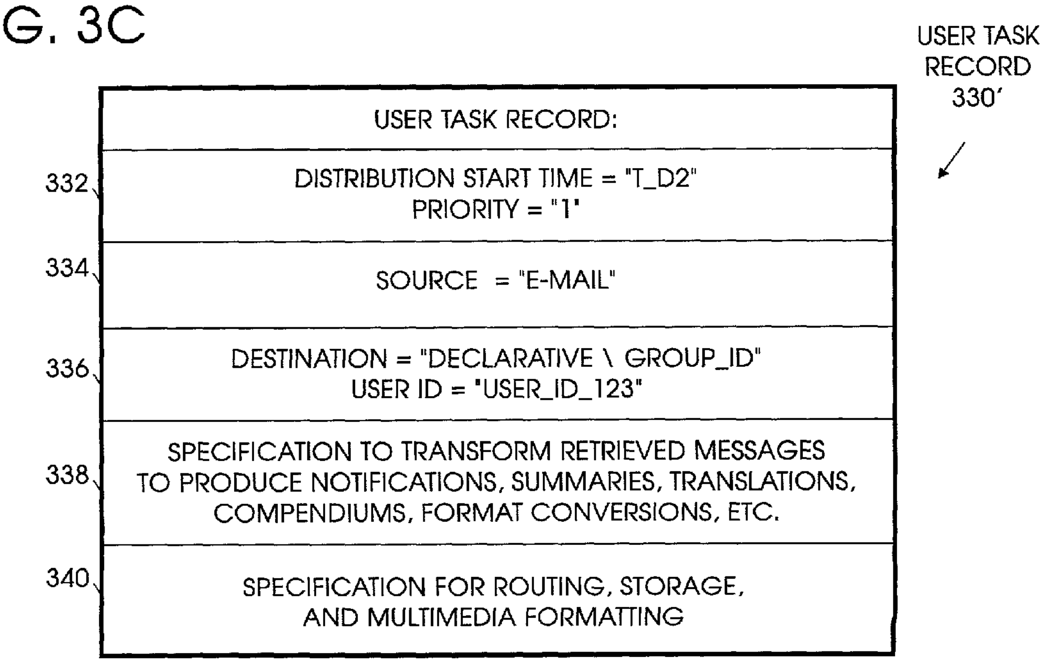
SOURCE = "REUTERS"

DESTINATION = "ENDPOINT \ USER_ID_123"
USER ID = "USER_ID_123"

SPECIFICATION TO TRANSFORM RETRIEVED ARTICLES TO PRODUCE NOTIFICATIONS, SUMMARIES, TRANSLATIONS, COMPENDIUMS, FORMAT CONVERSIONS, ETC.

SPECIFICATION FOR ROUTING, STORAGE, AND MULTIMEDIA FORMATTING

FIG. 3C



USER TASK RECORD:

DISTRIBUTION START TIME = "T_D2"
PRIORITY = "1"

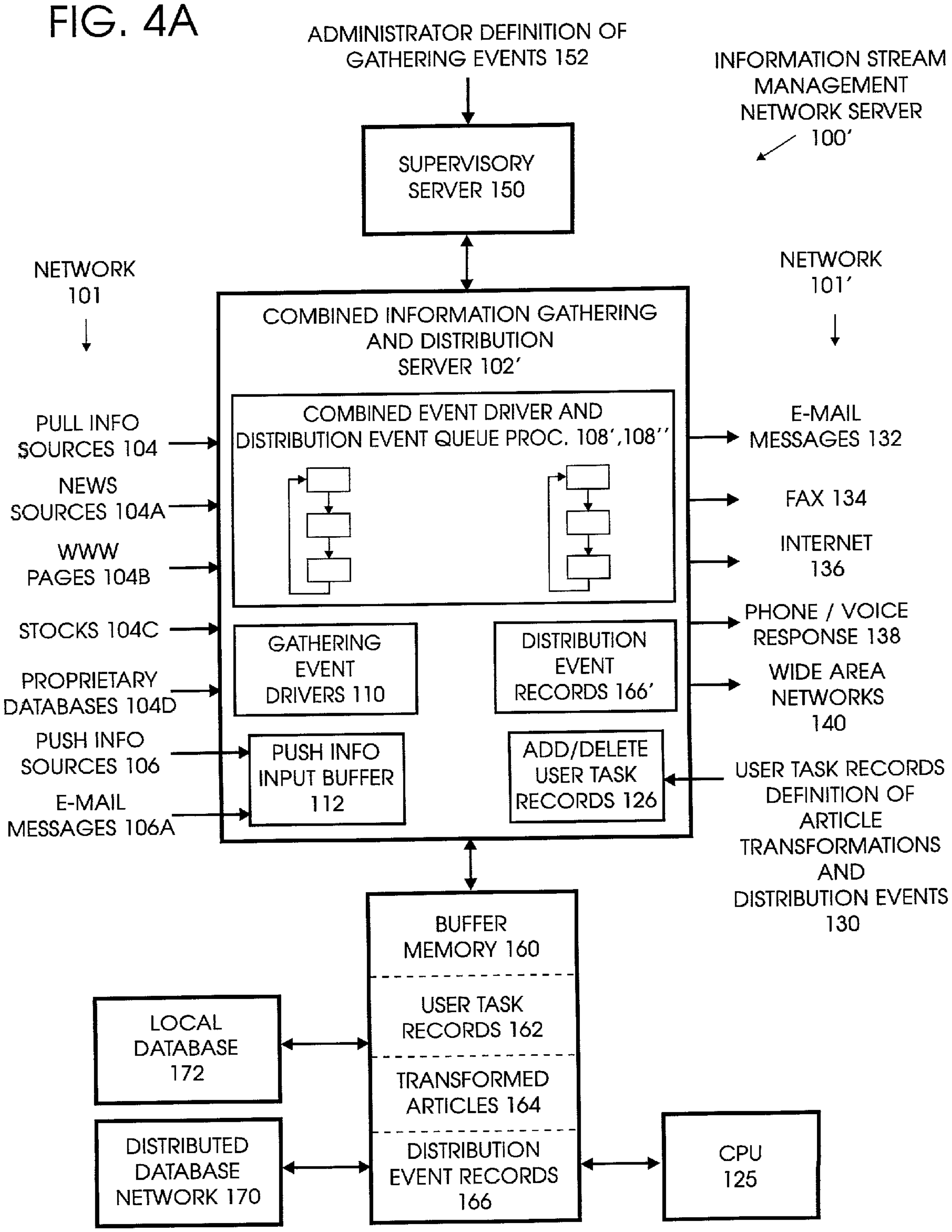
SOURCE = "E-MAIL"

DESTINATION = "DECLARATIVE \ GROUP_ID"
USER ID = "USER_ID_123"

SPECIFICATION TO TRANSFORM RETRIEVED MESSAGES TO PRODUCE NOTIFICATIONS, SUMMARIES, TRANSLATIONS, COMPENDIUMS, FORMAT CONVERSIONS, ETC.

SPECIFICATION FOR ROUTING, STORAGE, AND MULTIMEDIA FORMATTING

FIG. 4A


ADMINISTRATOR DEFINITION OF GATHERING EVENTS 152
INFORMATION STREAM MANAGEMENT NETWORK SERVER 100'
SUPERVISORY SERVER 150
NETWORK 101
NETWORK 101'
COMBINED INFORMATION GATHERING AND DISTRIBUTION SERVER 102'
COMBINED EVENT DRIVER AND DISTRIBUTION EVENT QUEUE PROC. 108',108''
PULL INFO SOURCES 104
NEWS SOURCES 104A
WWW PAGES 104B
STOCKS 104C
PROPRIETARY DATABASES 104D
PUSH INFO SOURCES 106
E-MAIL MESSAGES 106A
GATHERING EVENT DRIVERS 110
DISTRIBUTION EVENT RECORDS 166'
PUSH INFO INPUT BUFFER 112
ADD/DELETE USER TASK RECORDS 126
E-MAIL MESSAGES 132
FAX 134
INTERNET 136
PHONE / VOICE RESPONSE 138
WIDE AREA NETWORKS 140
USER TASK RECORDS DEFINITION OF ARTICLE TRANSFORMATIONS AND DISTRIBUTION EVENTS 130
BUFFER MEMORY 160
USER TASK RECORDS 162
TRANSFORMED ARTICLES 164
DISTRIBUTION EVENT RECORDS 166
LOCAL DATABASE 172
DISTRIBUTED DATABASE NETWORK 170
CPU 125

