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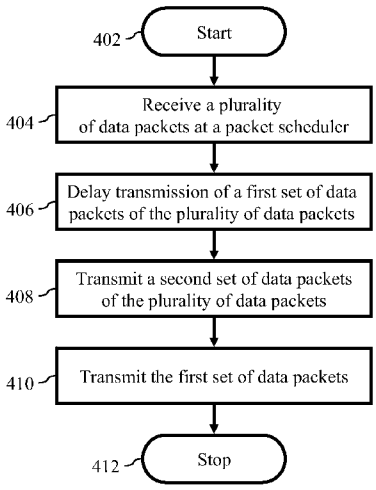
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(54) **Title:** METHOD AND SYSTEM FOR TRANSMITTING DATA PACKETS IN A COMMUNICATION NETWORK



(57) **Abstract:** The present invention provides a method for transmitting a plurality of data packets in a communication network (100). The method includes receiving (404) the plurality of data packets at a packet scheduler. The packet scheduler can be the electronic device (110). The method also includes delaying (406) transmission of a first set of data packets of the plurality of data packets at the packet scheduler. The first set of data packets has a high priority. Further, the method includes transmitting (408) a second set of data packets of the plurality of data packets. The second set of data packets has a low priority. Furthermore, the method includes transmitting (410) the first set of data packets after transmission of the second set of data packets.

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METHOD AND SYSTEM FOR TRANSMITTING DATA PACKETS IN A COMMUNICATION NETWORK

[0001] The present invention generally relates to communication networks, and more particularly, to a method and system for data transmission of packets in communication networks.

BACKGROUND OF THE INVENTION

[0002] Communication devices are valuable tools for transmitting and receiving data and information today. Examples of such communication devices include a mobile phone, a smart phone, a fixed-line phone, a pager, a computer, a laptop, and a Personal Digital Assistant (PDA). These communication devices may be connected to each other in a communication network such as the Internet, a Public Switched Telephone Network (PSTN), a global Telecommunications Exchange (TELEX) network, a Global System for Mobile (GSM) communication network, a Code Division Multiple Access (CDMA) network, a Local Area Network (LAN), a third generation partnership project (3GPP) long term evolution (LTE), an ultra mobile broadband (UMB), a Worldwide Interoperability for Microwave Access (WiMax), a wireless fidelity (WiFi) and so forth.

[0003] These communication devices may be used to transfer data such as voice, video, multimedia applications, and so forth, to one another through the communication network. The transfer of data from one communication device to another takes place via communication network entities such as routers, base transceiver station (BTS) and so forth. The transfer of large amounts of data from one communication device to another in the communication network causes

communication network overloading which may prevent users from transferring data from one communication device to another.

[0004] There are different methods for reducing network overloading of communication networks due to the transfer of a large amount of data from one communication device to another. One of the methods is to transfer the data in order of their Quality of Service (QoS) or priority levels. For example, Voice over Internet Protocol (VoIP) data is transmitted before File Transfer Protocol (FTP) data because of the high QoS level of VoIP data. This method gives priority to VoIP data over other types of data such as text, images, multimedia applications, and so forth. Therefore, the VoIP data is transmitted as soon as it arrives at the communication network entity.

[0005] However, when VoIP data packets are to be transmitted to or from users who are in poor network conditions, the data frames in which the VoIP data packets are scheduled for transmission, are allocated a poor data transfer interface link over the communication network. Because the inter-arrival time of VoIP packets is longer than scheduling slots, this results in scheduling transmission of small-sized VoIP data packets along with other low QoS level data in the data frame. Due to this characteristic of the method, several low rate data frames with small size VoIP data packets are used to transmit all the VoIP data packets together. Due to the inefficient scheduling of data frames with small size packets, data throughput over the communication network decreases.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views, and which, together with the detailed description below, are incorporated in and form part of the specification, serve to further illustrate various embodiments and explain various principles and advantages, all in accordance with the present invention.

[0007] **FIG. 1** illustrates an exemplary communication network, where various embodiments of the present invention can be practiced;

[0008] **FIG. 2** illustrates another exemplary communication network, where various embodiments of the present invention can be practiced;

[0009] **FIG. 3** is a block diagram of an electronic device, in accordance with an embodiment of the present invention;

[0010] **FIG. 4** is a flow diagram depicting a method for transmitting a plurality of data packets in a communication network, in accordance with an embodiment of the present invention;

[0011] **FIG. 5** is another flow diagram that depicts the transmission of a plurality of data packets in the communication network, in accordance with another embodiment of the present invention; and

[0012] **FIGs. 6** and **7** are another flow diagram that depicts a detailed method for transmitting a plurality of data packets in the communication network, in accordance with another embodiment of the present invention.

[0013] Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated, relative to other elements, to help in improving an understanding of the embodiments of the present invention.

DETAILED DESCRIPTION

[0014] Before describing in detail the particular method and system for transmitting data packets in a communication network, in accordance with various embodiments of the present invention, it should be observed that the present invention resides primarily in combinations of method steps related to the method and system for transmitting data packets in a communication network. Accordingly, the apparatus components and method steps have been represented, where appropriate, by conventional symbols in the drawings, showing only those specific details that are pertinent for an understanding of the present invention, so as not to obscure the disclosure with details that will be readily apparent to those with ordinary skill in the art, having the benefit of the description herein.

[0015] In this document, the terms 'comprises,' 'comprising', or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article or apparatus that comprises a list of elements does not include only those elements but may include other elements that are not expressly listed or inherent in such a process, method, article or apparatus. An element proceeded by 'comprises ... a' does not, without more constraints, preclude the existence of additional identical elements in the process, method, article or apparatus that comprises the element. The

term 'another,' as used in this document, is defined as at least a second or more. The terms 'includes' and/or 'having', as used herein, are defined as comprising.

[0016] For one embodiment, a method for transmitting a plurality of data packets in a communication network is provided. The method includes receiving the plurality of data packets at a packet scheduler. The method also includes delaying the transmission of a first set of data packets of the plurality of data packets at the packet scheduler. The first set of data packets has a high priority. Further, the method includes transmitting a second set of data packets of the plurality of data packets. The second set of data packets has a low priority. Moreover, the method includes transmitting the first set of data packets of the plurality of data packets.

[0017] For another embodiment, an electronic device that is capable of transmitting a plurality of data packets in a communication network is provided. The electronic device includes a receiver that is configured to receive a plurality of data packets. The electronic device also includes a processor that is configured to delay the transmission of a first set of data packets of the plurality of data packets. The first set of data packets has a high priority. Further, the electronic device includes a transmitter that is capable of transmitting the plurality of data packets.

