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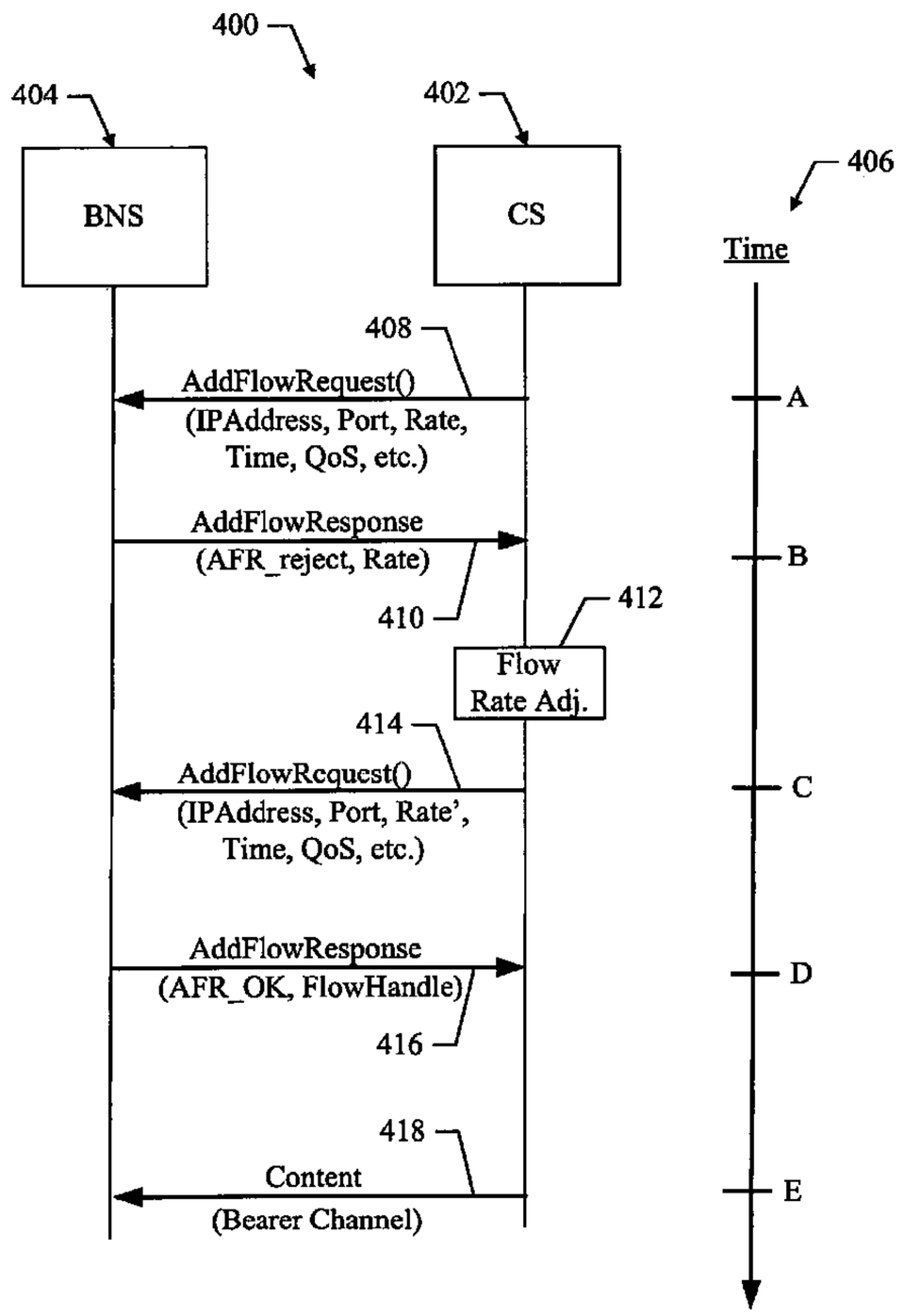
(54) Titre : PROCEDES ET DISPOSITIFS POUR LA CREATION ET LE TRANSPORT DE FLUX DE CONTENU MULTIMEDIA VERS UN RESEAU DE DISTRIBUTION

(54) Title: METHODS AND APPARATUS FOR CREATION AND TRANSPORT OF MULTIMEDIA CONTENT FLOWS TO A DISTRIBUTION NETWORK



(57) Abrégé/Abstract:
Methods and apparatus for creation and transport of multimedia content flows to a distribution network. The system includes a method for transporting a content flow to an access network for distribution to devices coupled to the access network. The method

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(57) Abrégé(suite)/Abstract(continued):
includes transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow. The method also includes receiving a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network, and delivering the content flow to the access network.

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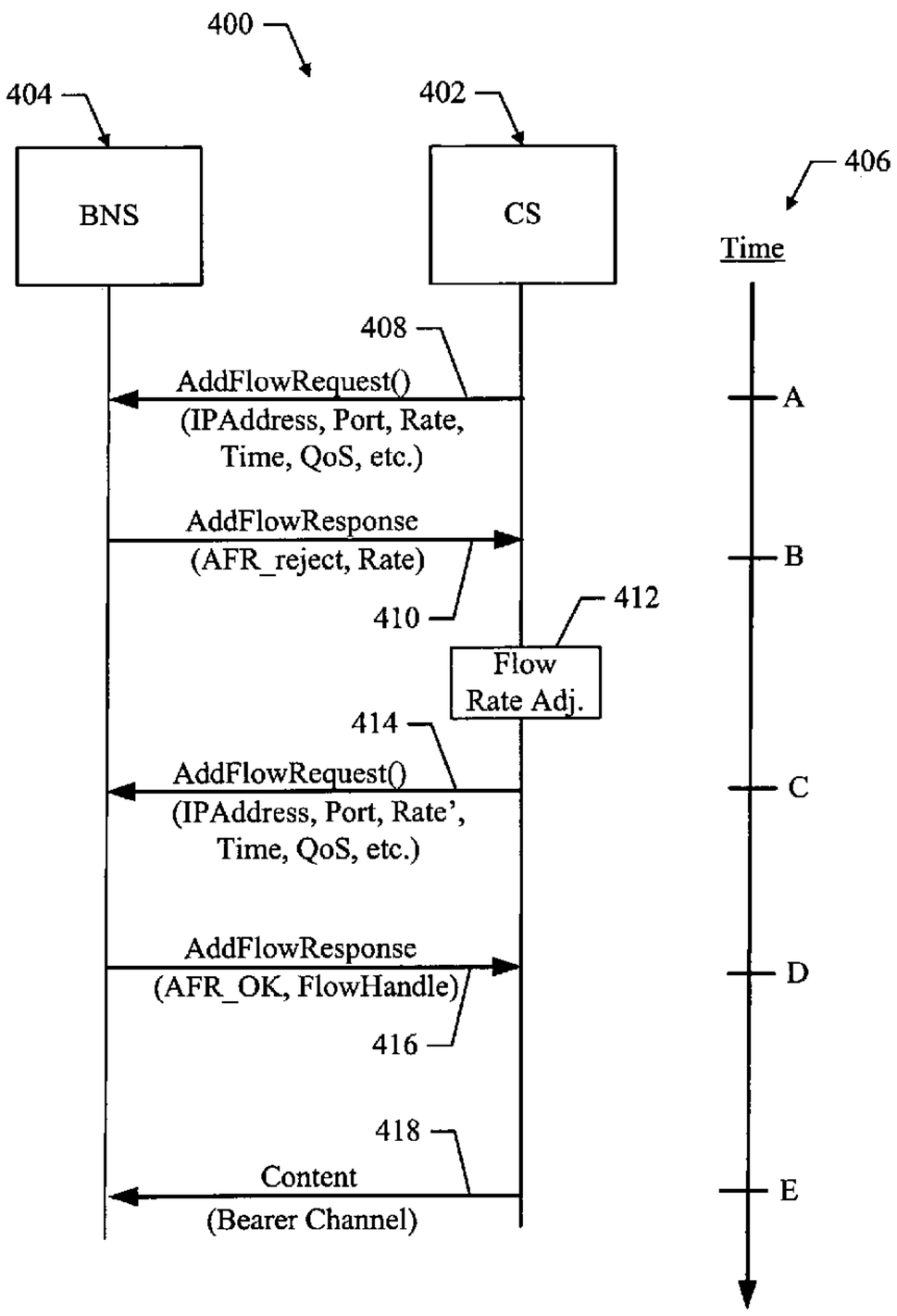

(57) Abstract: Methods and apparatus for creation and transport of multimedia content flows to a distribution network. The system includes a method for transporting a content flow to an access network for distribution to devices coupled to the access network. The method includes transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow. The method also includes receiving a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network, and delivering the content flow to the access network.