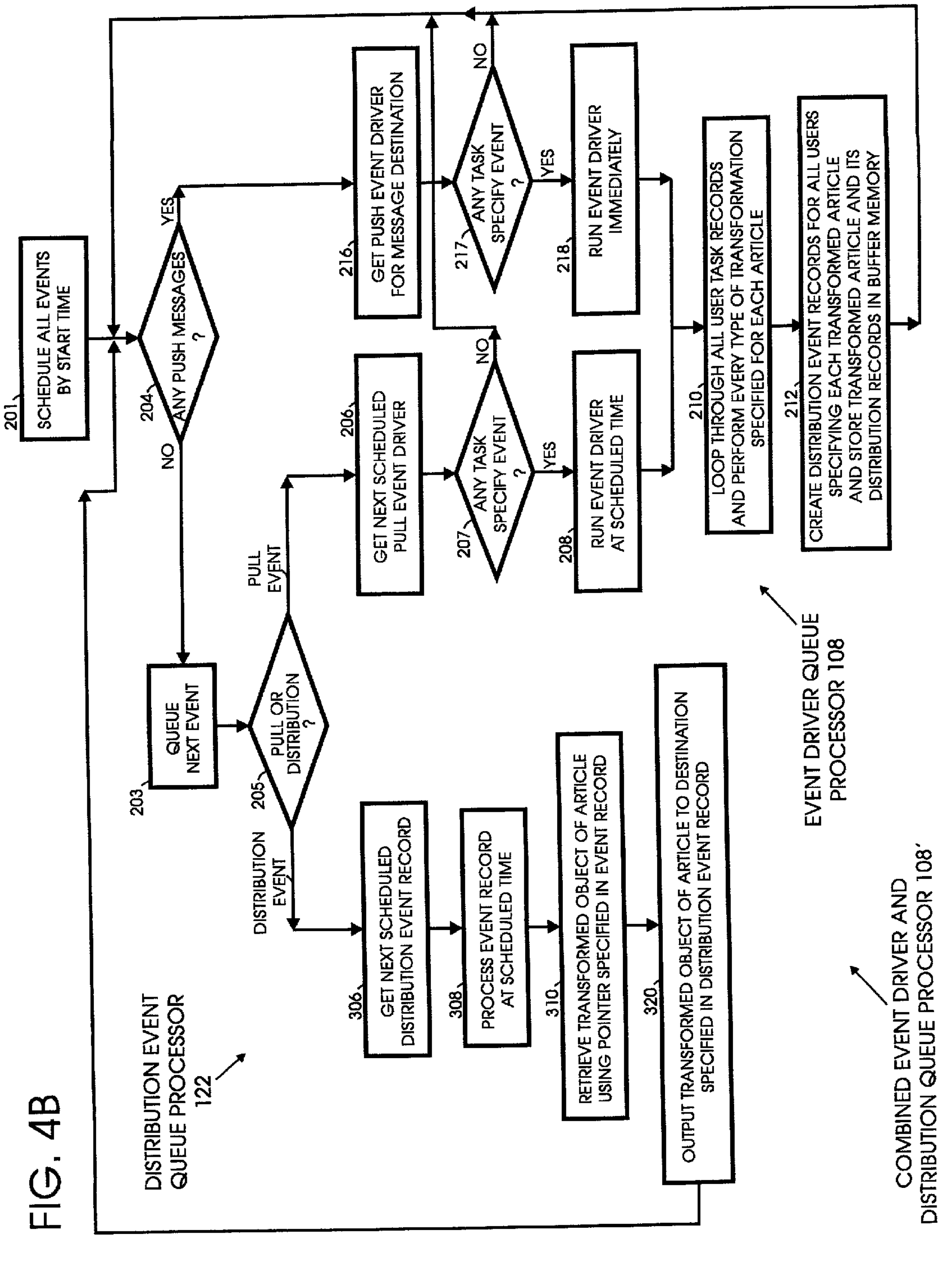


FIG. 4B
201
SCHEDULE ALL EVENTS BY START TIME
204
ANY PUSH MESSAGES ?
YES
NO
216
GET PUSH EVENT DRIVER FOR MESSAGE DESTINATION
217
ANY TASK SPECIFY EVENT ?
NO
YES
218
RUN EVENT DRIVER IMMEDIATELY
203
QUEUE NEXT EVENT
205
PULL OR DISTRIBUTION ?
PULL EVENT
DISTRIBUTION EVENT
206
GET NEXT SCHEDULED PULL EVENT DRIVER
207
ANY TASK SPECIFY EVENT ?
NO
YES
208
RUN EVENT DRIVER AT SCHEDULED TIME
210
LOOP THROUGH ALL USER TASK RECORDS AND PERFORM EVERY TYPE OF TRANSFORMATION SPECIFIED FOR EACH ARTICLE
212
CREATE DISTRIBUTION EVENT RECORDS FOR ALL USERS SPECIFYING EACH TRANSFORMED ARTICLE AND STORE TRANSFORMED ARTICLE AND ITS DISTRIBUTION RECORDS IN BUFFER MEMORY
EVENT DRIVER QUEUE PROCESSOR 108
306
GET NEXT SCHEDULED DISTRIBUTION EVENT RECORD
308
PROCESS EVENT RECORD AT SCHEDULED TIME
310
RETRIEVE TRANSFORMED OBJECT OF ARTICLE USING POINTER SPECIFIED IN EVENT RECORD
320
OUTPUT TRANSFORMED OBJECT OF ARTICLE TO DESTINATION SPECIFIED IN DISTRIBUTION EVENT RECORD
DISTRIBUTION EVENT QUEUE PROCESSOR 122
COMBINED EVENT DRIVER AND DISTRIBUTION QUEUE PROCESSOR 108'

FIG. 5

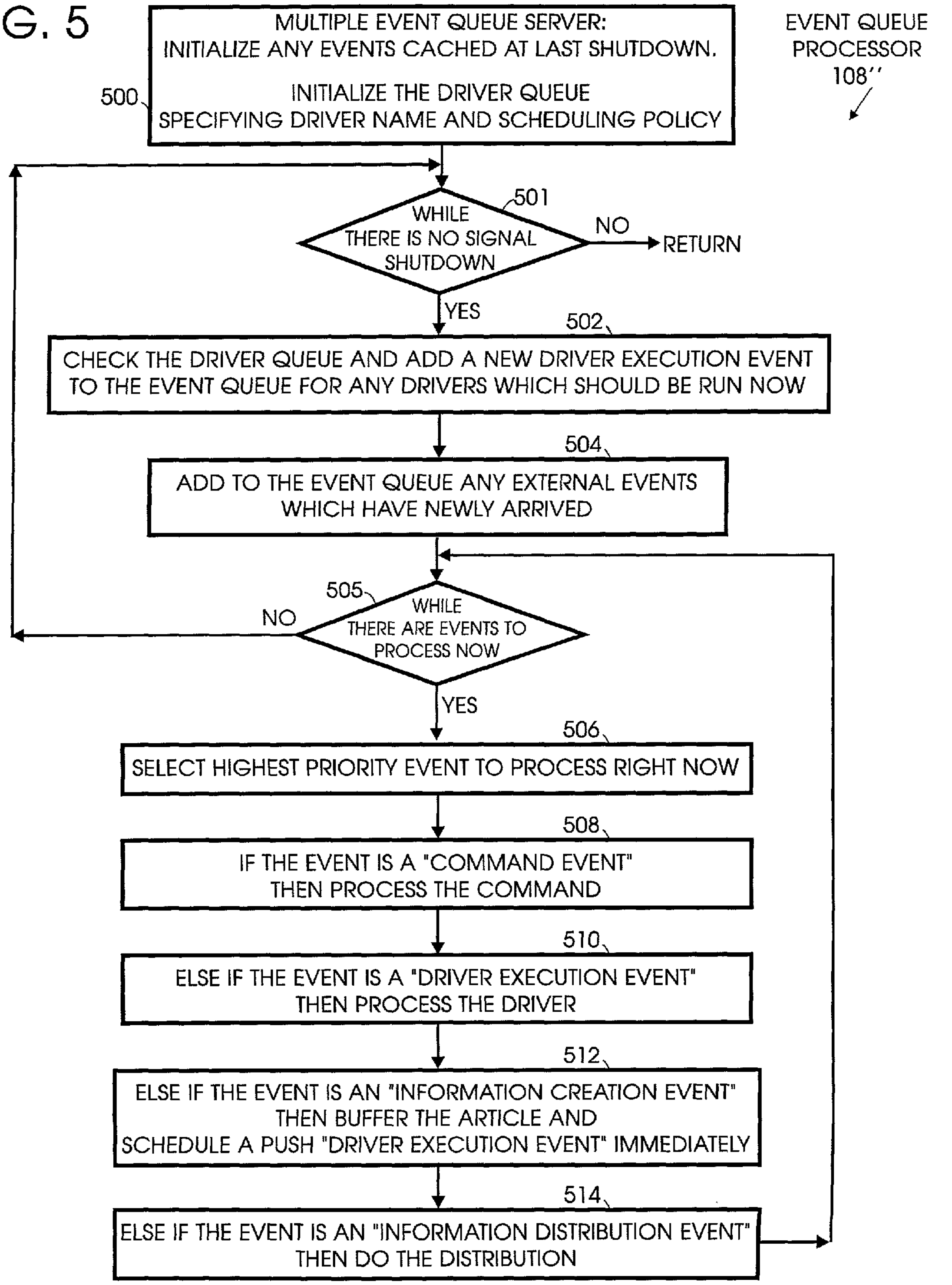

EVENT QUEUE
PROCESSOR
108''
500
MULTIPLE EVENT QUEUE SERVER:
INITIALIZE ANY EVENTS CACHED AT LAST SHUTDOWN.
INITIALIZE THE DRIVER QUEUE
SPECIFYING DRIVER NAME AND SCHEDULING POLICY
501
WHILE THERE IS NO SIGNAL SHUTDOWN
NO
RETURN
YES
502
CHECK THE DRIVER QUEUE AND ADD A NEW DRIVER EXECUTION EVENT TO THE EVENT QUEUE FOR ANY DRIVERS WHICH SHOULD BE RUN NOW
504
ADD TO THE EVENT QUEUE ANY EXTERNAL EVENTS WHICH HAVE NEWLY ARRIVED
505
WHILE THERE ARE EVENTS TO PROCESS NOW
NO
YES
506
SELECT HIGHEST PRIORITY EVENT TO PROCESS RIGHT NOW
508
IF THE EVENT IS A "COMMAND EVENT" THEN PROCESS THE COMMAND
510
ELSE IF THE EVENT IS A "DRIVER EXECUTION EVENT" THEN PROCESS THE DRIVER
512
ELSE IF THE EVENT IS AN "INFORMATION CREATION EVENT" THEN BUFFER THE ARTICLE AND SCHEDULE A PUSH "DRIVER EXECUTION EVENT" IMMEDIATELY
514
ELSE IF THE EVENT IS AN "INFORMATION DISTRIBUTION EVENT" THEN DO THE DISTRIBUTION