[0018] **FIG. 1** illustrates an exemplary communication network **100**, where various embodiments of the present invention can be practiced. The communication network **100** enables communication between a plurality of communication devices. The communication network **100** can be the Internet, a Public Switched Telephone Network (PSTN), a Global Telecommunications Exchange (TELEX) network, a Global System for Mobile (GSM) communication network, a Code Division Multiple

Access (CDMA) network, a Local Area Network (LAN), a third generation partnership project (3GPP) long term evolution (LTE), an ultra mobile broadband (UMB), a Worldwide Interoperability for Microwave Access (WiMax), a wireless fidelity (WiFi) and so forth.

[0019] The communication environment includes exemplary communication devices interacting with each other in the communication network **100**. These exemplary communication devices include a first device **102**, a second device **104**, a third device **106** and a fourth device **108.** Examples of the devices **102-108**are computers, laptops, smart phones, fixed-line phones, pagers, personal digital assistants (PDAs), mobile phones, or the like. The devices **102-108** can share information and data such as text, images, voice, video, multimedia applications, and so forth, via the communication network **100**.

[0020] The communication network **100** includes an electronic device **110**, which manages communication between the plurality of communication devices. Further, the electronic device **110** enables transfer of data between the communication devices. The electronic device **110** can be a communication network entity such as a packet scheduler, a router, a BTS, and so forth. The electronic device **110** receives data packets from a communication device of the plurality of communication devices. Further, the electronic device **110** uses appropriate data-scheduling methods to transmit data packets to one or more exemplary communication devices in a manner to optimize the bandwidth utilization in the communication network **100** and maintain the desired data throughput in the communication network **100**. Although the electronic device **110** is shown to be located in the communication network **100**, it

can also be located in any communication device present in the communication network **100**.

[0021] **FIG. 2** illustrates another exemplary communication network **200**, where various embodiments of the present invention can be practiced. The communication network **200** shows a plurality of communication devices **102-108**communicating with each other via a BTS **202** over an air interface. Although the plurality of communication devices 102-108 are shown to communicate with each other via the BTS **202**, it will be apparent to any person ordinarily skilled in the art that the invention can be implemented with the help of any other suitable electronic device. Examples of the communication network **200** are the Internet, a Public Switched Telephone Network (PSTN), a Global Telecommunications Exchange (TELEX) network, a Global System for Mobile (GSM) communication network, a Code Division Multiple Access (CDMA) network, a Local Area Network (LAN), a third generation partnership project (3GPP) long term evolution (LTE), an ultra mobile broadband (UMB), a Worldwide Interoperability for Microwave Access (WiMax), a wireless fidelity (WiFi) and so forth. The plurality of communication devices 102-108 can transfer data such as voice, video, text, images, multimedia applications and so forth amongst each other via the BTS 202 over the air interface. The air interface has transmit opportunities that come at regular intervals. Thus, data packets can be received and/or transmitted at regular intervals. For example, in a CDMA rev A network, data packets can be transmitted approximately every 1.6 ms.

[0022] The communication devices can be located in areas that are experiencing different radio-frequency (RF) conditions. The size of the data packet

that can be transferred to a particular communication device after the continuous time interval is dependant on the RF conditions that the communication device is experiencing. For example, if the first device **102** is experiencing good RF conditions, it may request the transfer of 5120 bits of the data packet in a data frame as compared to a second device **104** which is experiencing poor RF conditions. The second device **104** experiencing poor RF conditions may request the transfer of only 256 bits of data packets in a data frame. Data packets that are transmitted via the BTS **202** can differ in terms of QoS levels, the size of each data packet, rate request of each data packet, RF conditions experienced by the communication devices where the data packets are being transmitted, and so forth. Due to such differences, the BTS **202** uses different scheduling algorithms in order to efficiently utilize the over the air interface bandwidth.

[0023] **FIG. 3** is a block diagram of an electronic device **110**, in accordance with an embodiment of the present invention. The electronic device **110** is described with respect to the exemplary communication network **100** of the **FIG. 1** The electronic device **110** manages the transfer of data packets from one communication device to the other. The device **110** receives data from one of the plurality of communication devices, schedules transmission of data in the communication network **100** and transmits data packets to one or more of the plurality of communication devices in the communication network **100**. The device **110** uses scheduling algorithms to transfer data such that communication network overloading is minimized and bandwidth used in transferring the data is utilized efficiently. The electronic device **110** includes a receiver **302**, a processor **304**, and a transmitter **306**.

[0024] The receiver **302** receives a plurality of data packets from one or more of the communication devices that are coupled together in the communication network **100**. In an embodiment of the present invention, the plurality of data packets can be received at regular time intervals. For example, in a CDMA rev A communication network, the data packets can be received and/or transmitted approximately every 1.6 ms. The plurality of data packets is received at the electronic device 110, which in turn, schedules and transmits data packets in the communication network **100**. For example, the receiver **302** in the BTS **202** can receive a plurality of data packets, such as VoIP data packets, to facilitate the transfer of data from the first device **102** to the second device **104** in the communication network **100**. Upon receipt of the data packets at the receiver **302**, the processor **304** schedules transmission of the data packets on the basis of a scheduling algorithm.

[0025] In accordance with the invention, the processor **304** can delay transmission of a subset of data packets received. In a first embodiment, the processor 304 can delay transmission of a first set of high priority (high QoS) data packets of a plurality of data packets received and transmit a second set of low priority data packets of the plurality of data packets received. Throughout the remainder of this document reference to a "first set of data packets" will be used interchangeably with "high priority data packets" or "high QoS data packets." Likewise, reference to a "second set of data packets" will be used interchangeably with "low priority data packets." The processor 304 will transmit the low priority data packets and delay transmission of the high priority data packets when the high priority data packets are to be transmitted to communication devices that are experiencing poor RF conditions. For example, the first set of data packets may

contain VoIP data packets, since they have a high QoS level and a high priority. The priority of the plurality of data packets received is determined by the processor **304**. In the first embodiment, transmission of the first set of data packets is delayed for a time period less than a predefined threshold value of delay for the QoS level pertaining to the first set of data packets (i.e. delayed for a period of time that will not violate the required latency of the particular QoS application). If transmission of the first set of data packets is delayed for more than the predefined threshold value of delay, the latency of the first set of data packets can be affected.