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METHODS AND APPARATUS FOR CREATION AND TRANSPORT OF MULTIMEDIA CONTENT FLOWS TO A DISTRIBUTION NETWORK

Claim of Priority under 35 U.S.C. §119

[0001] The present Application for Patent claims priority to Provisional Application No. 60/670,946 entitled "METHODS AND APPARATUS FOR STATE SYNCHRONIZATION IN MEDIA COMMUNICATION" filed April 12, 2005, and assigned to the assignee hereof and hereby expressly incorporated by reference herein and Provisional Application No. 60/634,977 entitled "BCMCS INTERFACE" filed December 9, 2004, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

Claim of Priority under 35 U.S.C. §120

[0002] The present Application for Patent is a continuation-in-part of Patent Application No. 11/111,050 entitled "METHODS AND APPARATUS FOR CREATION AND TRANSPORT OF MULTIMEDIA CONTENT FLOWS" filed April 20, 2005, pending, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

BACKGROUND

Field

[0003] The present invention relates generally to transporting multimedia content in a data network, and more particularly, to methods and apparatus for creation and transport of multimedia content flows to a distribution network.

Background

[0004] Data networks, such as wireless communication networks, have to trade off between services customized for a single terminal and services provided to a large number of terminals. For example, the distribution of content to a large number of mobile terminals (subscribers) is a complicated problem. This is especially true for mobile terminals that communicate using relatively slow speed over-the-air

communication links. Therefore, it is very important for content providers to have a way that allows mobile terminals to easily and efficiently receive content and/or other network services.

[0005] In current content delivery/media distribution systems, a content provider provides content in the form of audio, video, multimedia, real-time, or non real-time content and other content types to a content provider network that operates to distribute the content to end users. For example, the content provider may provide high quality content, which has corresponding high data rates, to the content provider network. In certain geographic regions, specialized broadcast networks have been developed to receive and distribute this high quality content to selected end users by utilizing special hardware and/or communication links. In some cases, the specialized broadcast network may provide ten or more high bandwidth channels with which to distribute the content.

[0006] Unfortunately, these specialized networks are generally expensive and are provided over only limited operating regions. Over wide operating areas access networks typically provide users with much less bandwidth at a much lower cost. For example, a typical wireless network may provide only one data channel with which to deliver multimedia content. Typically, this data channel provides only point-to-point communications so that it is expensive and inefficient to deliver content to a large number of wireless users. Additionally, the bandwidth available on the data channel may be much less than the bandwidth available over the specialized broadcast network. As a result, there currently exists no cost effective and efficient way to deliver high quality content to a large number of users on a access network.

[0007] Therefore, what is needed is a system to create and transport multimedia content flows across data networks. For example, the system should operate to create and transport multimedia content flows from a content provider's network to a broadcast distribution network. The system should also provide a mechanism to adjust one or more parameters of a content flow so that it may be broadcast over the distribution network.

SUMMARY

[0008] In one or more embodiments, a transport system, comprising methods and apparatus, is provided that operates to create and transport multimedia content flows to a distribution network. For example, in one embodiment, the transport system operates to transport content flows from a content network to an access network. By allowing content to be transported to an access network, the content may be broadcast to devices on the access network using the available bandwidth. Devices that are authorized to receive the content can store the received broadcast in a cache for later viewing.

[0009] In one embodiment, a method is provided for transporting a content flow to an access network for distribution to devices coupled to the access network. The method comprises transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow. The method also comprises receiving a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network, and delivering the content flow to the access network.

[0010] In one embodiment, a method is provided for transporting a content flow to an access network for distribution to devices coupled to the access network. The method comprises transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow. The method also comprises receiving the response message indicating that the content flow will not be added to the access network, and adjusting selected flow parameters associated with the content flow to produce updated flow parameters. The method also comprises transmitting a new request message to add the content flow to the access network, wherein the new request message comprises the updated flow parameters, and receiving a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

[0011] In one embodiment, a method is provided for transporting a content flow to an access network for distribution to devices coupled to the access network. The method comprises transmitting a heartbeat request message, and receiving a heartbeat response message that indicates a communication link is operational. The method also comprises transmitting a request message to add the content flow to the access network, wherein

the request message comprises one or more flow parameters associated with the content flow, and receiving a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network.

[0012] In one embodiment, apparatus is provided for transporting a content flow to an access network for distribution to devices coupled to the access network. The apparatus comprises logic for transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow, and logic for receiving the response message indicating that the content flow will not be added to the access network. The apparatus also comprises logic for adjusting selected flow parameters associated with the content flow to produce updated flow parameters, and logic for transmitting a new request message to add the content flow to the access network, wherein the new request message comprises the updated flow parameters. The apparatus also comprises logic for receiving a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

[0013] In one embodiment, a computer-readable media is provided that comprises instructions, which when executed by processing logic, operate to transport a content flow to an access network for distribution to devices coupled to the access network. The computer-readable media comprises instructions for transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow, and instructions for receiving the response message indicating that the content flow will not be added to the access network. The computer-readable media also comprises instructions for adjusting selected flow parameters associated with the content flow to produce updated flow parameters, instructions for transmitting a new request message to add the content flow to the access network, wherein the new request message comprises the updated flow parameters, and instructions for receiving a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

[0014] In one embodiment, a method is provided for transporting a content flow to an access network for distribution to devices coupled to the access network. The method comprises receiving a request message to add the content flow to the access network,

wherein the request message comprises one or more flow parameters associated with the content flow, and determining that the content flow will be added to the access network based on the one or more flow parameters. The method also comprises transmitting a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network, and receiving the content flow.

[0015] In one embodiment, a method is provided for transporting a content flow to an access network for distribution to devices coupled to the access network. The method comprises receiving a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow, and determining that the content flow will not be added to the access network based on the one or more flow parameters. The method also comprises transmitting a response message indicating that the content flow will not be added to the access network, receiving a new request message to add the content flow to the access network, wherein the new request message comprises updated flow parameters, and transmitting a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

[0016] In one embodiment, apparatus is provided for transporting a content flow to an access network for distribution to devices coupled to the access network. The apparatus comprises logic configured to receive a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow, and logic configured to determine that the content flow will be added to the access network based on the one or more flow parameters. The apparatus also comprises logic configured to transmit a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network, and logic configured to receive the content flow.

[0017] In one embodiment, apparatus is provided for transporting a content flow to an access network for distribution to devices coupled to the access network. The apparatus comprises logic configured to receive a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow, and logic configured to determine that the content flow will be added to the access network based on the one or more flow parameters. The apparatus also comprises logic configured to transmit a response message indicating

that the content flow associated with the one or more flow parameters will be added to the access network, and logic configured to receive the content flow.

[0018] In one embodiment, a computer-readable media is provided that comprises instructions, which when executed by processing logic, operate to transport a content flow to an access network for distribution to devices coupled to the access network. The computer-readable media comprises instructions for receiving a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow, and instructions for determining that the content flow will be added to the access network based on the one or more flow parameters. The computer-readable media also comprises instructions for transmitting a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network and instructions for receiving the content flow.

[0019] Other aspects, advantages, and features of the present invention will become apparent after review of the hereinafter set forth Brief Description of the Drawings, Description, and the Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The foregoing aspects and the attendant advantages of the embodiments described herein will become more readily apparent by reference to the following detailed description when taken in conjunction with the accompanying drawings wherein:

[0021] **FIG. 1** shows one embodiment of a communication network that comprises one embodiment of a system that operates to create and transport multimedia content flows to a broadcast distribution network;

[0022] **FIG. 2** shows a diagram of one embodiment of a transport system that operates to create and transport multimedia content flows to a distribution network;

[0023] **FIG. 3** shows one embodiment of transport messages for use in embodiments of a transport system;

[0024] **FIG. 4** shows one embodiment of a messaging protocol for use in embodiments of a transport system;

FIG. 5 shows one embodiment of a method for operating a content server in embodiments of a transport system;

[0025] **FIG. 6** shows one embodiment of a method for operating a broadcast server in embodiments of a transport system; and

[0026] **FIG. 7** shows one embodiment of a messaging protocol for use in embodiments of a transport system.

DESCRIPTION

[0027] In one or more embodiments, a transport system is provided for the creation and transport of multimedia content flows to a distribution network.

[0028] **FIG. 1** shows one embodiment of a communication network **100** that comprises one embodiment of a transport system that operates to create and transport multimedia content flows to a broadcast distribution network. For example, the transport system is suitable for use in transporting content from a content network to an access network for broadcast distribution.

[0029] The network **100** comprises a content server **102**, a content network **104**, and an access network **106**. The network **100** also includes devices **108** that comprise a mobile telephone **110**, a personal digital assistance (PDA) **112**, and a notebook computer **114**. The devices **108** illustrate just some of the devices that are suitable for use in one or more embodiments of the transport system. It should be noted that although three devices are shown in **FIG. 1**, virtually any number of devices, or types of devices, are suitable for use in the transport system. It should also be noted that the device **110** and **112** communicate with the access network **106** through wireless communication links, and that the computer **114** communicates with the access network **106** through a hardwired connection.