FIG. 5A

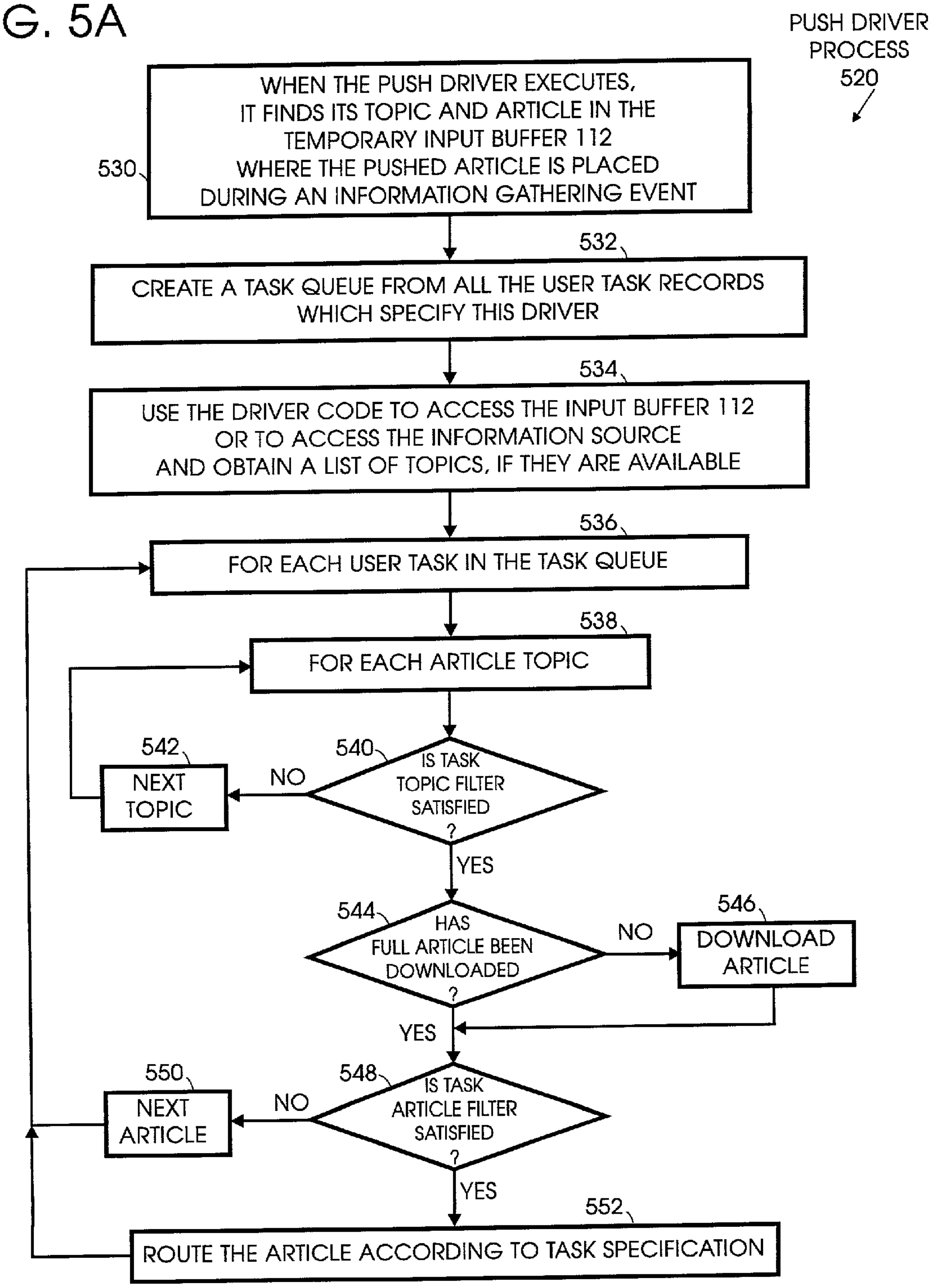
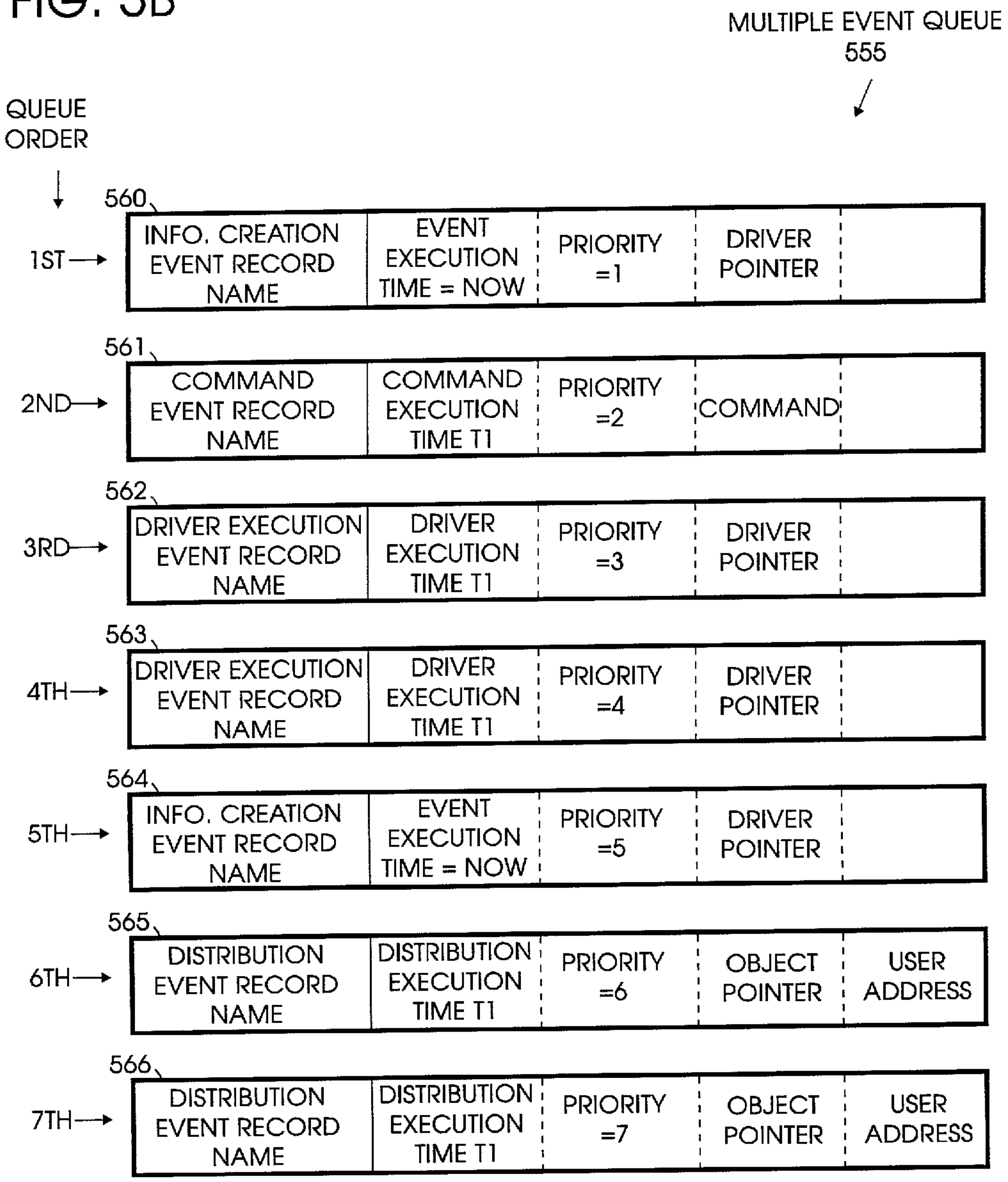

PUSH DRIVER PROCESS
520
530
WHEN THE PUSH DRIVER EXECUTES, IT FINDS ITS TOPIC AND ARTICLE IN THE TEMPORARY INPUT BUFFER 112 WHERE THE PUSHED ARTICLE IS PLACED DURING AN INFORMATION GATHERING EVENT
532
CREATE A TASK QUEUE FROM ALL THE USER TASK RECORDS WHICH SPECIFY THIS DRIVER
534
USE THE DRIVER CODE TO ACCESS THE INPUT BUFFER 112 OR TO ACCESS THE INFORMATION SOURCE AND OBTAIN A LIST OF TOPICS, IF THEY ARE AVAILABLE
536
FOR EACH USER TASK IN THE TASK QUEUE
538
FOR EACH ARTICLE TOPIC
540
IS TASK TOPIC FILTER SATISFIED ?
NO
542
NEXT TOPIC
YES
544
HAS FULL ARTICLE BEEN DOWNLOADED ?
NO
546
DOWNLOAD ARTICLE
YES
548
IS TASK ARTICLE FILTER SATISFIED ?
NO
550
NEXT ARTICLE
YES
552
ROUTE THE ARTICLE ACCORDING TO TASK SPECIFICATION

FIG. 5B


MULTIPLE EVENT QUEUE
555
QUEUE ORDER
560
1ST
INFO. CREATION EVENT RECORD NAME
EVENT EXECUTION TIME = NOW
PRIORITY =1
DRIVER POINTER
561
2ND
COMMAND EVENT RECORD NAME
COMMAND EXECUTION TIME T1
PRIORITY =2
COMMAND
562
3RD
DRIVER EXECUTION EVENT RECORD NAME
DRIVER EXECUTION TIME T1
PRIORITY =3
DRIVER POINTER
563
4TH
DRIVER EXECUTION EVENT RECORD NAME
DRIVER EXECUTION TIME T1
PRIORITY =4
DRIVER POINTER
564
5TH
INFO. CREATION EVENT RECORD NAME
EVENT EXECUTION TIME = NOW
PRIORITY =5
DRIVER POINTER
565
6TH
DISTRIBUTION EVENT RECORD NAME
DISTRIBUTION EXECUTION TIME T1
PRIORITY =6
OBJECT POINTER
USER ADDRESS
566
7TH
DISTRIBUTION EVENT RECORD NAME
DISTRIBUTION EXECUTION TIME T1
PRIORITY =7
OBJECT POINTER
USER ADDRESS

INFORMATION STREAM MANAGEMENT PUSH-PULL BASED SERVER FOR GATHERING AND DISTRIBUTING ARTICLES AND MESSAGES SPECIFIED BY THE USER

FIELD OF THE INVENTION

[0001] The invention disclosed broadly relates to telecommunications network architectures and more particularly relates to servers for managing information streams in a telecommunications network.