[0026] There are other reasons for delaying transmission of high priority data packets. For example, if the size of the first set of data packets received is small, the data frame(s) will be largely unoccupied and can be filled with low priority data packets. When the first set of data packets are to be transmitted to users experiencing poor RF conditions, the data frame is provided a low rate data transfer interface link. Thus, the communication devices requesting the second set of data packets that are being transmitted in the low data transfer rate data frame are also affected. Further, if several high QoS users experiencing poor RF conditions are on the air interface at the same time, they each may be allocated their own low rate data transfer interface link. This can artificially constrict the bandwidth of the channel greatly. Therefore in a second embodiment, transmission of the first set of data packets is delayed to enable aggregation of the first set of data packets having a low rate request. This reduces the number of data frames being allocated the low data transfer rate over the communication network **100**.

[0027] In the second embodiment, the processor **304** aggregates the first set of data packets. For example, when transmission of low rate VoIP data packets at the BTS **202** is delayed, they can be aggregated with the next set of low rate VoIP data packets. Please note that reference throughout this description to low rate data packets implies that the users requesting the data packets are experiencing poor RF conditions such that transmission of the data packets occurs over a low rate interface link. Similarly, a low rate request and a high rate request refer to request for a low rate interface link and high rate interface link, respectively. A rate threshold can be used to distinguish between a high and a low rate request. The rate request and the size of each of the plurality of data packets are determined by the processor **304**. Aggregation of the first set of data packets accommodates the low rate first set of data packets in a fewer number of data frames. When the number of data frames that are allocated a low transfer rate bandwidth over the communication network **100** is reduced, the overall data throughput over the communication network **100** increases.

[0028] There are good reasons for not delaying transmission of high priority data packets. For example, the processor **304** does not delay transmission of the first set of data packets when they are being transmitted to users experiencing good RF conditions. Additionally, if no other data packet is to be transmitted along with the first set of data packets, the packets are transmitted without delay. Further, transmission of the first set of data packets is not delayed when the plurality of data packets arrive at the electronic device **110** at a rate such that packet packing efficiency is not affected by immediate transmission of the first set of data packets. Moreover, when there are a few low rate first set of data packets in the data frame, but not enough to fill up the low data transfer rate data frame and there is no low priority data

to send, the data frame is transmitted without delaying the transmission of the first set of data packets. Furthermore, when the transmission delay of the first set of data packets exceeds a predefined threshold value, the first set of data packets is transmitted immediately, even when the first set of data packets has a low rate request. After the transmission of data packets is scheduled by the processor **304**, the transmitter **306** transmits the plurality of data packets. The plurality of data packets can be transmitted to one or more of plurality of the communication devices in the communication network **100**.

[0029] **FIG. 4** is a flow diagram depicting a method for transmitting a plurality of data packets in the communication network **100**, in accordance with an embodiment of the present invention. The method is initiated at step **402**. At step **404**, a plurality of data packets is received at a packet scheduler, which can be the electronic device **110**. The plurality of data packets includes a first set of data packets (high priority/high QoS) and a second set of data packets (low priority/low QoS data packets). Examples of the first set of data packets include, but are not limited to, a VoIP data packet, streaming multimedia data packet, video teleconferencing data packet, alarm-signaling data packet, etc. Examples of the second set of data packets include, but are not limited to, an FTP data packet such as an HTTP web browsing packet, a text, an image, etc. At step **406**, transmission of a low rate first set of data packets of the plurality of data packets is delayed. At step **408**, a second set of data packets of the plurality of data packets is transmitted to one or more of the plurality of communication devices in the communication network **100**. At step **410**, the first set of data packets are transmitted to one or more of the plurality of communication

devices in the communication network **100**. Thereafter, the method terminates at step **412**.

[0030] **FIG. 5** illustrates a flow diagram depicting a method for transmitting a plurality of data packets in the communication network **100**, in accordance with another embodiment of the present invention. The method is initiated at step **502**. At step **504**, a plurality of data packets is received at a packet scheduler, which can be the electronic device **110**. As described with respect to FIG. 4, the plurality of data packets includes a first set of data packets and a second set of data packets. At step **506**, the transmission of a low rate first set of data packets of the plurality of data packets is delayed, so that the first set of data packets can be aggregated. The transmission of the VoIP data packets can be delayed at a BTS **202** in the communication network **100**. At step **508**, the first set of data packets is aggregated in a data frame. For example, in a communication network **100**, the low rate VoIP data packets that arrive at the packet scheduler at regular intervals are aggregated with the low rate VoIP data packets that arrive after an interval of time. Aggregation of the first set of data packets at the packet scheduler results in fewer data frames necessary to transmit the low rate first set of data packets. At step **510**, a second set of data packets of the plurality of data packets is transmitted to one or more of the plurality of the communication devices in the communication network **100**. At step **512**, the first set of data packets is transmitted to one or more of the plurality of the communication devices in the communication network **100**. Thereafter, the method terminates at step **514**.

[0031] **FIGs. 6 and 7** illustrate a flow diagram depicting a detailed method for transmitting a plurality of data packets in the communication network **100**, in accordance with another embodiment of the present invention. The method is initiated at step **602**. At step **604**, a plurality of data packets is received at a packet scheduler. The packet scheduler can be the electronic device **110**, for example a router, a BTS **202**, etc. that is present in the communication network **100**. The plurality of data packets is received by the receiver **302**. These data packets are received at the packet scheduler to facilitate their transmission from one of the plurality of communication device to another communication device in the communication network **100**.

[0032] At step **606**, the rate request of each of the plurality of data packets is determined. The rate request of the data packet depends on the RF conditions being experienced by the user requesting the data packet. If the user is experiencing poor RF conditions, a smaller size data packet is transmitted per unit time compared to the size of the data packet that is transmitted per unit time when the user is experiencing good RF conditions. Thus, the rate request of the data packet is proportional to the size of the data packet transmitted per unit time. A pre-defined rate threshold is used to distinguish data packets with high and low rate requests. The pre-defined rate threshold can be configured by a system/network administrator of the communication network **100**.

[0033] At step **608**, it is determined whether the rate request of each of the plurality of data packets is greater than a pre-defined rate threshold. If the answer is yes, at step **610** each of the plurality of data packets is transmitted by the transmitter

306 to one or more of the plurality of communication devices in the communication network **100**. For example, all the VoIP data packets can be transmitted immediately from the BTS **202** to one or more of the plurality of communication devices that are connected in the communication network **100** when the device(s) are experiencing good RF conditions. The method then terminates at step **612**.