[0030] The content network **104** operates to provide content for distribution. The content comprises video, audio, multimedia content, clips, real-time and non real-time content, scripts, programs, data or any other type of suitable content. The content network **104** comprises any combination of wired and wireless networks that operate to provide the content. It should also be noted that in various embodiments of the transport system, any other entities, such as a content provider, content retailer, content

access entity, or any other entity may provide content for distribution over the access network **106**.

[0031] In one or more embodiments, the transport system operates to deliver content from the content network **104** for distribution over the access network **106**. In one embodiment, the content server (CS) **102** at the content network **104** operates to communicate with a broadcast network server (BNS) **116** at the access network **106**. The CS **102** and the BNS **116** communicate using one or more embodiments of a transport interface **118** that allows the content network **104** to deliver content in the form of content flows to the access network **106** for broadcast/multicast to the devices. The transport interface **118** comprises a control interface **120** and a bearer channel **122**. The control interface **120** operates to allow the CS **102** to add, change, cancel, or otherwise modify contents flows that are transmitted to the access network **106**. The bearer channel **122** operates to transport the content flows from the content network **104** to the access network **106**.

[0032] In one embodiment, the CS **102** uses the transport interface **118** to schedule a content flow to be transmitted to the BNS **116** for broadcast/multicast over the access network **106**. For example, the content flow **124** may comprise a non real time content clip. In one embodiment, the CS **102** operates to negotiate with the BNS **116** to determine one or more parameters associated with the content flow **124**. For example, the data rate or other characteristic of the content clip is negotiated so that the content clip may be broadcast over the access network **106**. Once the BNS **116** receives the content flow **124**, it broadcasts/multicasts the content flow **124** over the access network **106** for reception by one or more of the devices **108**. Any of the devices **108** may be authorized to receive the content contained in the flow **124** and cache it for later viewing by the device user.

[0033] For example the device **110** comprises a client program **126** that operates to provide a program guide that displays a listing of content that is scheduled for broadcast over the access network **106**. The device user may then select to receive any particular content for rendering in real time or to be stored in a cache **128** for later viewing. For example the content clip may be scheduled for broadcast during the evening hours, and the device **110** operates to receive the broadcast and cache the content clip in the cache **128** so that the device user may view the clip the next day. Typically, the content is

broadcast as part of a subscription service and the receiving device may need to provide a key or otherwise authenticate itself to receive the broadcast.

[0034] In one or more embodiments, the transport system allows the CS **102** to add, change, modify, or delete flows that are provided over the bearer channel **122** to the BNS **116**. In another embodiment, the transport system allows the CS **102** to obtain statistical information about any content flow provided to the access network **106**. As a result, the transport system operates to allow scheduled content flows to be transmitted from the content network **104** to the access network **106** for broadcast to the devices **108**. The system also provides a way for statistical information pertaining to the content flows at the access network **106** to be returned to the CS **102**.

[0035] **FIG. 2** shows a diagram of one embodiment of a transport system **200** that operates to create and transport multimedia content flows to a distribution network. For example, the system **200** may be used as the transport system described in **FIG. 1**.

[0036] One embodiment of the transport system **200** allows a content network **202** to transport content flows to an access network **204**. The content network **202** includes a CS **206** that comprises CS control protocol logic **208** and CS bearer channel logic **210**. The access network **204** includes a BNS **212** that comprises BNS control protocol logic **214** and BNS bearer channel logic **216**.

[0037] The CS control protocol logic **208** communicates with the BNS control protocol logic **214** via a control interface that comprises a request channel **218** and a response channel **220**. The request channel **218** allows the CS control protocol logic **208** to send request messages to the BNS control protocol logic **214** that requests to add, change, delete or otherwise modify content flows, or request statistical information. The response channel **220** allows the BNS protocol logic **214** to send response messages to the CS control protocol logic **208** that respond to any of the request messages. In one embodiment, the request channel **218** and the response channel **220** are comprised of any suitable type of communication links and the CS control protocol logic **208** and the BNS control protocol logic **214** comprises any suitable transmitting and receiving logic to allow messages to be exchanged using the request channel **218** and the response channel **220**.

[0038] The CS bearer channel logic **210** operates to transmit content flows from the content network **202** to the access network **204** under the control of the CS control

protocol logic **208**. For example, the CS bearer channel logic **210** receives a content flow **228** at its input **224** from the content network **202**. After the CS control protocol logic **208** gets authorization to add the content flow **228** to the access network **204**, the CS bearer channel logic **210** operates to transmit the content flow **228** over the bearer channel **222** to the BNS bearer channel logic **216**, which in turn broadcasts the content flow **228** over its output channel **226** to devices coupled to the access network **204**.

[0039] In one embodiment, the bearer channel **222** utilizes a generic routing encapsulation (GRE) protocol to transmit flows from the CS **206** to the BNS **212**, however any other transmission technology or protocol may be used. For example, the CS bearer protocol logic **210** and the BNS bearer protocol logic **216** comprise any suitable logic to implement the bearer channel **222** using the GRE protocol. However, in other embodiments, the bearer channel **222** may utilize any suitable transmission protocol.

[0040] In one embodiment, the CS **206** and BNS **212** comprise a CPU, processor, gate array, hardware logic, memory elements, virtual machine, software, and/or any combination of hardware and software. Thus, the CS **206** and BNS **212** generally comprise logic to execute machine-readable instructions to perform the functions described herein. It should be noted that the CS **206** and the BNS **212** shown in **FIG. 2** represent just one implementation and that other implementations are possible within the scope of the embodiments.

[0041] In one embodiment, the transport system comprises program instructions stored on a computer-readable media, which when executed by at least one processor, for instance, a processor located at the CS **206** or the BNS **212**, operate to provide the functions of the transport system described herein. For example, instructions may be loaded into the CS **206** and/or the BNS **212** from a computer-readable media, such as a floppy disk, CDROM, memory card, FLASH memory device, RAM, ROM, or any other type of memory device or computer-readable media. In another embodiment, the instructions may be downloaded into the CS **206** and/or the BNS **212** from an external device or network resource that interfaces to the CS **206** or the BNS **212**. The instructions, when executed by the processing logic at the CS **206** or the BNS **212**, provide one or more embodiments of a transport system as described herein.

[0042] **FIG. 3** shows one embodiment of transport messages **300** for use in

embodiments of a transport system. For example, the transport messages **300** may be used in the transport system **200** shown in **FIG. 2**. In one or more embodiments, the transport messages **300** are transmitted between the CS control protocol logic **208** and the BNS control protocol logic **214** (i.e., via links **218**, **220**) to allow the CS control protocol logic **208** to add, change, or delete content flows provided to the access network **204**. In another embodiment, the transport messages **300** allow the CS **206** to obtain statistical information about flows in the access network **204**.

[0043] In one embodiment, one or more of the transport messages **300** comprise parameters that are associated with any particular flow. For example, the AddFlowRequest message **302** comprises one or more parameters to indicate a flow identifier, proposed delivery time, rate, proposed quality of service (QoS), start time, end time, or any other parameter associated with the referenced flow. Any of the messages **300** may be used to convey one or more message parameters to allow information to pass between the CS control protocol logic **208** and the BNS control protocol logic **214.** It should be noted that the transport messages **300** illustrate just one implementation and that other messages and message types are possible for use within the scope of the embodiments.

[0044] The transport messages **300** comprise messages **302** through **312** that operate to add, modify, and remove a flow from the access network **204**. For example, the message **302** contains flow parameters and operates to request that a content flow be added to the access network. The message **306** operates to modify a particular content flow that is identified in the message, for example, by modifying its start or end time. The message **310** operates to remove a particular content flow identified in the message, which may be either a flow scheduled for delivery or a flow currently being delivered.

[0045] The messages **314** through **324** operate to obtain registration, statistics, and latency information about flows in the access network **204** that are identified in the respective message. For example, the message **314** operates to request a determination of how many devices are registered to receive a particular content flow identified in the message. The message **316** operates to provide a report that indicates the number of registered devices. The message **318** operates to request any type of statistics about a flow identified in the message, and the message **322** operates to request a latency time about a flow identified in the message.

[0046] The messages **326** through **332** operate to provide a heartbeat mechanism and to provide a reset/re-sync mechanism. The heartbeat mechanism operates to indicate that the communication link between a CS and BNS is operational. The reset/re-sync mechanism operates to allow either a CS or BNS to reset/re-sync the state of flows in the transport system. A more detailed description of the messages **326** through **332** is provided in another section of this document.