BACKGROUND OF THE INVENTION

[0002] The invention disclosed herein is related to the inventions described in U.S. Pat. No. 5,802,510, by Mark Alan Jones, entitled "Universal Directory Service"; U.S. Pat. No. 5,742,763, by Mark Alan Jones, entitled "Universal Message Delivery System for Handles Identifying Network Presences;" and U.S. Pat. No. 5,832,221, by Mark Alan Jones, entitled "Universal Message Storage System", all of which are assigned to AT&T Corp., and are incorporated herein by reference for their disclosure of the concepts of a network presence, a directory system, a message delivery system, and a message storage system which are related to the invention disclosed herein.

[0003] Existing network information management technologies, such as the browser-centric technology of the Internet's World Wide Web, require an immediate response by network information sources, such as news services, to requests for the information by the client. Internet browsers act as information gatherers by going out over the network to a specific information source and requesting information, such as an article. The information source can maintain a channel definition format file for that particular client. When the client makes a request to for an article from the source, the source must immediately respond with the requested article. The article is custom formatted and routed especially for the requesting client using the channel definition format. The requirement of an immediate and customized response in browser-centric technologies is a burden to the information source.

[0004] What is needed is to change from the existing client side model and, instead, maintain the source's information in a highly networked service environment. In this manner, the information source would not be constrained to deliver the information at the time and in the form that each client requests. It would not be necessary for an information source to immediately respond to multiple clients requesting the same article to be delivered in individually customized formats. What is needed is a network service that can break the linkage between the mode in which information is gathered and the mode in which it is distributed, that linkage being referred to as mode locking. Mode locking arises where the source of information is incompatible with the destination of the information, such as where there are differences in protocol (e.g., HTTP vs. SMTP email protocol), differences in data format (e.g., HTML vs. RFC-822 email standards), differences in senses (speech vs. text or image vs. text), or differences in content expression (e.g., French vs. English). What is needed is a way to break the mode locking inherent in browser-centric network technologies. This would enable a significant improvement in flexibility for obtaining and disseminating information in a network. Customized services for a client such as the translation from one language to another or the summarization of articles could be performed independently of the task of gathering the article from the information source.

SUMMARY OF THE INVENTION

[0005] An information stream management network server is disclosed that enables distributing articles and messages to a destination in the network at times and in forms that are specified by a user, while also enabling accessing and receiving the articles and messages from sources in the network at times and in forms that are independent of the user. The network server handles both information pull articles and information push articles. The information push articles use declarative addressing to specified groups of users, thereby masking recipient endpoint identities and delivery preferences from sources and enabling broadcast communication to members of such a group.

[0006] Several embodiments of the invention are disclosed. In a first embodiment, the information stream management network server, includes an information gathering server and an information distribution server whose respective gathering and distribution functions are kept separate and are respectively defined by a system supervisor and by the endpoint users.

[0007] The information gathering server has an input from a network for accessing information pull articles from information pull sources in the network and for receiving information push articles from information push sources in the network. The information gathering server has at least one pull event driver having a specified pull event schedule for accessing articles from a specified information pull source in the network. A supervisory input independent of end users, provides the specified pull event schedule. The information gathering server includes an event driver queue processor including a scheduler to schedule pull source event drivers by their respective specified next pull event start times. The event driver queue processor selects a next scheduled pull event driver and runs it at the specified pull event start time to access articles from a specified pull source. Then, for every received article requested by at least one user, the event driver queue processor performs customized transformations on the article specified by the users and stores the transformed article objects in a buffer memory.

[0008] For the case of information push articles (such as email messages), the information gathering server includes at least one push event driver for receiving push articles from the information push sources in the network addressed to a declarative address specified by the endpoint user. The information gathering server includes an information push input buffer for buffering any push articles received from the information push sources. The event driver queue processor determines whether any push articles have been received from the information push sources addressed to the declarative address specified by the user. If so, it immediately selects and runs a push event driver in the information gathering server for such information push articles. Then, the push articles are treated in a manner similar to the articles from pull sources. For every received push article addressed to a user, the event driver queue processor performs customized transformations on the push article specified by the user and stores the transformed article object in the buffer memory. The transformed push article may also be immediately forwarded to the distribution server for distribution to the end user, if the user has specified immediate delivery.

[0009] The endpoint users define user task records that each specify an article type to be gathered, a customized transformation of that article type into a transformed object, a customized routing of the transformed object, the user's destination address, and the time of distribution of the transformed object to the destination address. After the information gathering server has executed an event driver for gathering a pull article or a push article from a source which has been specified by at least one user task definition, the event driver queue processor loops through all of the user task records to perform every type of transformation specified for the article. The customized transformations can be changing the senses (speech to text or image to text) or changing the content, such as to produce notifications, summaries, language translations, compendiums, format conversions, and the like. The transformed article object is then stored in a memory buffer.

[0010] For each type of transformed article object, the event driver queue processor creates a distribution event record for each user requesting it, specifying the distribution time requested by the user, the user's destination address for the object, and a memory pointer to the object. The distribution event records are then stored in a memory buffer.

[0011] The information distribution server has an input from the buffer memory and an output to the network. The information distribution server can access the distribution event records which have the distribution start time specified by the user for retrieving the transformed article objects from the buffer memory. The information distribution server can also access the user task records that specify the distribution routing, storage, and endpoint destination specifications provided by the user for distributing the articles in the network. A distribution event queue processor in the information distribution server includes a scheduler to schedule distribution event records by their respective the distribution event start times. The distribution event queue processor selects a next scheduled distribution event record and runs it at the distribution event start time to retrieve the articles from the buffer memory. Then, the distribution event queue processor outputs the retrieved transformed article objects using the specified storage and routing paths to an endpoint destination specified in the distribution event record.

[0012] Each push event driver extracts a declarative address from the envelope of the pushed article. The declarative address is a query that is evaluated to produce a set of address handles corresponding to specific end users. For each such user, that user's push task record will be invoked to transform the article for that user. The task record then provides the routing information for distribution of the transformed article.

[0013] The buffer memory stores in a database the transformed articles accessed by the pull event driver and the push event driver. The buffer memory can store the push articles by the declarative address of the intended destination. The distribution server can include the declarative address information for retrieving from the database the transformed articles from the information push sources addressed to the declarative address.

[0014] In another embodiment, the information gathering server and information distribution server are combined as a multiple event queue server. The multiple event queue server has an input coupled to a network for accessing articles from information pull sources in the network. At least one pull event driver in the server, has a specified driver execution time for accessing articles from a specified information pull source in the network. A supervisory input coupled to the server provides the specified driver execution time. A storage coupled to the server stores the articles accessed by the pull event driver. The multiple event queue server is coupled to the storage and to the network, and has at least one user task record specified by the user, the record including a distribution execution time specified by the user for retrieving the articles from the storage and a distribution format specified by the user for distributing the articles to a destination in the network specified by the user. The multiple event queue server distributes the articles to the destination in the network at times and in forms that are specified by the user, while the server accesses the articles from the sources in the network at times and in forms that are independent of the user.

[0015] The multiple event queue server includes an event queue processor with a scheduler to schedule events by their respective execution times. The event queue processor selects a next scheduled event and runs it at the specified execution time to process the scheduled event. The multiple events include command events, driver execution events, information creation events, and information distribution events.

[0016] The multiple event queue server selectively modifies the retrieved articles as specified in the user task record, forming objects which are stored in the storage. The event queue processor selects a next scheduled driver execution event record and runs it at the execution time to retrieve the objects from the storage. The event queue processor outputs the objects to a destination specified in the user task record using a format specified in the user task record.

[0017] The multiple event queue server includes an information push input buffer for buffering any articles received from information push sources in the network. The event queue processor determines whether any articles have been received from the information push sources addressed to a declarative address, and immediately selects and runs a push event driver server for such information push articles. The event queue processor outputs the articles received from the information push sources to the storage.

[0018] In this manner, the server distributes the articles and messages to destinations in the network at times and in forms that are specified by the user, while the server accesses and receives the articles and messages from the sources in the network at times and in forms that are independent of the user.

DESCRIPTION OF THE FIGURES

[0019] **FIG. 1** is an architectural block diagram of the information stream management network server, in accordance with a first embodiment the invention.

[0020] **FIG. 1A** is a flow diagram of provisioning the information stream management network server by the supervisory server in accordance with the first embodiment the invention.

[0021] **FIG. 2A** is a flow diagram of the event driver queue processor in the information gathering server in accordance with the first embodiment the invention.

[0022] **FIG. 2B** is a flow diagram of a pull event driver in the information gathering server.

[0023] **FIG. 2C** is a flow diagram of a push event driver in the information gathering server.

[0024] **FIG. 2D** shows how steps **210** and **212** of **FIG. 2A** result in producing transformed objects of articles and in producing distribution event records.

[0025] **FIG. 3A** is a flow diagram of the distribution event queue processor in the information distribution server in accordance with the first embodiment the invention.

[0026] **FIG. 3B** illustrates a user task record for an information pull article.

[0027] **FIG. 3C** illustrates a user task record for an information push message, which includes a declarative addressing specification.