[0034] If it is determined at step **608** that the rate request of some of the plurality of data packets is not more than the pre-defined rate threshold, at step **614**, the priority of each of the plurality of data packets is determined. The priority of the data packets can be determined by the processor **304**. For example, VoIP data packets having a higher QoS level, as compared to FTP data packets, will have higher priority than FTP data packets. The priority of the data packets is determined in order to classify them on the basis of their priority. For example, VoIP data packets are classified as the first set of data packets since they have a high priority and FTP data packets are classified as second set of data packets as they have a low priority.

[0035] At step **616**, the size of each of the plurality of data packets is determined by the processor **304** in order to determine the size of the first set of data packets, the size of the second set of data packets, as well as the size of the data frame that. At step **618**, it is determined whether the size of the second set of data packets of the plurality of data packets is less than a predefined size threshold. If the answer is yes, step **610** is performed. This implies that if there are no or very few low priority data packets to be transmitted along with the first set of data packets , all of the plurality of data packets received at the electronic device 110 are transmitted. The method then terminates at step **612**.

[0036] If, at step **618**, the size of the second set of data packets is determined to be greater than or equal to the predefined size threshold, at step **620** transmission of a first set of data packets having a low rate request is delayed by the processor **304** so that the first set of data packets having a low rate request can be aggregated. For example, when transmission of the low rate VoIP data packets at the router is delayed, the low rate VoIP data packets are aggregated with the next set of low rate VoIP data packets. This is possible because the VOIP data packets are received for transmission at the router after an interval of time, for instance, every 20 ms.

[0037] At step **622**, the first set of data packets having a low rate request is aggregated at the electronic device **110**. Aggregation of the low rate first set of data packets in the data frame accommodates large sized high priority data packets having the low rate request in the data frame. This results in a reduced number of data frames that are allocated a low transfer rate interface link over the communication network **100**. For example, aggregation of low rate VoIP data packets enables a large number of VoIP data packets to be accommodated in the data frame. This reduces the number of data frames with low rate VoIP data packets being transmitted. Further, aggregation of the low rate first set of data packets in the data frame enables the transmission of the first set of data packets and the second set of data packets in two distinct data frames. Hence, the second set of data packets can be transmitted over a high data transfer rate interface link.

[0038] At step **624**, a second set of data packets of the plurality of data packets is transmitted. The second set of data packets is transmitted by the transmitter **306** to one or more of the plurality of communication devices in the communication

network **100**. At step **626**, the first set of data packets is transmitted. The first set of data packets having a low rate request is transmitted by the transmitter **306** to one or more of the plurality of communication devices in the communication network **100**. Thereafter, the method terminates at step **612**.

[0039] Various embodiments of the present invention offer one or more advantages. Aggregation of the low rate first set of data packets in a data frame results in the accommodation of large size high priority data packets in the data frame. This results in a reduced number of data frames being transmitted over a low data transfer rate interface link. Consequently, there is an increased data throughput over the communication network. As a result, users can transfer and/or share large amounts of data at higher bit rates with other communication devices in the communication network. Further, the use of the method disclosed above improves and/or optimizes the capacity of the network to transmit the data packets in the communication network.

[0040] It will be appreciated that the method and system for transmitting data packets in the communication network, described herein, may comprise one or more conventional processors and unique stored program instructions that control the one or more processors, to implement, in conjunction with certain non-processor circuits, some, most, or all of the functions of the system described herein. The non-processor circuits may include, but are not limited to, signal drivers, clock circuits, power-source circuits and user-input devices. As such, these functions may be interpreted as steps of a method and system for transmitting data packets in a communication network. Alternatively, some or all the functions can be implemented by a state

machine that has no stored program instructions, or in one or more application-specific integrated circuits (ASICs), in which each function, or some combinations of certain of the functions, are implemented as custom logic. Of course, a combination of the two approaches can also be used. Thus, methods and means for these functions have been described herein.

[0041] It is expected that one with ordinary skill, notwithstanding possibly significant effort and many design choices motivated by, for example, available time, current technology and economic considerations, when guided by the concepts and principles disclosed herein, will be readily capable of generating such software instructions, programs and ICs with minimal experimentation.

[0042] In the foregoing specification, the invention and its benefits and advantages have been described with reference to specific embodiments. However, one with ordinary skill in the art would appreciate that various modifications and changes can be made, without departing from the scope of the present invention, as set forth in the claims below. Accordingly, the specification and the figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of the present invention. The benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage or solution to occur or become more pronounced are not to be construed as critical, required or essential features or elements of any or all the claims. The invention is defined solely by the appended claims, including any amendments made during the pendency of this application, and all equivalents of those claims, as issued.

What is claimed is:

1. A method for transmitting a plurality of data packets in a network, the method comprising:

receiving the plurality of data packets at a packet scheduler;

delaying transmission of a first set of data packets of the plurality of data packets at the packet scheduler, the first set of data packets having a high priority;

transmitting a second set of data packets of the plurality of data packets, the second set of data packets having a low priority; and

transmitting the first set of data packets after transmitting the second set of data packets.

2. The method as recited in claim 1, wherein the delay given to the transmission of the first set of data packets is less than a predefined threshold value of delay for the first set of data packets, wherein the predefined threshold value of delay depends on the required Quality of Service of the first set of data packets.

3. The method as recited in claim 1 wherein after transmitting a second set of data packets the method further comprises aggregating the first set of data packets.

4. The method as recited in claim 1 wherein after receiving the plurality of data packets, the method further comprises determining priority of each of the plurality of data packets.

5. The method as recited in claim 1 wherein after receiving the plurality of data packets, the method further comprises determining a rate request of each of the plurality of data packets, wherein the rate request is proportional to a size of a data packet.

6. The method as recited in claim 5, wherein transmission of the first set of data packets is delayed when the rate request of the first set of data packets is less than a pre-defined rate threshold.

7. The method as recited in claim 1 wherein after receiving the plurality of data packets, the method further comprises determining a size of each of the plurality of data packets.

8. The method as recited in claim 7 further comprising determining a size of the second set of data packets.

9. The method as recited in claim 8, wherein transmission of the first set of data packets is delayed when the size of the second set of data packets is more than a pre-defined size threshold.

10. The method as recited in claim 1 wherein after delaying transmission of the first set of data packets the method further comprises aggregating the first set of data packets.

11. An electronic device capable of transmitting a plurality of data packets in a network, the electronic device comprising:

a receiver configured to receive a plurality of data packets;

a processor configured to delay transmission of a first set of data packets of the plurality of data packets, the first set of data packets having a high priority; and schedule transmission of a second set of data packets having low priority without delay; and

a transmitter capable of transmitting the second set of data packets followed by transmission of the first set of data packets.