[0047] Thus, in one or more embodiments, the messages **300** operates to process content flows transmitted from the content network **202** to the access network **204**, and also to allow status information about those flows to be returned from the access network **204** to the content network **202**.

[0048] **FIG. 4** shows one embodiment of a messaging protocol **400** for use embodiments of a transport system. For example the messaging protocol **400** may be used to transmit the messages **300** between a CS **402** and a BNS **404**. A time indicator **406** is provided which indicates a relative time for each message.

[0049] At time A, an add flow request message **302** is transmitted, as shown at **408,** from the CS **402** to the BNS **404**. The add flow request message transmitted at **408** is a request to add a flow to the access network, and the request includes flow parameters such as a flow address (IP Address), a flow port (Port), a flow rate (Rate), a scheduled delivery time (Time), QoS level, and/or any other suitable flow parameters that may be used to describe the flow that the CS **402** would like to add to the access network.

[0050] At time B, which may be a relatively short time after time A, the BNS **404** responds with an add flow response message **304**, as shown at **410**, that indicates that the requested addition of the flow is rejected because the requested rate cannot be supported.

[0051] As a result of the rejected add flow request, the CS **402** operates (at **412**) to adjust the rate of the flow (i.e., Rate') so that the flow may be accepted by the BNS **404** for distribution by the access network.

[0052] At time C, a new AddFlowRequest message **302** is transmitted, as shown at **414,** from the CS **402** to the BNS **404**. The add flow request message transmitted at **414** is a request to add the updated flow to the access network, and the request includes new flow parameters (i.e., Rate').

[0053] At time D, which may be a relatively short time after time C, the BNS **404** responds with an add flow response message **304**, as shown at **416**, that indicates that the requested addition of the flow with the updated parameters is accepted The response message at **416** includes a flow handle that identifies the flow.

[0054] At time E, which corresponds to the time parameter (Time) indicated in the add flow request **302**, the content flow is transmitted from the CS **402** to the BNS **404** through the bearer channel as shown at **418**. For example, the bearer channel may be the bearer channel **222** shown in **FIG. 2**. Thus, in one or more embodiments, the messaging protocol **400** may be used to exchange one or more of the transport messages **300** between the CS **402** and the BNS **404** to allow a flow to be added, modified, deleted, or to allow statistics to be obtained.

[0055] **FIG. 5** shows one embodiment of a method **500** for operating a content server in embodiments of a transport system. For clarity, the method **500** will be described with reference to the CS **206** shown in **FIG. 2**. In one or more embodiments, the CS control protocol logic **208** executes program instructions and controls the operation of the server CS **206** to perform the functions described below.

[0056] At block **502**, a request is transmitted that requests to add a content flow to an access network. For example the request is an AddFlowRequest message **302** transmitted to a BNS associated with the access network. The request includes flow parameters that describe the flow (i.e., rate, QoS, etc.) and indicates a scheduled time that the flow is to be added to the access network. For example, the CS control protocol logic **208** transmits the request over the request channel **218** to the BNS control protocol logic **214**.

[0057] At block **504**, a response is received that indicates whether or not the flow will be added to the access network. For example, the response is an AddFlowResponse message **304** received by the CS control protocol logic **208**. In one embodiment, the access network determines if the flow can be broadcast given the stated flow parameters. For example, if the flow parameters indicate a very high data rate, the access network may not be able to broadcast the flow. Similarly, the flow parameters may indicate any other criteria that may not be supported by the access network, (i.e., scheduled time, QoS, etc.). If the request is granted, the method proceeds to block **508**.

[0058] If the request is not granted, the response message may also provide one or

more acceptable parameters. For example, the AddFlowResponse message **304** indicates that the flow will not be added to the access network, however, in one embodiment, the response message comprises one or more acceptable parameters that may be used to obtain flow acceptance. For example, an acceptable rate or QoS parameter may be provided in the response message. The method proceeds to block **506**.

[0059] At block **506**, the flow and/or its associated parameters are adjusted so that it may be transmitted on the access network. For example, the flow rate, QoS, scheduled transmission time, or any other parameter of the flow may be adjusted so that the flow may be broadcast by the access network. For example, the flow data rate may be adjusted to a data rate that can be supported by the access network. In one embodiment, the CS control protocol logic **208** operates to adjust the flow and/or flow parameters based on acceptable parameters provided in the response message. The method then proceeds to block **502** where a new AddFlowRequest message **302** is transmitted and includes the new or adjusted flow parameters.

[0060] It should be noted that the blocks **502**, **504**, and **506** operate to allow the CS to negotiate one or more parameters associated with the flow. For example, if the access network refuses to accept the flow at a given rate, the CS may adjust the rate at block **506** based on acceptable parameters in the response message, and a new request to add the flow at the new rate is transmitted at block **502**. Thus, any of the parameters associated with the flow, such as the scheduled transmission time, data rate, QoS

[0061] parameters, start time, or end time may be negotiated until parameters are determined that are acceptable to the access network.

[0062] At block **508**, assuming the add flow request is successful, a test is performed to determine if it is time to deliver the flow to the access network. For example, the CS control protocol logic **208** operates to determine if the scheduled time for flow transmission has occurred. If the schedule time for flow transmission has occurred, the method proceeds to block **516**. If the scheduled time for flow transmission has not occurred, the method proceeds to block **510**.

[0063] At block **510**, a test is performed to determine if any flow functions need to be performed. For example, the flow start or end time may need to be adjusted, or the flow may be deleted. In one embodiment, the CS control protocol logic **208** operates to

determine if another flow function needs to be performed. If there are no flow functions that need to be performed, then the method proceeds to block **508** to determine if it is time to delivery the flow. If a flow function needs to be performed, then the method proceeds to block **512**.

[0064] At block **512**, a message is transmitted requesting a flow function be performed. For example, the message may request that the flow start or end times be adjusted, or that a flow be deleted. For example, the message may be one of the messages **300** shown in **FIG. 3**. In one embodiment, the CS control protocol logic **208** operates to transmit the message to the BNS control protocol logic **214** via the request channel **218**.

[0065] At block **514**, a response message is received indicating whether or not the function is authorized or otherwise providing a response to the function. For example, the response message may indicate that a requested change in start time for the flow is authorized. Alternatively, the response message may provide information that has been requested. For example, the response message may indicate a registration value as provided by the RegistrationReportResponse message **316**. In one embodiment, the response message is receive by the CS control protocol logic **208** through the response channel **220**. The method then proceeds to block **508** to determine if it is time to delivery the flow.

[0066] At block **516**, a transmission of the content flow to the access network at the scheduled time is started. For example, in one embodiment, the content flow is transmitted from the CS bearer channel logic **210** over the bearer channel **222** to the BNS bearer channel logic **216**.

[0067] At block **518**, a test is performed to determine if more flow functions need to be performed. For example, the CS control protocol logic **208** determines if more flow functions need to be performed. For example, the flow functions include changing the flow end time, deleting the flow, or any other function. If no more flow functions are to be performed, the method proceeds to block **524**. If more flow functions need to be performed, the method proceeds to block **520**.

[0068] At block **520**, a message is transmitted requesting a flow function be performed. For example, the message may request that the flow end time be adjusted, or that a flow be deleted. For example, the message may be one of the messages **300**

shown in **FIG. 3**. In one embodiment, the CS control protocol logic **208** operates to transmit the message to the BNS control protocol logic **214** through the request channel **218**.

[0069] At block **522**, a response message is received indicating whether or not the function is authorized or otherwise provide a response to the function. For example, the response message may indicate that a requested change in the end time for the flow is authorized. Alternatively, the response message may provide information that has been requested, such as a registration value as provided by message **300** of **FIG. 3**. In one embodiment, the response message is receive by the CS control protocol logic **208** via the response channel **220**.

[0070] At block **524**, a test is performed to determine if the transmission of the flow has completed. For example, the CS control protocol logic **208** determines if the transmission has been completed. If the transmission has not completed, the method proceeds to block **518** to determine if more flow functions need to be performed. If the transmission has completed, the method ends at block **526**.

[0071] It should be noted that the method **500** illustrates just one implementation and that changes, additions, deletions, or rearrangements of the described functions may be made without deviating from the scope of the described embodiments.

[0072] **FIG. 6** shows one embodiment of a method **600** for operating a broadcast server in embodiments of a transport system. For clarity, the method **600** will be described with reference to the BNS **212** shown in **FIG. 2**. In one or more embodiments, the BNS control protocol logic **214** executes program instructions and controls the operation of the BNS **212** to perform the functions described below.

[0073] At block **602**, a request is received to add a content flow for broadcast over an access network associated with the broadcast server. For example, the request is an AddFlowRequest message **302** received by the BNS control protocol logic **214**, and the request includes flow parameters associated with the flow that may include a rate, QoS, scheduled delivery time, etc.