[0028] **FIG. 4A** is an architectural block diagram of the information stream management network server, which combines the information gathering server and the distribution server, in accordance with a second embodiment the invention.

[0029] **FIG. 4B** is a flow diagram of the combined event driver queue processor and distribution event queue processor, for the architecture of **FIG. 4A**.

[0030] **FIG. 5** is a flow diagram of the multiple event queue processor embodiment, for the architecture of **FIG. 4A**.

[0031] **FIG. 5A** is a flow diagram of the push driver process, as a component of the multiple event queue processor embodiment of **FIG. 5**.

[0032] **FIG. 5B** illustrates an example of the multiple event queue operated on by the multiple event queue processor embodiment of **FIG. 5**.

DISCUSSION OF THE PREFERRED EMBODIMENT

[0033] The first embodiment of the information stream management network server **100** is shown in architectural block diagram form in **FIG. 1**. The server enables distributing articles and messages to a destination in the network at times and in forms that are specified by an endpoint user, while also enabling accessing and receiving the articles and messages from sources in the network at times and in forms that are independent of the endpoint user. The term "articles" as used herein, pertains to both an information pull model and an information push model. In an information pull model, the server accesses an information source in the network and requests information which is delivered to the server in response to the request and also to . In an information push model, information is spontaneously sent from sources in the network to the server. The network server **100** handles both information pull articles and information push articles from the network. The information push articles use declarative addressing to specify groups of users, thereby masking the recipient endpoint identities and delivery preferences from the sources and also enabling broadcast communication to members of such a group.

[0034] The information stream management network server **100** of **FIG. 1** includes an information gathering server **102** and an information distribution server **120** whose respective gathering and distribution functions are kept separate and are respectively defined by a supervisory server **150** which accepts a system administrator's definition of gathering events **152**. Distribution functions are defined by the endpoint users over path **130** to the information distribution server **120**. The central processing unit (CPU) **125** in the information stream management network server **100** executes program instructions to perform the various functions of the network server **100**.

[0035] The information gathering server **102** has an input connected to the network **101** for accessing information pull articles from information pull sources **104** such as news sources **104**A, worldwide web (www) pages **104**B, stocks and securities information **104**C, and propriety databases **104**D. The information gathering server **102** also receives over the network **101** information push articles from information push sources **106** such as e-mail messages **106**A, calendar updates, reminders, and the like which are spontaneously sent to the server **100** from the network **101**. The information gathering server **102** has a plurality of pull event drivers **110** which are shown in greater detail as pull event driver **230** of **FIG. 2B**. The pull event driver **230** includes a header **232** which specifies a start time T1, an access protocol such as HTTP, and a source name such as "Reuters". The pull event driver **230** executes a sequence of steps including step **234** to access articles from the specified source at the source's network address, followed by step **236** which applies a prefilter, if it is defined, to the accessed articles. The specified pull event start time T1 establishes the time for accessing information pull articles from a specified information pull source **104** in the network **101**. In accordance with the invention, a supervisory input **152** from the network administrator, as shown in **FIG. 1**, which is independent of the end users, provides a specified pull event start time T1, and the other specified parameters of the pull event driver **230** in **FIG. 2B**. The information gathering server **102** further includes an event driver queue processor **108** which is shown in greater detail in **FIG. 2A**. The event driver queue processor **108** includes a header **200** and a scheduler which performs the step **202** of scheduling pull source event drivers by their respective start times T1. Thereafter, step **204** determines if there are any information push articles pending in the information push input buffer **112** of the information gathering server **102** of **FIG. 1**. If there are no information push articles pending, then step **206** gets the next scheduled pull event driver **230**. Step **207** determines if any user-defined task record **330** shown in **FIG. 3B** has specified this event. If a task record **330** has specified the event, then Step **208** runs the event driver **230** at its scheduled time T1.

[0036] Then, in step **210**, for every received article requested by at least one user in a user task record **330**, the event driver queue processor performs customized transformations on the article specified by the users in their user task records **330** and stores the transformed article objects in a buffer memory **160** at partition **162** of **FIG. 1**. The endpoint users define user task records **330** of **FIG. 3B** that each specify an article type to be gathered **332**, a customized transformation of that article type into a transformed object **338**, a customized routing of the transformed object **340**, the user's destination address **336**, and the time of distribution of the transformed object to the destination address **332**. After the information gathering server **102** has executed an event driver **230** for gathering a pull article or an event driver **250** for gathering a push article from a source which has been specified by at least one user task definition **330** or **330'**, the event driver queue processor **108** of **FIG. 2A** in step **210** loops through all of the user task records **330** to perform every type of transformation specified for the article. The customized transformations can be changing the senses (speech to text or image to text) or changing the content, such as to produce notifications, summaries, language translations, compendiums, format conversions, and the like. The transformed article object is then stored in a memory buffer **160** at partition **164** of **FIG. 1**.

[**0037**] **FIG. 2D** shows the results of steps **210** and **212** of **FIG. 2A** for an article **180** ARTICLE_A that is operated on by transformation subroutines which are called using each of three user task records **330**, USER$_{13}$ **1**, USER$_{13}$ **2**, USER_**3**. The USER_**1** task record results in creating the transformed article **181**, TRANSFORM$_1$ object of ARTICLE$_{13}$ A, which could be a transformation from a full text article **180** to a summary that is expressed as a voice record **181**, for example. The USER_**2** task record results in creating the transformed article **181'**, TRANSFORM_**2** object of ARTICLE_A, which could be a transformation from a full text article in English **180** into a full text article in French **181'**. The USER_**3** task record could specify the same transformation as the USER_**2** task record. For each type of transformed article object **181**, the event driver queue processor **108** in step **212** creates a distribution event record **182** shown in **FIG. 2D** for each user requesting the transformed article object **181**, specifying the distribution time requested by the user, the user's destination address for the object, and a memory pointer to the object **181**. The distribution event records are then stored in a memory buffer **160** in partition **166** of **FIG. 1**. Distribution event records **182'**and **182"** are generated for the transformed article **181'**, TRANSFORM_**2** object of ARTICLE_A.

[**0038**] For the case of information push articles, the information gathering server **102** includes a plurality of push event drivers such as the push event driver **250** of **FIG. 2C**. The push event driver **250** of **FIG. 2C** includes the header **252** which can specify the destination in the form of a user address or a declarative address. The push event driver **250** carries out the steps beginning with step **254** of retrieving an information push article from the push information input buffer **112** of the information gathering server **102** of **FIG. 1**. Thereafter, step **256** applies a prefilter, if it is defined, to the retrieved message. In the event driver queue processor **108** of **FIG. 2A**, if the step **204** determines that an information push article is present at the information push input buffer **112**, then step **216** gets the information push event driver **250** for the message destination specified by the received message. This will typically be user destination address or a declarative address such as "GROUP ID". Step **217** determines if any user task record **330'**of **FIG. 3C** has specified this event. Then step **218** immediately runs the event driver **250**.

[**0039**] Then, in step **210**, for every received push article requested by at least one user in a user task record **330'**, the event driver queue processor performs customized transformations on the article specified by the users in their user task records **330'**and stores the transformed article objects in a buffer memory **160** at partition **162** of **FIG. 1**. For each type of transformed push article object **181**, the event driver queue processor **108** in step **212** creates a distribution event record **182** shown in **FIG. 2D** for each user requesting the transformed article object **181**, specifying the distribution time requested by the user, the user's destination address for the object, and a memory pointer to the object **181**. The distribution event records are then stored in a memory buffer **160** in partition **166** of **FIG. 1**. Note that the transformed objects of information push articles are treated in the same way are the transformed objects of information pull articles.

[**0040**] Each push event driver **250** extracts a declarative address from the envelope of the pushed article. The declarative address is a query that is evaluated to produce a set of address handles corresponding to specific end users. For each such user, that user's push task record **330'**will be invoked to transform the article for that user. The task record **330'**then provides the routing information for distribution of the transformed article. This process is described in greater detail in the U.S. Pat. No. 5,742,763, by Mark Alan Jones, entitled "Universal Message Delivery System for Handles Identifying Network Presences," assigned to AT&T Corp., and incorporated herein by reference.

[**0041**] The buffer memory **160** stores in a database the transformed articles accessed by the pull event driver **230** and the push event driver **250**. The buffer memory can store the push articles by the declarative address of the intended destination. The distribution server **120** can include the declarative address information for retrieving from the database the transformed articles from the information push sources addressed to the declarative address.

[**0042**] The information distribution server **120** of **FIG. 1** has an input from the buffer memory **160** and an output to the network **101'**, which can be the same as the network **101** of **FIG. 1**. The network **101'** includes endpoint user work stations, network routers, network bulk storage devices, and other network components. The network **101'** can convey e-mail messages **132**, facsimile transmissions **134**, Internet transmissions **136**, telephone voice response sounds **138**, digital messages to wide area networks **140**, and the like. Importantly, the network **101'** will convey over path **130**, the endpoint user's task records **330** and **330'** which are applied to the add/delete user task records unit **126** of the information distribution server **120** of **FIG. 1** and stored in buffer memory **160** in partition **162**. The information distribution server **120** can access the buffer memory **160** for user task records, transformed articles, and distribution event records.

[**0043**] Two examples of user task records **330** and **330'** are shown in **FIGS. 3B and 3C**, respectively. The user task record **330** of **FIG. 3B** has its parameters defined by the endpoint user's definition of transformations and distribution events. The user task record **330** includes a specified start time "T_D1" and a priority "3" in field **332**. It further includes a source of "Reuters" in field **334**. It further includes a specified destination which, in this case, is an endpoint destination "USER_ID__123". Field **336** also includes the user id which is "USER_ID__123". Field **338** includes a specification provided by the user of how to transform retrieved articles to optionally produce notifications, summaries, translations, compendiums, format conversions, and the like. Field **340** is a specification by the user of special routing, storage, and multimedia formatting for the transformed article objects. **FIG. 3C** shows a distribution event record **330**' which is for an information push type message having an e-mail source. The field **336** specifies that the destination is a declarative address which is "GROUP_ID". The user id is the same user as in **FIG.** 3B, "USER_ID__123". Field **338** specifies the transformations desired by the endpoint user for processing retrieved push articles and field **340** specifies user's desire for any special routing, storage or multimedia formatting for the transformed article objects.