12. The electronic device as recited in claim 11, wherein the processor is further configured to aggregate the first set of data packets.

13. The electronic device as recited in claim 11, wherein the processor is further configured to determine priority of each of the plurality of data packets.

14. The electronic device as recited in claim 11, wherein the processor is further configured to determine a rate request of each of the plurality of data packets, wherein the rate request is proportional to RF conditions experienced by users of the data packets.

15. The electronic device as recited in claim 11, wherein the processor is further configured to determine a size of each of the plurality of data packets.

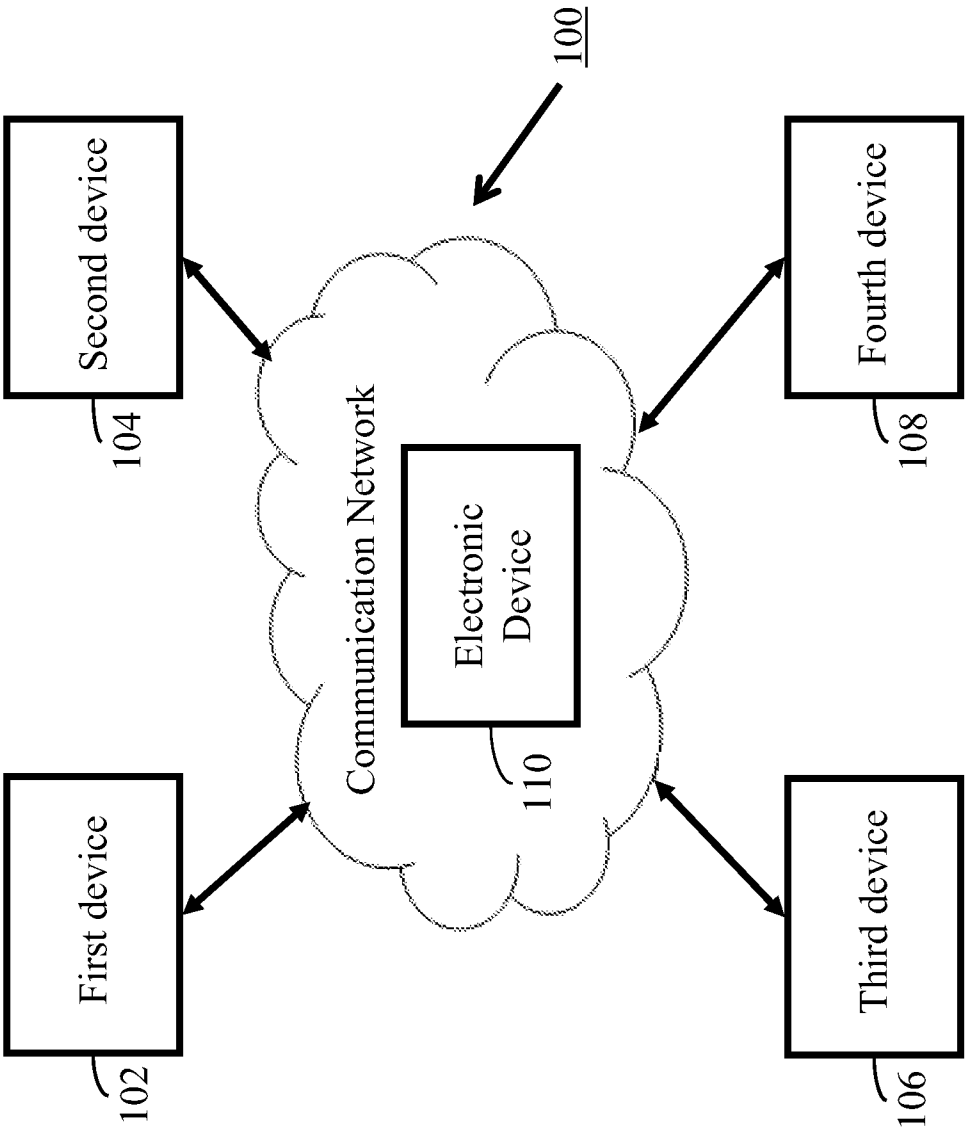

100
Second device
104
Fourth device
108
Communication Network
Electronic Device
110
First device
102
Third device
106

FIG. 1

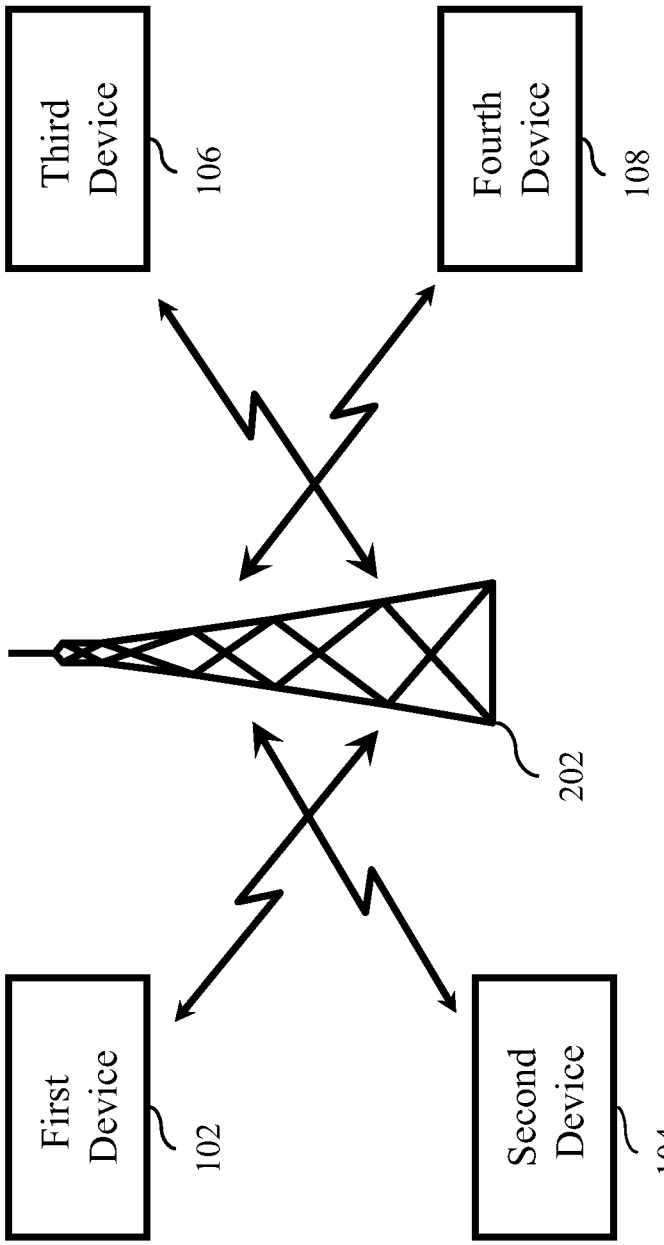

Third Device
106
Fourth Device
108
202
First Device
102
Second Device
104
200

FIG. 2

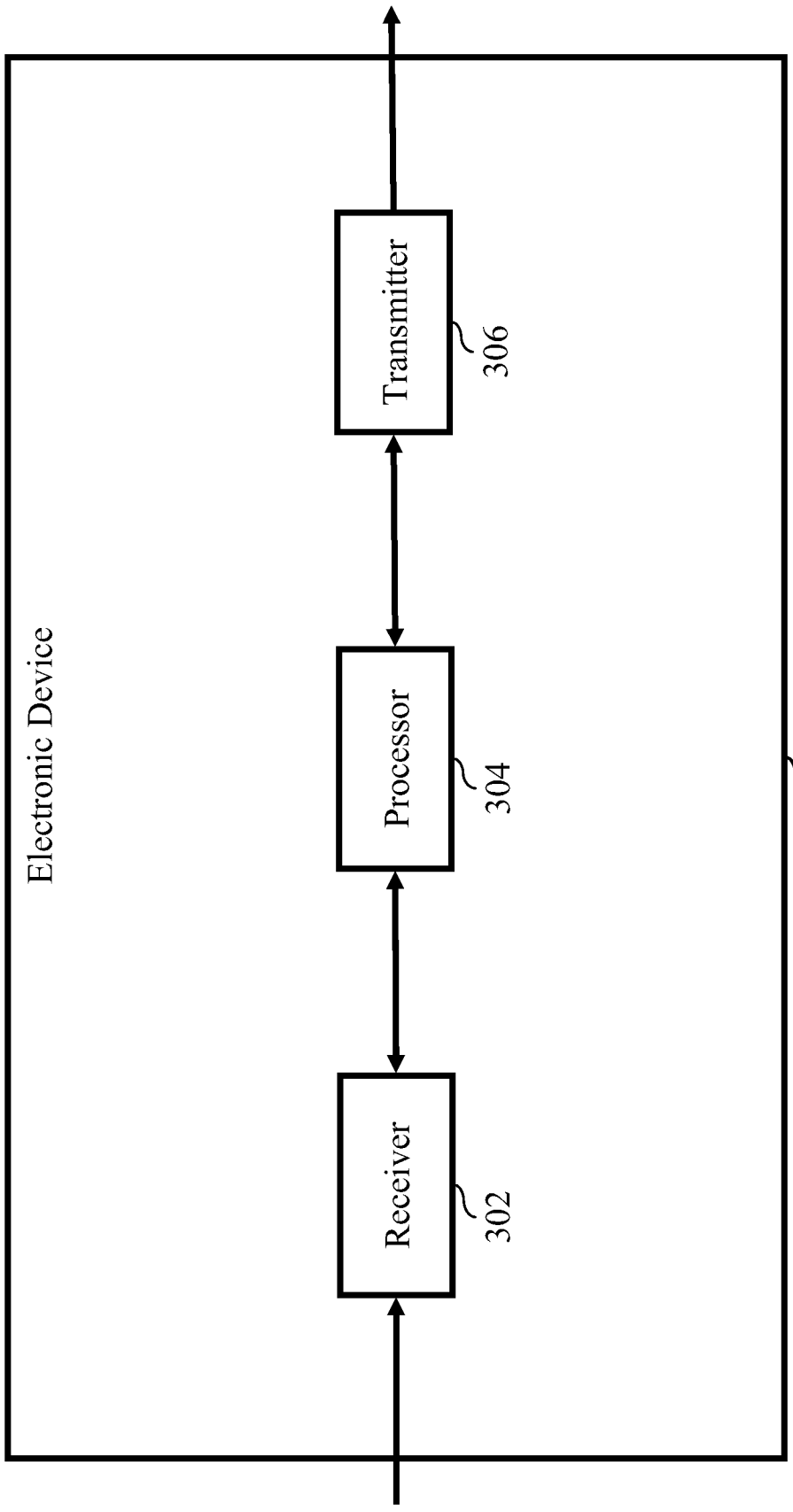

Electronic Device
Transmitter
306
Processor
304
Receiver
302
110

FIG. 3

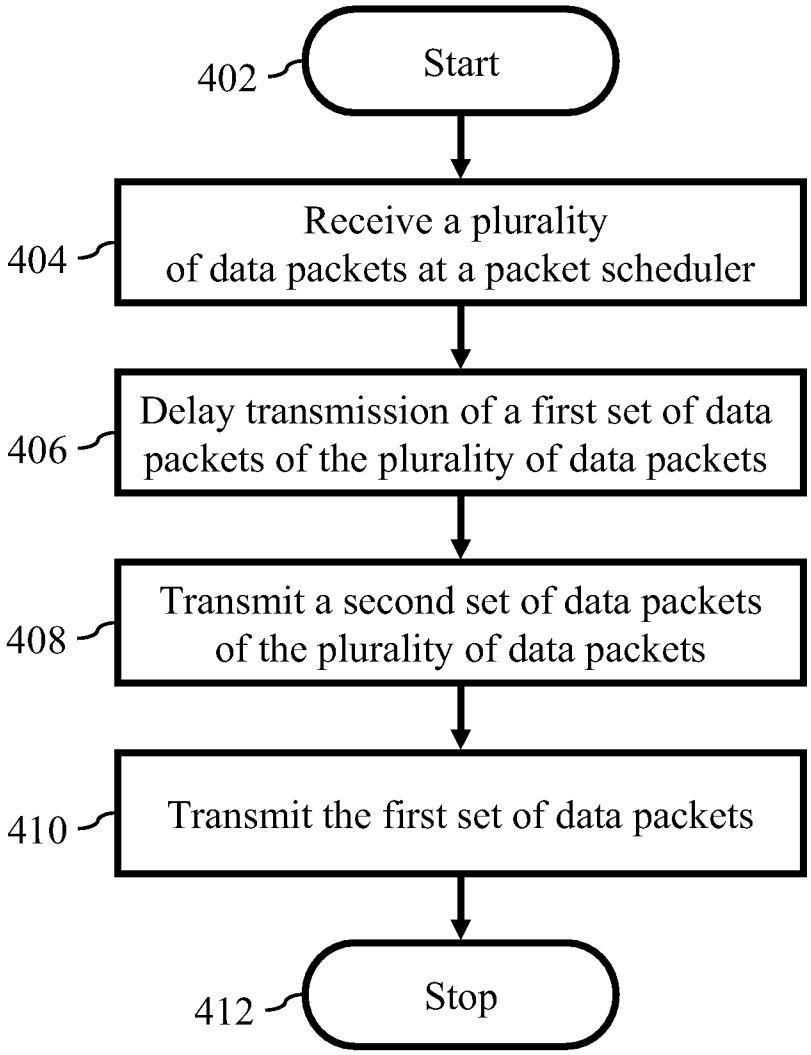

402
Start
404
Receive a plurality of data packets at a packet scheduler