[0074] At block **604**, a determination is made whether or not the flow will be accepted given the stated flow parameters. For example, the BNS control protocol logic **214** operates to determine if the proposed rate or QoS of the flow is acceptable. If the propose flow and/or its parameters are acceptable, the method proceeds to block **610**. If

the proposed flow and/or its parameters are not acceptable, the method proceeds to block **606**.

[0075] At block **606**, a negative response is transmitted in response to the add flow request. For example, the BNS control protocol logic **214** operates to transmit the negative response message to the CS control protocol logic **208** via the response channel **220**. In one embodiment, the negative response message is the AddFlowResponse message **304** shown in **FIG. 3**, which is set to include a parameter to indicate a negative response, and may also comprise one or more acceptable parameters. For example, the BNS control protocol logic **214** may determine acceptable parameters that would allow the flow to be broadcast on the access network. These parameters are included in the response message so that a requesting device is provided with an indication of what parameters need to be adjusted to allow the flow to be added to the access network. The method then ends at block **608**.

[0076] At block **610**, a positive response is transmitted that authorizes the content flow to be added to the access network. For example, the BNS control protocol logic **214** transmits a positive response message that authorizes the content flow to be added to the access network. In one embodiment, the response message is the AddFlowResponse message **304** that includes parameters indicating the positive response and transmitted to the CS control protocol logic **208** using the response channel **220**. The response message includes a flow handle that identifies the flow in the access network.

[0077] It should be noted that the blocks **602**, **604**, **606**, and **610** operate to allow parameters associated with the flow to be negotiated between the CS and the BNS. Fore example, if the BNS **212** rejects a flow and transmits a negative response at block **606**, the CS **206** may adjust the flow parameters and transmit a new add flow request that is receive at block **602**. If the new flow parameters are acceptable, the BNS **212** accepts the flow and transmits a positive response at block **610**. Thus, the BNS **212** and the CS **206** may operate to negotiate any flow parameter associated with the flow.

[0078] At block **612**, a determination is made to determine whether or not it is time to for the scheduled flow to be received. For example, the BNS control protocol logic **214** waits for the scheduled transmission time provided in the add flow request message received at block **602**. If it is time for the flow to be received, the method proceeds to

block **620**. If it is not time to receive the flow, the method proceeds to block **614**.

[0079] At block **614**, a determination is made to determine if any more flow requests have been received. For example, the BNS control protocol logic **214** operates to receive any additional flow requests from the CS control protocol logic **208**, via the request channel **218**. The flow requests may request to modify or delete a flow in the wireless network, or obtain status about a particular flow. If no requests are received, the method proceeds to block **612** to determine if it is time to receive the flow. If additional flow requests are received, the method proceeds to block **616**.

[0080] At block **616**, the received flow request is decoded and if necessary, any identified functions are performed. For example, the request is decoded to determine what flow function is to be performed. The flow function may be one of the functions described with reference to the messages **300** in **FIG. 3**, or any other suitable function. For example, the BNS control protocol logic **214** operates to decode the flow request, and the requested function is provided if necessary. For example, the requested function may be a statistics request (message **318**) regarding a particular flow in the access network. The BNS control protocol logic **214** operates to obtain the statistics and provide the statistics information to the requesting device in a response message (message **320**). For example the requesting device may be the CS control protocol logic **208** and the BNS control protocol logic **214** operates to perform the requested function.

[0081] At block **618**, a response is transmitted in response to the flow request. For example, the BNS control protocol logic **214** operates to assemble a response message and transmit it to the requesting device via the response channel **220**. For example, the request may be a request to determine how many devices in the access network are registered to receive the flow, as provided by the message **314**. The BNS control protocol logic **214** operates to determine the number of registered devices and return this value in the response message **316**. The method then proceeds to block **612** to determine if it is time to receive the transmitted flow.

[0082] At block **620**, the BNS begins receiving the flow at the scheduled time. For example, the content flow is received over the bearer channel **222** by the BNS bearer channel logic **216**.

[0083] At block **622**, the content flow is broadcast over the access network. For example, the BNS bearer channel logic **216** operates to broadcast the received content

flow over the access network for reception by one or more devices. The devices may cache the content flow for later viewing. In another embodiment, the flow may be cached by the BNS for later broadcast to the devices in the access network.

[0084] At block **624**, a determination is made whether or not the flow has been completely received. For example, the BNS control protocol logic **214** operates to determine if the flow has been completely received. If the flow has not been completely received, the method proceeds to block **626**. If the flow has been completely received, the method ends at block **632**.

[0085] At block **626**, a determination is made to determine if any more flow requests have been received. For example, the BNS control protocol logic **214** operates to receive any additional flow requests from the CS control protocol logic **208** via the request channel **218**. The flow requests may request to modify or delete a flow from the access network, or obtain status about a particular flow. If no requests are received, the method proceeds to block **624** to determine if the flow has been completely received. If additional flow requests are received, the method proceeds to block **628**.

[0086] At block **628**, the received flow request is decoded and if necessary, any identified functions are performed. For example, the request is decoded to determine what flow function is to be performed. The flow function may be one of the functions described with reference to the messages **300** in **FIG. 3**, or any other suitable function. For example, the BNS control protocol logic **214** operates to decode the flow request, and the requested function is provided if necessary. For example, the requested function may be a statistics request regarding a particular flow in the access network. The BNS control protocol logic **214** operates to obtain the statistics and provide the statistics information to the requesting device in the message **320**. For example the requesting device may be the CS control protocol logic **208** and the BNS control protocol logic **214** operates to perform the requested function.

[0087] At block **630**, a response is transmitted in response to the flow request. For example, the BNS control protocol logic **214** operates to assemble a response message and transmit it to the requesting device via the response channel **220**. For example, the request may be a request to determine how many devices in the access network are registered to receive the flow, as provided by the message **314**. The BNS control protocol logic **214** operates to determine the number of registered devices and return

this value in the response message **316**. The method then proceeds to block **624** to determine if the flow has been completely received. When the flow has been completely received, the method ends at block **632**.

[0088] It should be noted that the method **600** illustrates just one implementation and that changes, additions, deletions, or rearrangements of the described functions may be made without deviating from the scope of the described embodiments.

Heartbeat Mechanism

[0089] Referring again to **FIGS. 2** and **3**, in one or more embodiments, a heartbeat mechanism is provided that monitors the health of the communication link between the CS **206** and the BNS **212**. In one embodiment, the CS control protocol logic **208** periodically sends a HeartbeatRequest message **326** to the BNS control protocol logic **214**. For example, the HeartbeatRequest message **326** is transmitted every 60 seconds over the request channel **218.** The BNS control protocol logic **214** responds with a HeartbeatResponse message **328** over the response channel **220** within a selectable response time. The successful exchange of heartbeat messages indicates that the communication link between the CS **206** and the BNS **212** is operating properly. In one embodiment, the HeartbeatRequest message **326** and the HeartbeatResponse message **328** may comprise one or more messages having any suitable format and/or information parameters to allow the health of the communication link between the CS **206** and the BNS **212** to be monitored.

[0090] In one embodiment, the transport system operates to detect the health of the communication link between the CS **206** and the BNS **212** based on three scenarios. In the first scenario, the HeartbeatRequest and HeartbeatResponse messages are successfully exchanged. In a second scenario, HeartbeatRequest messages transmitted from the CS **206** go unanswered due to the fact that HeartbeatResponse messages from the BNS **212** have been lost. After several repeated transmissions of the HeartbeatRequest message go unanswered, the CS **206** determines that the communication link has failed. In a third scenario, repeated transmission of the HeartbeatRequest message fails to reach the BNS **212** due to some type of communication link failure. After several repeated transmissions of the HeartbeatRequest message go unanswered, the CS **206** determines that the

communication link has failed. Thus, the heartbeat mechanism provides a way to monitor the health of the communication link between the CS **206** and the BNS **212**.

State Synchronization Mechanism

[0091] In one or more embodiments, a state synchronization mechanism is provided that allows flow state information at both the CS **206** and the BNS **212** to be reset and/or synchronized. In one or more embodiments, state synchronization is achieved through the use of the ResetRequest **330** and ResetResponse **332** messages.

[0092] The ResetRequest message **330** may be transmitted from either the CS **206** or the BNS **212** and contains zero or more flow handles that indicate that the transmitter of the ResetRequest message has state information for zero or more flows, respectively. Upon receipt of the ResetRequest message, the receiver (either CS **206** or BNS **212**) compares the received list of flow handles with it own list and removes state for any flow handles that are not included within the received list.

[0093] The receiver of the ResetRequest message (either CS **206** or BNS **212**) acknowledges the receipt of the message by transmitting a ResetResponse message **332** that includes a list of its active flow handles. Upon receipt of the ResetResponse message **332**, the receiver of that message compares the received list of flow handles with its own list and removes state for any flow handles that are not included within the received list. As a result of the ResetRequest/ResetResponse transaction, the CS **206** and the BNS **212** have the same state information for the same flows.