[**0044**] The information distribution server **120** includes a distribution event queue processor **122** which is shown in greater detail in **FIG. 3A**. The distribution event queue processor **122** includes a header **300** and a scheduler which performs the step **302** of scheduling the distribution event records by their respective start times T_D1, T_D2, etc. Recognition can be made of the relative priority assigned by the user to the respective distribution event records in establishing the scheduled order. Next, the distribution event queue processor **102** gets the next scheduled distribution event record in step **306**. Then in step **308** the event record is processed at the scheduled time T_D1, T_D2, etc. Thereafter, step **310** retrieves the transformed article objects from partition **164** of the buffer memory **160** as specified in the user task records **330** and **330**'. The destination specified in the user task record can be a declarative address for a group or alternately it can be an endpoint address for the endpoint user. Thereafter, step **320** outputs the transformed article objects to the specified destination using the optional multimedia format, routing and/or storage features specified in the user task record **330** and **330**'.

[**0045**] **FIG. 5** shows the buffer memory **160** which stores user task records, transformed article objects, and distribution event records. The buffer memory **160** can offload these objects and records to backing storage, for example the distributed database network **170** and the local database **172**. The buffer memory **160** stores in a database therein the transformed article objects accessed by the pull event driver and the push event driver. The buffer memory **160** can store the push articles by the declarative address of the intended destination. Each event driver **230** and **250** includes information such as address information, for storing the transformed article objects in the database. The distribution server **120** includes the address information for retrieving from the database the transformed article objects. Each push event driver **250** can include a declarative address information for storing in the database the transformed article objects from the information push sources addressed to the declarative address. The distribution server includes the declarative address information for retrieving from the database the transformed article objects received from the information push sources addressed to the declarative address.

[**0046**] Transformed article objects can be stored in the buffer memory **160** using source handles such as "Reuters" and such as "DowJones" for storing transformed information pull article objects from specified information pull sources **104**. Transformed article objects can be stored in the buffer memory **160** using declarative address information, e.g. "GROUP__1" and "GROUP__2" for storing transformed information push article objects from the information push sources **106** addressed to the declarative addresses. Each pull event driver **230** of **FIG. 2B** includes the source address information **232** in header **232** for storing in the buffer memory **160** the transformed article objects derived from the specified information pull source which is specified in the header **232**. The distribution server **120** includes the source address information in field **334** of the record in **FIG. 3B** for retrieving from the buffer memory **160** the transformed information pull article objects derived from the specified information pull source. Each push event driver **250** in **FIG. 2C** includes a declarative address information in the header **252** for storing in the buffer memory **160** the transformed information push article objects from the information push sources **106** addressed by the declarative address specified in the header **252**. The distribution server **120** includes in the user task record **330**' of **FIG.** 3C, the declarative address information in field **336**, for retrieving from the buffer memory **160** transformed information push article objects derived from the information push sources **106** addressed to the declarative address specified in the field **336**. The buffer memory **160** can also include an endpoint address information derived from endpoint user addresses, so that any transformed information push article objects designated for an endpoint user can be stored by the information gathering server **102** and can be accessed by the information distribution server **120**. The distribution server **120** can also include a channel directory which is accessible by the endpoint user. The channel directory is organized with endpoint user addresses for storing pointers for each respective endpoint user, which point to transformed article objects stored on behalf of the user, elsewhere in the local or distributed databases **172** and **170**.

[**0047**] In this manner, the information distribution server distributes the articles to destinations in the network at times and in forms that are specified by the user, while the information gathering server accesses and receives the articles from the sources in the network at times and in forms that are independent of the user.

[**0048**] **FIG. 1A** illustrates the system administrator's definition of gathering events for the information gathering server **102**. In **FIG.** 1A, the supervisory server provides the provisioning for the gathering event drivers. Beginning at the header **153** in **FIG.** 1A, step **154** defines gathering event drivers **230** for information pull sources with start times and source address information which are loaded into the information gathering server **102**. Then in step **155**, the database in the buffer memory **160** is updated for new sources. Then step **156** defines gathering event drivers **250** for information push sources with destination address information and loads them into the information gathering server **102**. Then in step **157**, the database in the buffer memory **160** is updated for new sources. In order to provide information which will be available to the user as to existing information pull and information push sources which are available, step **158** defines pull and push source menus address information which are loaded into the distribution server. These pull and push source menus are available to the endpoint user when the endpoint user is defining user task records. In a similar manner, step **159** defines a menu of available distribution options and article transformation options which is loaded into the information distribution server **120** and is made available to endpoint users for their use when defining user task records.

[**0049**] An endpoint user can update user task records by requesting menus from the distribution server **120**, which sends the existing source menu and distribution and transformation options menu to the endpoint user. Then distribution server **120** receives the user's request for a new user task record **330** with a distribution start time, a pull source, for example "Reuters", and article processing specifications such as how the retrieved article is to be summarized, translated to a particular language, and how the processed article will then be routed, stored and formatted. Then the distribution server checks to see if the specified pull source has an existing source address information. Then, if there is no existing source address information, the distribution server sends a request for a new pull source and new address information to the supervisory server **150**. Then, the supervisory server **150** determines whether to grant the request. If the decision is not to grant the request, then the supervisory server sends a denial notice to the distribution server **120**. Alternately, if the supervisory server **150** determines that the parameters requested in the user's request need to be modified, then the supervisory server sends a modified gathering event driver with an appropriate prefilter to the gathering server **102**. Alternately, if the supervisory server **150** determines to grant the user's request, then the supervisory server sends a new gathering event driver **230** having a new gathering start time and a new address information to the information gathering server **102**. Then, the supervisory server **150** sends a new address information to the buffer memory **160** and to the distribution server **120**. Then, the distribution server **120** creates a new user task record **330**, such as is shown in **FIG. 3B**, with a specified distribution start time, a pull source such as "Reuters" and article processing, formatting, routing, and storage options specified, and a specified destination which may be either an endpoint user address or a declarative address. A similar operation can be performed for creating a user task record **330**' for an information push type source, such as is shown in **FIG. 3C**.

[**0050**] **FIG. 4A** is an architectural block diagram of the information stream management network server **100**', which combines the information gathering server and the distribution server, in accordance with a second embodiment the invention.

[**0051**] In the second embodiment, the information gathering server and information distribution server are combined as a multiple event queue server **102**'. The multiple event queue server has an input **104** coupled to the network for accessing articles from information pull sources in the network. At least one pull event driver **230** in the server, has a specified driver execution time for accessing articles from a specified information pull source in the network. A supervisory input **150** coupled to the server provides the specified driver execution time. A storage **160** coupled to the server stores the transformed article objects of articles accessed by the pull event driver. The multiple event queue server **102**' is coupled to the storage **160** and to the network, and has at least one user task record **330** specified by the user, the record including a distribution execution time specified by the user for retrieving the transformed article objects from the storage **160** and a distribution format specified by the user for distributing the articles to a destination in the network specified by the user. The multiple event queue server **102**' distributes the transformed article objects to the destination in the network at times and in forms that are specified by the user, while the server **102**' accesses the articles from the sources in the network at times and in forms that are independent of the user.

[**0052**] **FIG. 5** is a flow diagram of the multiple event queue processor embodiment **108**", for the architecture of **FIG. 4A**. The multiple event queue server **102**' includes an event queue processor **108**" with a scheduler to schedule events by their respective execution times. The event queue processor **108**" selects a next scheduled event and runs it at the specified execution time to process the scheduled event. The multiple events include command events, driver execution events, information creation events, and information distribution events.

[**0053**] Command events are server administrative functions such as the allocation of memory, and are typically issued by the supervisory server **150**. Driver execution events are the execution of the pull driver **230** or the push driver **250**. Information creation events place the newly arrived pushed article into the temporary input buffer **112**. Information distribution events are the delivery of transformed article objects to the end user. Each type of event is represented by an event record **560-566**, as is shown in **FIG. 5B**. The event records are arranged into a multiple event queue **555** in their order of time of execution and within that time, by their relative priority. **FIG. 5B** illustrates an example of the multiple event queue **555** operated on by the multiple event queue processor embodiment **108**" of **FIG. 5**. The flow diagram of **FIG. 5** enables multiple event queues **555** of different priority. It chooses events based first on time and then on priority. Its steps are as follows:

[**0054**] Step **500**: initialize event queues from a database with any events that were cached when the server was last shut down and initialize the driver queue from a database (this specifies the name of the drivers and the scheduling policy).

[**0055**] Step **501**: while there is no signal to shutdown:

[**0056**] Step **502**: consult the driver queue and add a new driver execution event to the event queue for any drivers which should be run now.

[**0057**] Step **504**: add to the event queue any external events which have newly arrived.

[**0058**] Step **505**: while there are events to process right now.

[**0059**] Step **506**: select the highest priority event to process right now

[**0060**] Step **508**: if the event is a COMMAND EVENT then process the command (see event record **561** of **FIG. 5B**)

[**0061**] Step **510**: else if the event is a DRIVER EXECUTION EVENT then execute the driver (see event records **562** and **563** of **FIG. 5B**)

[**0062**] Step **512**: else if the event is an INFORMATION CREATION EVENT then buffer the article and schedule a push DRIVER EXECUTION EVENT immediately (see event records **560** and **564** of **FIG. 5B**)

[0063] Step **514**: else if the event is an INFORMATION DISTRIBUTION EVENT then do the distribution (see event records **565** and **566** of **FIG. 5B**)

[0064] The term "execute the driver" is defined as follows. The system acknowledges the fact that many information sources have "levels" of information associated with an article. For example, there may be an abstract or a subject as well as the complete article. The system allows a user task to match against this "topic" and/or against the complete article if specified. This can potentially save expensive downloads of large, irrelevant articles. To force downloading when no topic match is available or desired, the task's topic filter merely returns "true". To force acceptance of any downloaded article, the task's article filter merely returns "true".