406
Delay transmission of a first set of data packets of the plurality of data packets
408
Transmit a second set of data packets of the plurality of data packets
410
Transmit the first set of data packets
412
Stop

FIG. 4

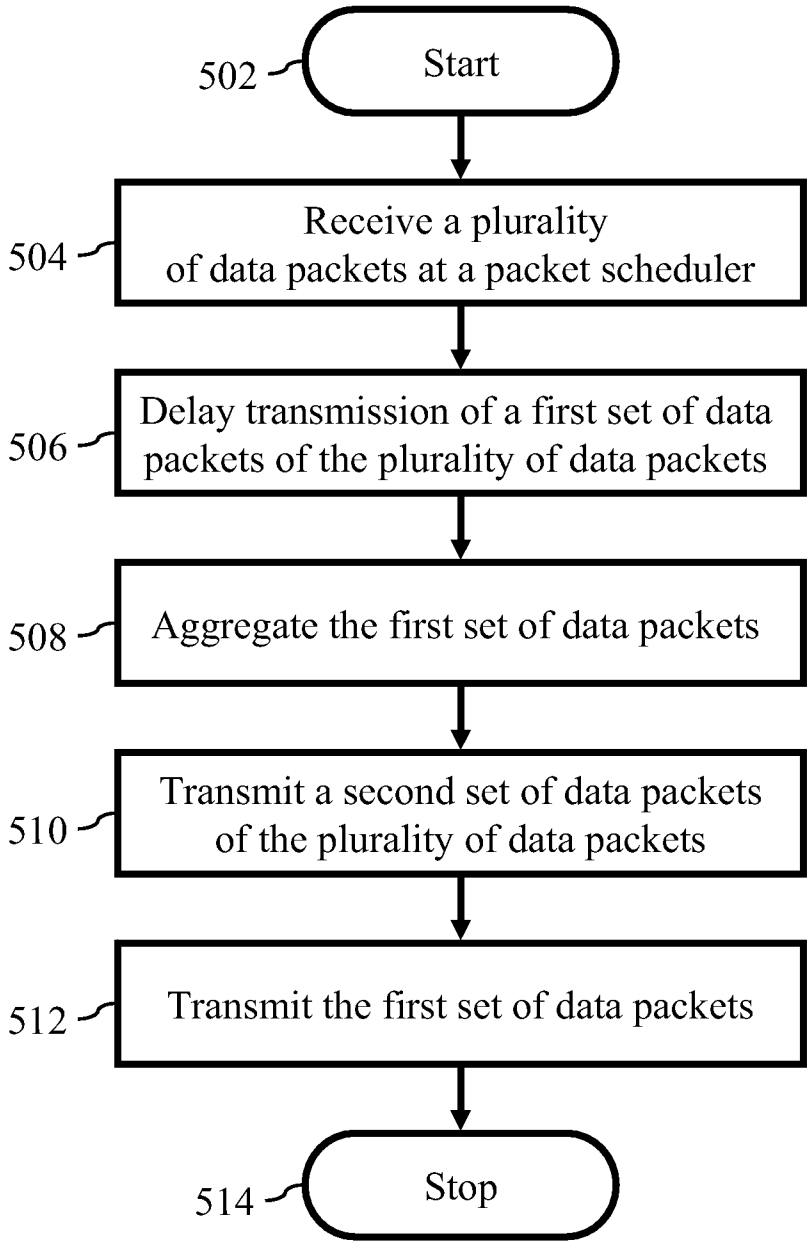

502
Start
504
Receive a plurality of data packets at a packet scheduler
506
Delay transmission of a first set of data packets of the plurality of data packets
508
Aggregate the first set of data packets
510
Transmit a second set of data packets of the plurality of data packets
512
Transmit the first set of data packets
514
Stop