[0094] **FIG. 7** shows one embodiment of a messaging protocol **700** for use in embodiments of a transport system. The messaging protocol **700** illustrates the operation of a heartbeat mechanism and a reset/re-sync mechanism between a BNS **704** and a CS **702**.

[0095] At a selected point in time the state of the BNS **704** is that two flows (A and B) are registered for distribution over an access network, as shown at **706**. The CS **702** also has the same state, as shown at **708**.

[0096] The CS **702** then transmits a HeartbeatRequest message **326** to the BNS **704**, as shown at **710**. In response, the BNS **704** transmits a HeartbeatResponse message **328**, as shown at **712**. Thus, the CS **702** and the BNS **704** are able to monitor the state of the communication link between them to determine that the link is operational.

[0097] During the course of operation, a reboot occurs at the BNS **704** that causes the state of the BNS **704** to change. For example, the registration of flow B is lost, and as a result, the state of the BNS **704** indicates that only flow A is registered, as shown at **714**.

[0098] The BNS **704** transmits a ResetRequest message **330** to the CS **702**, as shown at **716**. The ResetRequest message **330** comprises a list of registered flows at the BNS **704**. For example, flow A is registered at the BNS **704**.

[0099] In response to the ResetRequest message, the CS **702** updates its state to match the received list. For example, the CS **702** removes flow B from its state, which is shown at **718**. The CS **702** then transmits a ResetResponse message **332** that comprises a list of registered flows at the CS **702** (i.e., flow A). As a result of the ResetRequest and ResetResponse messages, the states of the CS **702** and the BNS **704** have been synchronized.

[00100] The CS **702** then transmits an AddFlowRequest message **302** to the BNS **704** to add flow B, as shown at **722**. The BNS **704** accepts the addition of flow B and adds flow B to its state of registered flows, as shown at **724**.. The BNS **704** then transmits an AddFlowResponse message **304** to the CS **702** to indicate that the flow B has been accepted for distribution. The CS **704** then updates its state to reflect that flow B is now registered for distribution, as shown at **728**. Thus, in embodiments of the transport system, the heartbeat and reset/re-sync mechanism operate to allow the operation of the communication link between the CS **702** and the BNS **704** to be monitored, and their respective states to be reset and/or re-synchronized.

[00101] The various illustrative logics, logical blocks, modules, and circuits described in connection with the embodiments disclosed herein may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor, but, in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of

microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[00102] The steps of a method or algorithm described in connection with the embodiments disclosed herein may be embodied directly in hardware, in a software module executed by a processor, or in a combination of the two. A software module may reside in RAM memory, flash memory, ROM memory, EPROM memory, EEPROM memory, registers, a hard disk, a removable disk, a CD-ROM, or any other form of storage medium known in the art. An exemplary storage medium is coupled to the processor, such that the processor can read information from, and write information to, the storage medium. In the alternative, the storage medium may be integral to the processor. The processor and the storage medium may reside in an ASIC. The ASIC may reside in a user terminal. In the alternative, the processor and the storage medium may reside as discrete components in a user terminal.

[00103] The description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments may be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments, e.g., in an instant messaging service or any general wireless data communication applications, without departing from the spirit or scope of the invention. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein. The word "exemplary" is used exclusively herein to mean "serving as an example, instance, or illustration." Any embodiment described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

[00104] Accordingly, while one or more embodiments of a transport system for the creation and transport of multimedia content flows across data networks have been illustrated and described herein, it will be appreciated that various changes can be made to the embodiments without departing from their spirit or essential characteristics. Therefore, the disclosures and descriptions herein are intended to be illustrative, but not limiting, of the scope of the invention, which is set forth in the following claims.

CLAIMS

WHAT IS CLAIMED IS:

1. A method for transporting a content flow to an access network for distribution to devices coupled to the access network, the method comprising:

transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

receiving a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network; and

delivering the content flow to the access network.

2. The method of claim 1, further comprising:

transmitting a second request message to modify the content flow; and

receiving a second response message indicating that the modification to the content flow will be accepted.

3. The method of claim 1, further comprising:

transmitting a second request message to delete the content flow; and

receiving a second response message indicating that the content flow will be deleted.

4. The method of claim 1, further comprising:

transmitting a second request message to obtain a latency time of the content flow; and

receiving a second response message indicating the latency time of the content flow.

5. The method of claim 1, wherein the step of transmitting comprises transmitting the request message to add the content flow, wherein the content flow comprises a non real-time media clip.

6. The method of claim 1, wherein the step of delivering comprises transmitting the content flow over a bearer channel to the access network.

7. The method of claim 1, further comprising adjusting selected flow parameters associated with the content flow based on one or more acceptable flow parameters included in the response message.

8. A method for transporting a content flow to an access network for distribution to devices coupled to the access network, the method comprising:

transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

receiving the response message indicating that the content flow will not be added to the access network;

adjusting selected flow parameters associated with the content flow to produce updated flow parameters;

transmitting a new request message to add the content flow to the access network, wherein the new request message comprises the updated flow parameters; and

receiving a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

9. The method of claim 8, wherein said adjusting comprises adjusting the selected flow parameters associated with the content flow to produce the updated flow parameters, wherein the updated flow parameters comprise a rate parameter.

10. The method of claim 8, wherein said adjusting comprises adjusting the selected flow parameters associated with the content flow to produce the updated flow parameters, wherein the updated flow parameters comprise a quality of service parameter.

11. A method for transporting a content flow to an access network for distribution to devices coupled to the access network, the method comprising:

transmitting a heartbeat request message;

receiving a heartbeat response message that indicates a communication link is

operational;

transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow; and

receiving a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network.

12. The method of claim 11, further comprising:
transmitting a reset request message that identifies a first flow state; and
receiving a reset response message that identifies the first flow state.

13. The method of claim 11, further comprising:
receiving a reset request message that identifies a first flow state;
adjusting a current flow state to match the first flow state; and
transmitting a reset response message that comprises the current flow state.

14. Apparatus for transporting a content flow to an access network for distribution to devices coupled to the access network, the apparatus comprising:

transmitting logic that operates to transmit a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

receiving logic that operates to receive a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network; and

a bearer channel that operates to deliver the content flow to the access network.

15. The apparatus of claim 14, wherein the transmitting logic operates to transmit a second request message to modify the content flow, and the receiving logic operates to receive a second response message indicating that the modification to the content flow will be accepted.

16. The apparatus of claim 14, wherein the transmitting logic operates to transmit a second request message to delete the content flow, and the receiving logic operates to receive a second response message indicating that the content flow will be

deleted.

17. The apparatus of claim 14, wherein the transmitting logic operates to transmit a second request message to obtain a latency time of the content flow, and the receiving logic operates to receive a second response message indicating the latency time.

18. The apparatus of claim 14, wherein the content flow comprises a non real time media clip.

19. Apparatus for transporting a content flow to an access network for distribution to devices coupled to the access network, the apparatus comprising:

logic for transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

logic for receiving the response message indicating that the content flow will not be added to the access network;

logic for adjusting selected flow parameters associated with the content flow to produce updated flow parameters;

logic for transmitting a new request message to add the content flow to the access network, wherein the new request message comprises the updated flow parameters; and

logic for receiving a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

20. The apparatus of claim 19, wherein said logic for adjusting comprises logic for adjusting the selected flow parameters associated with the content flow to produce the updated flow parameters, wherein the updated flow parameters comprise a rate parameter.

21. The apparatus of claim 19, wherein said logic for adjusting comprises logic for adjusting the selected flow parameters associated with the content flow to produce the updated flow parameters, wherein the updated flow parameters comprise a quality of service parameter.

22. Apparatus for transporting a content flow to an access network for distribution to devices coupled to the access network, the apparatus comprising:

means for transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

means for receiving the response message indicating that the content flow will not be added to the access network;

means for adjusting selected flow parameters associated with the content flow to produce updated flow parameters;

means for transmitting a new request message to add the content flow to the access network, wherein the new request message comprises the updated flow parameters; and

means for receiving a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

23. The apparatus of claim 22, wherein said means for adjusting comprises means for adjusting the selected flow parameters associated with the content flow to produce the updated flow parameters, wherein the updated flow parameters comprise a rate parameter.

24. The apparatus of claim 22, wherein said means for adjusting comprises means for adjusting the selected flow parameters associated with the content flow to produce the updated flow parameters, wherein the updated flow parameters comprise a quality of service parameter.