[0065] **FIG. 5A** is a flow diagram of the push driver process **520**, which is a driver execution event for push articles located in the temporary input buffer **112**, in the multiple event queue processor embodiment **108**" of **FIG. 5**. Note that when the "push driver" executes, it finds its topic and article in the temporary input buffer **112** where the pushed article is placed during an information creation event, as stated in

[0066] step **530**. The flow diagram proceeds through the following steps:

[0067] Step **532**: create a task queue from all the user task records which specify this driver.

[0068] Step **534**: use the driver code to access the information source or input buffer **112** and obtain a list of topics, if they are available.

[0069] Step **536**: start an outer loop for each task in the task queue

[0070] Step **538**: start an inner loop for each article topic

[0071] Step **540**: if the task's topic filter is satisfied then go to step **544**. Otherwise, select the next topic at step **542** and return to step **538**.

[0072] Step **544**: if the full article is not already downloaded then download it to the buffer memory **160** at step **546** and go to step **548**.

[0073] Step **548**: if the task's article filter is satisfied then go to step **552**. Otherwise select the next article and return to step **536**.

[0074] Step **552**: route the article according to the task specification and return to step **536**.

[0075] The term "route the article according to the task specification" is defined as follows: The user task record specifies a set of distribution specifications. Each specification consists of a destination and a time of distribution. A destination has a type (channel, email, fax, printer, etc.) and an address of the appropriate type for the destination (channel number, email address, fax number, printer name, etc.) If the address is omitted, then the address is determined from the type and the contact information that the system has stored in the user database (e.g., the system looks up the user's fax number if the destination type was fax). For each distribution specification, an INFORMATION DISTRIBUTION EVENT is generated. By default, these events are added to the multiple event queue **555** of the event queue processor **108**", but the server can be configured to pass some of the distribution events on to other servers.

[0076] The term "do the distribution" is defined as follows: The system uses a modular architecture for distribution events similar to that for acquisition. The distribution type maps to a "distribution driver" that handles distribution for that type.

[0077] The multiple event queue server **102**' selectively modifies the retrieved articles as specified in the user task record **330**, forming objects which are stored in the storage **160**. The event queue processor **108**" selects a next scheduled information distribution event record in the multiple event queue of **FIG. 5B** and runs it at the execution time to retrieve the objects from the storage. The event queue processor **108**" outputs the objects to a destination specified in the user task record **330** using a format specified in the user task record **330**.

[0078] The multiple event queue server **102**' includes an information push input buffer **112** for buffering any articles received from information push sources in the network. The event queue processor **108**" determines whether any articles have been received from the information push sources addressed to a declarative address, and immediately selects and runs a push event driver server **250** for such information push articles. The event queue processor **108**" outputs the transformed article objects derived from the information push sources to the storage **160**.

[0079] **FIG. 4B** is a flow diagram of an alternate embodiment **108**' of the combined event driver queue processor **108** of **FIG. 2**A and the distribution event queue processor **122** of **FIG. 3**A, for the architecture of **FIG. 4A**. The alternate embodiment **108**' operates on queues composed of gathering event drivers **230** and **250** and distribution event records **330** and **330**' organized in a queue order by their respective execution times. The flow diagram begins with step **210** to schedule all events by start time. Then step **204** determines if any push messages have been received. If yes, then the process flows to step **216** of the event driver queue processor **108** of **FIG. 2**A, to immediately run the push event driver. If step **204** returns a no, then the process flows to step **203** to queue the next event. Then step **205** determines if it is a pull event or a distribution event. If it is a pull event, then the process flows to step **206** of the event driver queue processor **108** of **FIG. 2**A, to get the next scheduled pull event driver. If step **205** returns a distribution event, then the process flows to step **306** of the distribution event queue processor **122** of **FIG. 3**A, to perform the distribution of the designated transformed article object to the designated destination specified in the distribution event record **182** of **FIG. 2D**. The distribution event queue processor **122** then loops back to step **204**. The event driver queue processor **108** also loops back to step **204**.

[0080] In this manner, the information distribution server distributes the articles and messages to destinations in the network at times and in forms that are specified by the user, while the information gathering server accesses and receives the articles and messages from the sources in the network at times and in forms that are independent of the user.

[0081] Various illustrative examples of the invention have been described in detail. In addition, however, many modifications and changes can be made to these examples without departing from the nature and spirit of the invention.

What is claimed is:

1. An information stream management network server, comprising:

an information gathering server having an input coupled to a network for accessing articles from information pull sources in the network and for receiving articles from information push sources in the network;

at least one pull event driver in said information gathering server, having a specified pull event start time for accessing articles from a specified information pull source in the network;

a supervisory input coupled to said information gathering server, for providing said specified pull event start time;

at least one push event driver in said information gathering server, for receiving articles from said information push sources in the network addressed to a declarative address specified by a user;

a storage coupled to said information gathering server, for storing said articles accessed by said pull event driver and said articles received by said push event driver; and

an information distribution server coupled to said storage and to said network, having at least one user task record specified by said user, said record including a distribution start time specified by said user for retrieving said articles from said storage and a distribution format specified by said user for distributing said articles to a destination in the network specified by said user;

said information distribution server distributing said articles to said destination in the network at times and in forms that are specified by said user, while said information gathering server accesses and receives said articles from said sources in the network at times and in forms that are independent of said user.

2. The information stream management network server of claim 1, wherein said information gathering server further comprises:

an event driver queue processor including a scheduler to schedule pull source event drivers by their respective said specified pull event start times;

said event driver queue processor selecting a next scheduled pull event driver and running it at said specified pull event start time to access articles from a specified pull source;

said event driver queue processor outputting said accessed articles from said specified information pull source to said storage.

3. The information stream management network server of claim 2, wherein said information gathering server further comprises:

an information push input buffer for buffering any articles received from said information push sources;

said event driver queue processor determining whether any articles have been received from said information push sources addressed to a declarative address, immediately selecting and running a push event driver in said information gathering server for such information push articles;

said event driver queue processor providing said articles received from said information push sources to said destination in the network at times and in forms that are specified by said user.

4. The information stream management network server of claim 3, wherein said information distribution server further comprises:

a distribution event queue processor including a scheduler to schedule distribution event records by their respective said distribution event start times;

said distribution event queue processor selecting a next scheduled distribution event record and running it at said distribution event start time to retrieve said articles from said storage;

said distribution event queue processor outputting said retrieved articles to a destination specified in said user task record using a format specified in said user task record.

5. The information stream management network server of claim 4, which further comprises:

said at least one push event driver including declarative address information for storing in said storage said received articles from said information push sources addressed to said declarative address; and

said distribution server retrieving from said storage said received articles from said information push sources addressed to said declarative address.

6. The information stream management network server of claim 1, wherein said at least one pull event driver further comprises:

information for storing in said storage said accessed articles from said specified information pull source.

7. The information stream management network server of claim 6, wherein said distribution server further comprises:

information for retrieving from said storage said accessed articles from said specified information pull source.

8. The information stream management network server of claim 1, wherein said at least one push event driver further comprises:

a declarative address information for storing in said storage said received articles from said information push sources addressed to said declarative address.

9. The information stream management network server of claim 8, wherein said distribution server further comprises:

said declarative address information for retrieving from said storage said received articles from said information push sources addressed to said declarative address.

10. The information stream management network server of claim 1, wherein said supervisory input further comprises:

a supervisory server for defining pull event drivers with pull event start times and loading thereof into said information gathering server;

said supervisory server defining push event drivers with declarative address information and loading thereof into said information gathering server.

11. The information stream management network server of claim 10, wherein said supervisory server further comprises:

said supervisory server providing information to said storage for storing said push and pull articles.

12. The information stream management network server of claim 11, wherein said supervisory server further comprises:

said supervisory server sending information to said information distribution server for enabling retrieval of push and pull articles from said storage.

13. The information stream management network server of claim 1, wherein said information gathering server further comprises:

an information push input buffer for buffering any articles received from said information push sources addressed to a specified declarative address;

an event driver queue processor for determining whether any articles have been received from said information push sources addressed to a specified declarative address, selecting and running a push event driver in said information gathering server for such information push articles;

said event driver queue processor outputting said articles received from said information push sources to said storage.

14. The information stream management network server of claim 1, wherein said information gathering server further comprises:

an event driver queue processor including a scheduler to schedule pull source event drivers by their respective pull event start times;

said event driver queue processor selecting a next scheduled pull event driver and running it at a scheduled time to access articles from a specified pull source;

said event driver queue processor outputting said accessed articles from said specified information pull source to said storage.

15. The information stream management network server of claim 1, wherein said information distribution server further comprises:

an event queue processor including a scheduler to schedule distribution event records by their respective distribution event start times;

said event queue processor selecting a next scheduled distribution event record and running it at a specified time to retrieve articles from said storage;

said event queue processor outputting said retrieved articles to a destination specified in said user task record using a format specified in said user task record.

16. The information stream management network server of claim 15, wherein said retrieved articles are modified comprising the step of:

producing a notification to the user of the retrieved articles.

17. The information stream management network server of claim 15, wherein said retrieved articles are modified comprising the step of:

producing a summary of the retrieved articles.

18. The information stream management network server of claim 15, wherein said retrieved articles are modified comprising the step of:

producing a translation of the retrieved articles.