FIG. 5

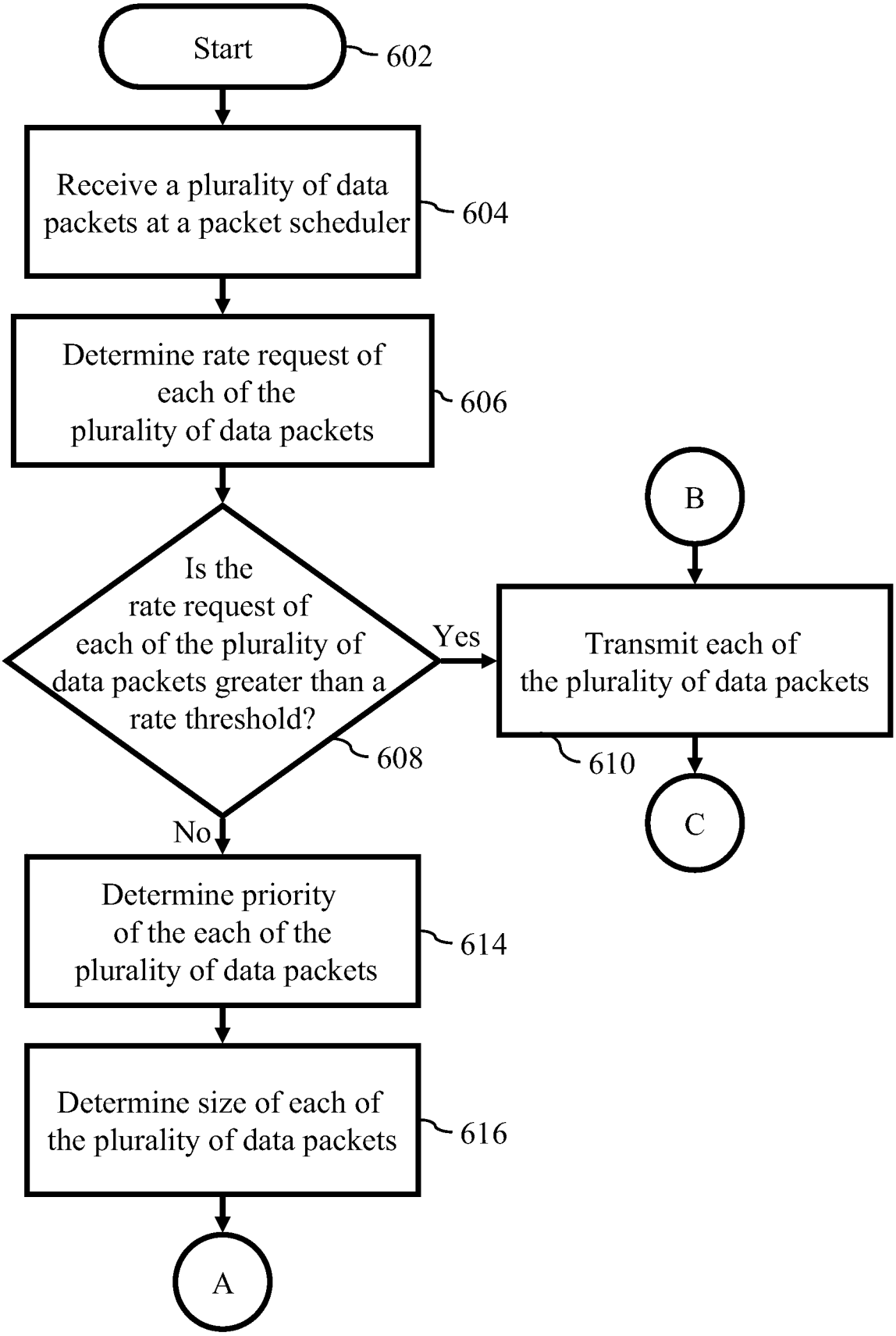

Start
602
Receive a plurality of data packets at a packet scheduler
604
Determine rate request of each of the plurality of data packets
606
Is the rate request of each of the plurality of data packets greater than a rate threshold?
608
Yes
No
B
Transmit each of the plurality of data packets
610
C
Determine priority of the each of the plurality of data packets
614
Determine size of each of the plurality of data packets
616
A

FIG. 6

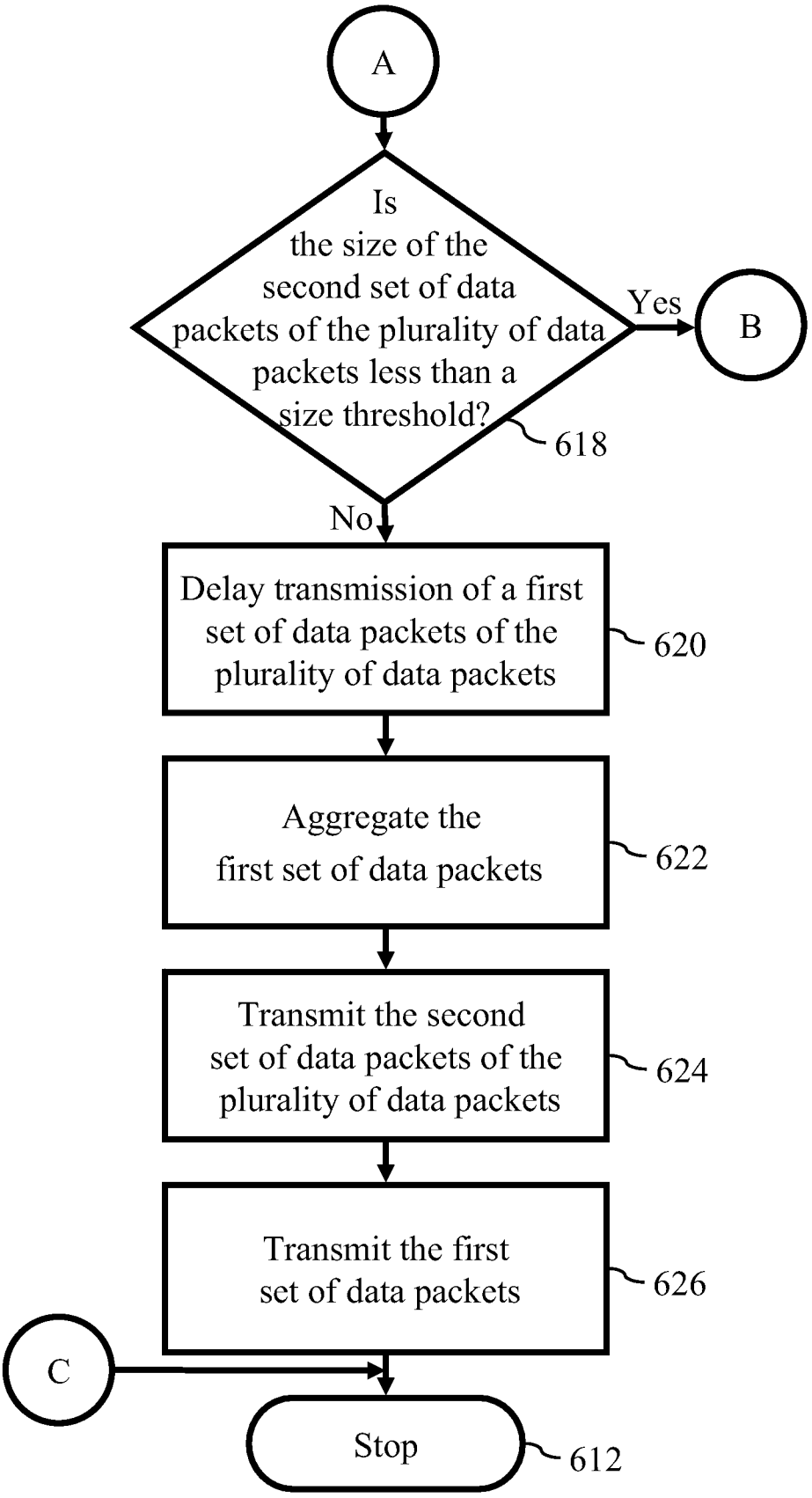

A
Is the size of the second set of data packets of the plurality of data packets less than a size threshold?
618
Yes
B
No
Delay transmission of a first set of data packets of the plurality of data packets
620
Aggregate the first set of data packets
622
Transmit the second set of data packets of the plurality of data packets
624
Transmit the first set of data packets
626
C
Stop
612

FIG. 7