25. A computer-readable media comprising instructions, which when executed by processing logic, operate to transport a content flow to an access network for distribution to devices coupled to the access network, the computer-readable media comprising:

instructions for transmitting a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

instructions for receiving the response message indicating that the content flow will not be added to the access network;

instructions for adjusting selected flow parameters associated with the content flow to produce updated flow parameters;

instructions for transmitting a new request message to add the content flow to the access network, wherein the new request message comprises the updated flow parameters; and

instructions for receiving a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

26. The computer-readable media of claim 25, wherein said instructions for adjusting comprise instructions for adjusting the selected flow parameters associated with the content flow to produce the updated flow parameters, wherein the updated flow parameters comprise a rate parameter.

27. The computer-readable media of claim 25, wherein said instructions for adjusting comprise instructions for adjusting the selected flow parameters associated with the content flow to produce the updated flow parameters, wherein the updated flow parameters comprise a quality of service parameter.

28. A method for transporting a content flow to an access network for distribution to devices coupled to the access network, the method comprising:

receiving a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

determining that the content flow will be added to the access network based on the one or more flow parameters;

transmitting a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network; and

receiving the content flow.

29. The method of claim 28, further comprising:

receiving a second request message to modify the content flow; and

transmitting a second response message indicating that the modification to the content flow is accepted.

30. The method of claim 28, further comprising:

receiving a second request message to delete the content flow; and

transmitting a second response message indicating that the content flow will be deleted.

31. The method of claim 28, further comprising:

receiving a second request message to obtain a latency time of the content flow; and

transmitting a second response message indicating the latency time of the content flow.

32. The method of claim 28, wherein the step of receiving the request message comprises receiving the request message to add the content flow, wherein the content flow comprises a non real-time media clip.

33. The method of claim 28, wherein the step of receiving the content flow comprises receiving the content flow over a bearer channel.

34. The method of claim 28, further comprising broadcasting the content flow over the access network.

35. A method for transporting a content flow to an access network for distribution to devices coupled to the access network, the method comprising:

receiving a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

determining that the content flow will not be added to the access network based on the one or more flow parameters;

transmitting a response message indicating that the content flow will not be added to the access network;

receiving a new request message to add the content flow to the access network,

wherein the new request message comprises updated flow parameters; and

transmitting a new response message indicating that the content flow associated with the updated flow parameters will be added to the access network.

36. Apparatus for transporting a content flow to an access network for distribution to devices coupled to the access network, the apparatus comprising:

logic configured to receive a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

logic configured to determine that the content flow will be added to the access network based on the one or more flow parameters;

logic configured to transmit a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network; and

logic configured to receive the content flow.

37. The apparatus of claim 36, wherein said logic configured to receive the request message comprises logic configured to receive a second request message to modify the content flow, and said logic configured to transmit comprises logic configured to transmit a second response message indicating that the modification to the content flow will be accepted.

38. The apparatus of claim 36, wherein said logic configured to receive the request messages comprises logic configured to receive a second request message to delete the content flow, and said logic configured to transmit comprises logic configured to transmit a second response message indicating that the content flow will be deleted.

39. The apparatus of claim 36, wherein said content flow comprises a non real-time media clip.

40. The apparatus of claim 36, wherein said logic configured to receive the content flow comprise logic configured to receive the content flow over a bearer channel.

41. The apparatus of claim 36, further comprising logic configured to

broadcast the content flow over the access network.

42. A computer-readable media comprising instructions, which when executed by processing logic, operate to transport a content flow to an access network for distribution to devices coupled to the access network, the computer-readable media comprising:

instructions for receiving a request message to add the content flow to the access network, wherein the request message comprises one or more flow parameters associated with the content flow;

instructions for determining that the content flow will be added to the access network based on the one or more flow parameters;

instructions for transmitting a response message indicating that the content flow associated with the one or more flow parameters will be added to the access network; and

instructions for receiving the content flow.

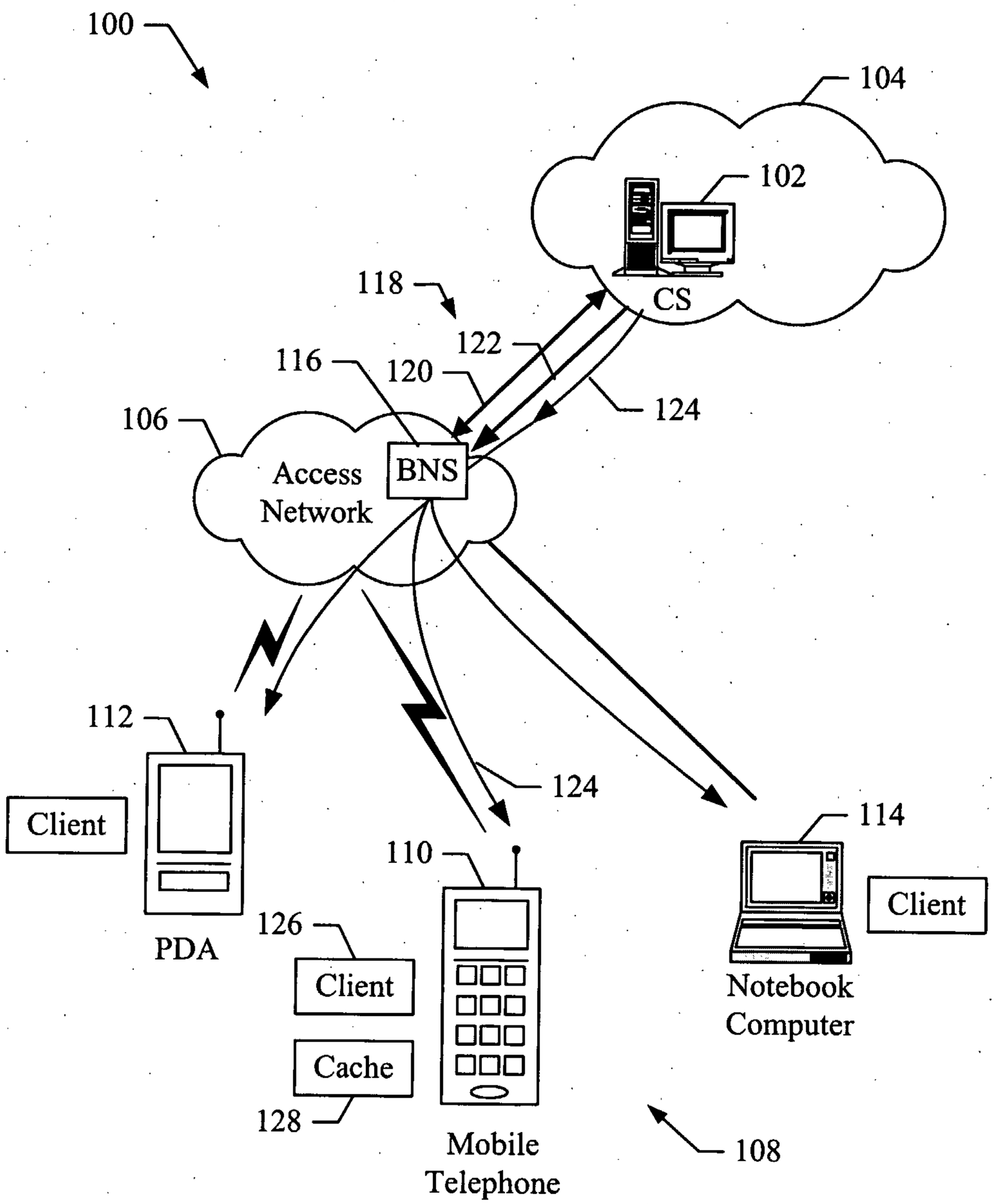

100
104
102
CS
118
122
116
120
124
106
Access Network
BNS
112
Client
PDA
124
110
126
Client
Cache
128
Mobile Telephone
114
Client
Notebook Computer
108