19. The information stream management network server of claim 15, wherein said retrieved articles are modified comprising the step of:

producing a compendium of the retrieved articles.

20. The information stream management network server of claim 15, wherein said retrieved articles are modified comprising the step of:

producing a format conversion of the retrieved articles.

21. The information stream management network server of claim 1, further comprising:

said information distribution server having an output coupled to said network for distributing E-mail articles.

22. The information stream management network server of claim 1, further comprising:

said information distribution server having an output coupled to said network for distributing facsimile articles.

23. The information stream management network server of claim 1, further comprising:

said information distribution server having an output coupled to said network for distributing Internet articles.

24. The information stream management network server of claim 1, further comprising:

said information distribution server having an output coupled to said network for distributing text-to-voice converted articles over telephone voice links.

25. The information stream management network server of claim 1, further comprising:

said information distribution server having an output coupled to said network for distributing articles over digital wide area networks.

26. The information stream management network server of claim 1, further comprising:

said information distribution server having an output coupled to said network for distributing articles in image data format.

27. The information stream management network server of claim 1, further comprising:

said information distribution server having an output coupled to said network for distributing articles in a graphical format.

28. The information stream management network server of claim 1, further comprising:

said information gathering server having said input coupled to said network for accessing articles from news sources.

29. The information stream management network server of claim 1, further comprising:

said information gathering server having said input coupled to said network for accessing articles from proprietary databases.

30. The information stream management network server of claim 1, further comprising:

said information gathering server having said input coupled to said network for receiving E-mail articles.

31. The information stream management network server of claim 1, further comprising:

said information gathering server having said input coupled to said network for receiving reminder articles.

32. The information stream management network server of claim 1, further comprising:

said information gathering server having said input coupled to a public switched telephone network.

33. The information stream management network server of claim 1, further comprising:

said information gathering server receiving articles in a first form and converting them to a second form as specified in said user task record.

34. The information stream management network server of claim 1, further comprising:

said information gathering server receiving articles in a first multimedia format and converting them to a second multimedia format as specified in said user task record.

35. The information stream management network server of claim 1, further comprising:

said information gathering server having said input coupled to an Internet network.

36. An information stream management network server, comprising:

an information gathering server having an input coupled to a network for accessing articles from information pull sources in the network;

at least one pull event driver in said information gathering server, having a specified pull event start time for accessing articles from a specified information pull source in the network;

a supervisory input coupled to said information gathering server, for providing said specified pull event start time;

a storage coupled to said information gathering server, for storing said articles accessed by said pull event driver; and

an information distribution server coupled to said storage and to said network, having at least one user task record specified by said user, said record including a distribution start time specified by said user for retrieving said articles from said storage and a distribution format specified by said user for distributing said articles to a destination in the network specified by said user;

said information distribution server distributing said articles to said destination in the network at times and in forms that are specified by said user, while said information gathering server accesses said articles from said sources in the network at times and in forms that are independent of said user.

37. The information stream management network server of claim 36, wherein said information gathering server further comprises:

an event driver queue processor including a scheduler to schedule pull source event drivers by their respective said specified pull event start times;

said event driver queue processor selecting a next scheduled pull event driver and running it at said specified pull event start time to access articles from a specified pull source;

said event driver queue processor outputting said accessed articles from said specified information pull source to said storage.

38. The information stream management network server of claim 37, wherein said information distribution server further comprises:

a distribution event queue processor including a scheduler to schedule distribution event records by their respective said distribution event start times;

said information gathering server selectively modifying said retrieved articles as specified in said user task record, forming objects which are stored in said storage;

said distribution event queue processor selecting a next scheduled distribution event record and running it at said distribution event start time to retrieve said objects from said storage;

said distribution event queue processor outputting said objects to a destination specified in said user task record using a format specified in said user task record.

39. The information stream management network server of claim 38, wherein said information gathering server further comprises:

an information push input buffer for buffering any articles received from information push sources in the network;

said event driver queue processor determining whether any articles have been received from said information push sources addressed to a declarative address, immediately selecting and running a push event driver in said information gathering server for such information push articles;

said event driver queue processor outputting said articles received from said information push sources to said storage.

40. The information stream management network server of claim 39, which further comprises:

said at least one push event driver including declarative address information for storing in said storage said received articles from said information push sources addressed to said declarative address; and

said storage including said declarative address information for retrieving from said storage said received articles from said information push sources addressed to said declarative address.

41. A process for an information stream management network service, comprising the steps of:

scheduling each of a plurality of information pull event drivers in an information gathering server in a network, according to respective pull event start times defined by a supervisor;

accessing articles from a plurality of information pull sources in the network using said pull event drivers at said respective pull event start times and storing said accessed articles in a storage, the sources being specified for respective ones of said drivers;

scheduling each of a plurality of information distribution event records in an information distribution server in the network, according to respective distribution event start times defined by a user; and

retrieving a subset of said articles from said storage for distribution to a destination in the network using a respective one of said information distribution event records at said respective distribution event start time and sending said subset of articles to said destination in a form which is specified by said user;

whereby said articles can be distributed to said destination at times and in forms that are customized by said user, while said accessing of said articles from said sources can remain independent of the user.

42. The process of claim 41, which further comprises:

receiving information push articles directed to declarative addresses, said articles having been sent from a plurality of information push sources in the network, and storing said articles in said storage using push event drivers, said declarative addresses being specified for respective ones of said push event drivers; and

retrieving a subset of said articles from said storage for distribution to a second destination in the network using a respective second one of said information distribution event records at a respective second distribution event start time and sending said subset of articles to said second destination in a form which is specified by said user.

43. An information stream management network server, comprising:

a multiple event queue server having an input coupled to a network for accessing articles from information pull sources in the network;

at least one pull event driver in said server, having a specified driver execution time for accessing articles from a specified information pull source in the network;

a supervisory input coupled to said server, for providing said specified driver execution time;

a storage coupled to said server, for storing said articles accessed by said pull event driver; and

said multiple event queue server coupled to said storage and to said network, having at least one user task record specified by said user, said record including a distribution execution time specified by said user for retrieving said articles from said storage and a distribution format specified by said user for distributing said articles to a destination in the network specified by said user;

said multiple event queue server distributing said articles to said destination in the network at times and in forms that are specified by said user, while said server accesses said articles from said sources in the network at times and in forms that are independent of said user.

44. The information stream management network server of claim 43, wherein said multiple event queue server further comprises:

an event queue processor including a scheduler to schedule events by their respective execution times;

said event queue processor selecting a next scheduled event and running it at said specified execution time to process the scheduled event;

said events including command events, driver execution events, information creation events, and information distribution events.

45. The information stream management network server of claim 44, wherein said multiple event queue server further comprises:

said server selectively modifying said retrieved articles as specified in said user task record, forming objects which are stored in said storage;

said event queue processor selecting a next scheduled driver execution event record and running it at said execution time to retrieve said objects from said storage;

said event queue processor outputting said objects to a destination specified in said user task record using a format specified in said user task record.

46. The information stream management network server of claim 45, wherein said multiple event queue server further comprises:

an information push input buffer for buffering any articles received from information push sources in the network;

said event queue processor determining whether any articles have been received from said information push sources addressed to a declarative address, immediately selecting and running a push event driver server for such information push articles;

said event queue processor outputting said articles received from said information push sources to said storage.

47. The information stream management network server of claim 46, which further comprises:

at least one push event driver including declarative address information for storing in said storage said received articles from said information push sources addressed to said declarative address; and

said storage including said declarative address information for retrieving from said storage said received articles from said information push sources addressed to said declarative address.

48. A process for an information stream management network service, comprising the steps of:

scheduling each of a plurality of information pull gathering events in a server in a network, according to respective driver execution times defined by a supervisor;

accessing articles from a plurality of information pull sources in the network at said respective driver execution times and storing said accessed articles in a storage, the sources being specified for respective ones of said gathering events;

scheduling each of a plurality of information distribution events in the server according to respective distribution execution times defined by a user; and

retrieving a subset of said articles from said storage for distribution to a destination in the network at said respective distribution execution times and sending said subset of articles to said destination in a form which is specified by said user;

whereby said articles can be distributed to said destination at times and in forms that are customized by said user, while said accessing of said articles from said sources can remain independent of the user.

49. The process of claim 48, which further comprises:

receiving information push articles directed to declarative addresses, said articles having been sent from a plurality of information push sources in the network, and storing said articles in said storage using push event drivers, said declarative addresses being specified for respective ones of said push event drivers; and

retrieving a subset of said articles from said storage for distribution to a second destination in the network at a respective second distribution execution time and sending said subset of articles to said second destination in a form which is specified by said user.

50. A process for an information stream management network service, comprising the steps of:

scheduling each of a plurality of information gathering events in a server in a network, according to respective driver execution times defined by a supervisor;

accessing articles from a plurality of information sources in the network at said respective driver execution times and transforming the articles into a form which is specified by a user;

scheduling each of a plurality of information distribution events in the server according to respective distribution execution times defined by said user; and

distributing a subset of said transformed articles to a destination in the network at said respective distribution execution times;

whereby said articles can be distributed to said destination at times and in forms that are customized by said user, while said accessing of said articles from said sources can remain independent of the user.

51. An information stream management network server, comprising:

scheduling means for scheduling each of a plurality of information gathering events in a server in a network, according to respective driver execution times defined by a supervisor;

accessing means for accessing articles from a plurality of information sources in the network at said respective driver execution times;

transforming means for transforming the articles into a form which is specified by a user;

said scheduling means scheduling each of a plurality of information distribution events in the server according to respective distribution execution times defined by said user; and

distributing means for distributing a subset of said transformed articles to a destination in the network at said respective distribution execution times;

whereby said articles can be distributed to said destination at times and in forms that are customized by said user, while said accessing of said articles from said sources can remain independent of the user.

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