FIG. 1

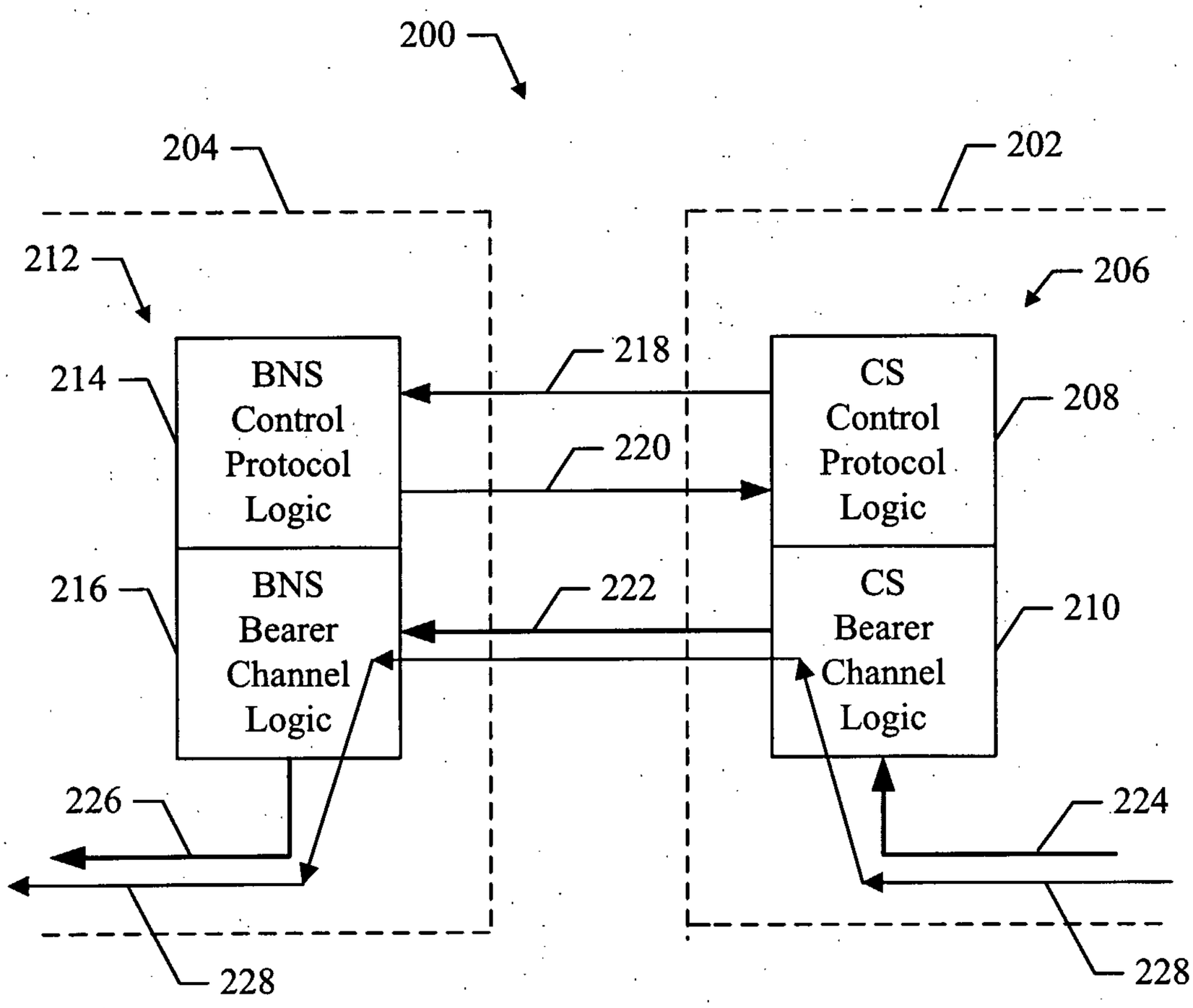

200
204
202
212
206
214
BNS Control Protocol Logic
218
CS Control Protocol Logic
208
220
216
BNS Bearer Channel Logic
222
CS Bearer Channel Logic
210
226
224
228
228

FIG. 2

	Message	Function
302	AddFlowRequest()	Sent by CS to BNS to add a content flow
304	AddFlowResponse()	Sent by BNS to CS with result of AddFlowRequest message
306	ModifyFlowRequest()	Sent by CS to BNS to modify parameters of a provisioned flow
308	ModifyFlowResponse()	Sent by BNS to CS with result of ModifyFlowRequest message
310	RemoveFlowRequest()	Sent by CS to BNS to remove a content flow
312	RemoveFlowResponse()	Sent by BNS to CS with result of the RemoveFlowRequest message
314	RegistrationReportRequest()	Sent by CS to BNS to request registration count
316	RegistrationReportResponse()	Sent by BNS to CS to report number of registrations
318	StatisticsCheckRequest()	Sent by CS to BNS to check status of a flow
320	StatisticsCheckResponse()	Sent by BNS to the CS with the result of the StatisticCheckRequest message
322	LatencyCheckRequest()	Sent by CS to BNS to get an estimatet of the latency to transmit a flow
324	LatencyCheckResponse()	Sent by BNS to CS to report transmission latency
326	HeartbeatRequest()	Sent by CS to BNS to monitor link
328	HeartbeatResponse()	Sent by BNS to CS to confirm link OK
330	ResetRequest()	Sent by either CS or BNS to reset or resync flow state
332	ResetResponse()	Sent by either CS or BNS to acknowledge reset or resync of flow state

300

FIG. 3

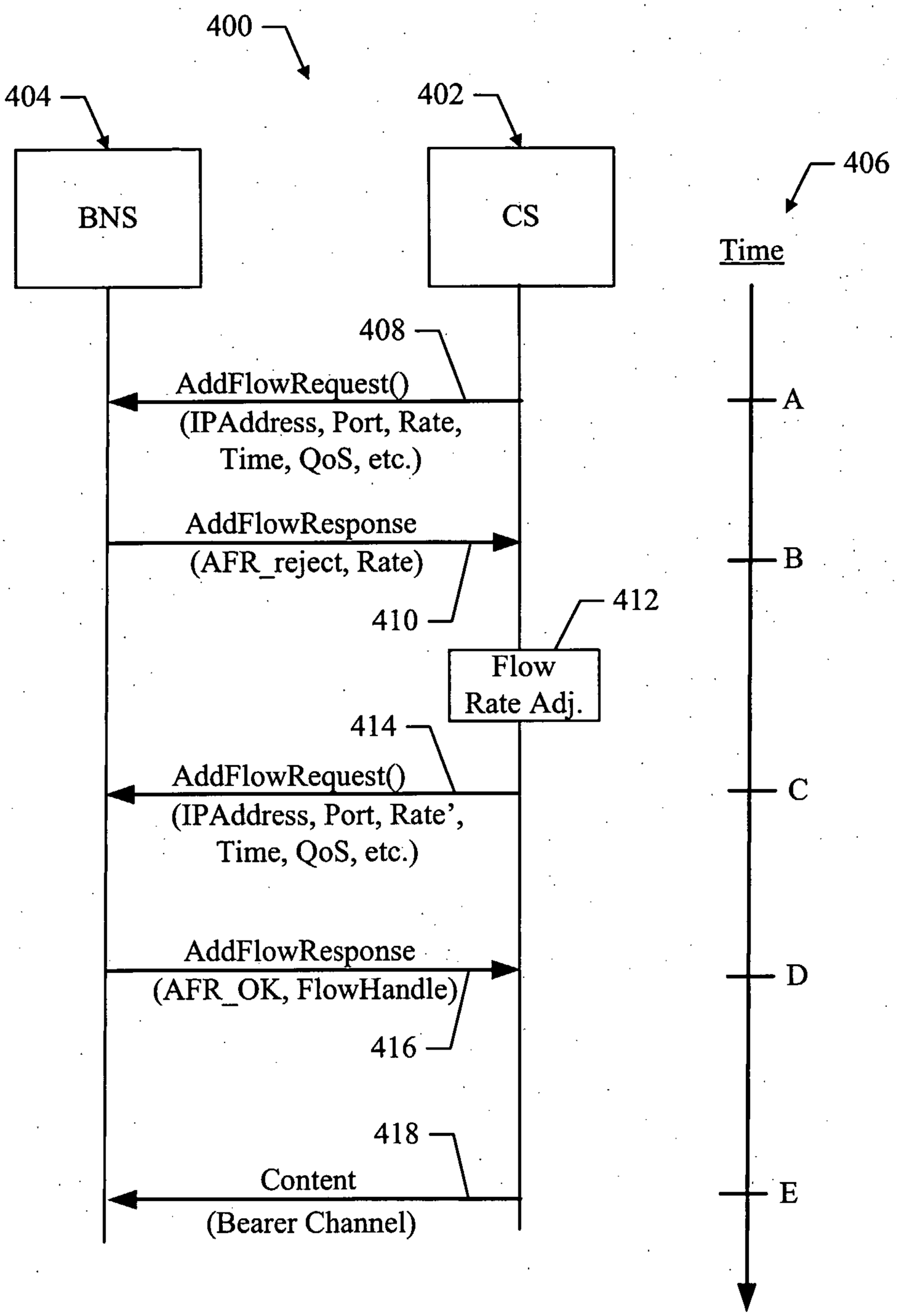

400
404
402
BNS
CS
406
Time
408
AddFlowRequest()
(IPAddress, Port, Rate,
Time, QoS, etc.)
A
AddFlowResponse
(AFR_reject, Rate)
B
410
412
Flow
Rate Adj.
414
AddFlowRequest()
(IPAddress, Port, Rate',
Time, QoS, etc.)
C
AddFlowResponse
(AFR_OK, FlowHandle)
D
416
418
Content
(Bearer Channel)
E

FIG. 4

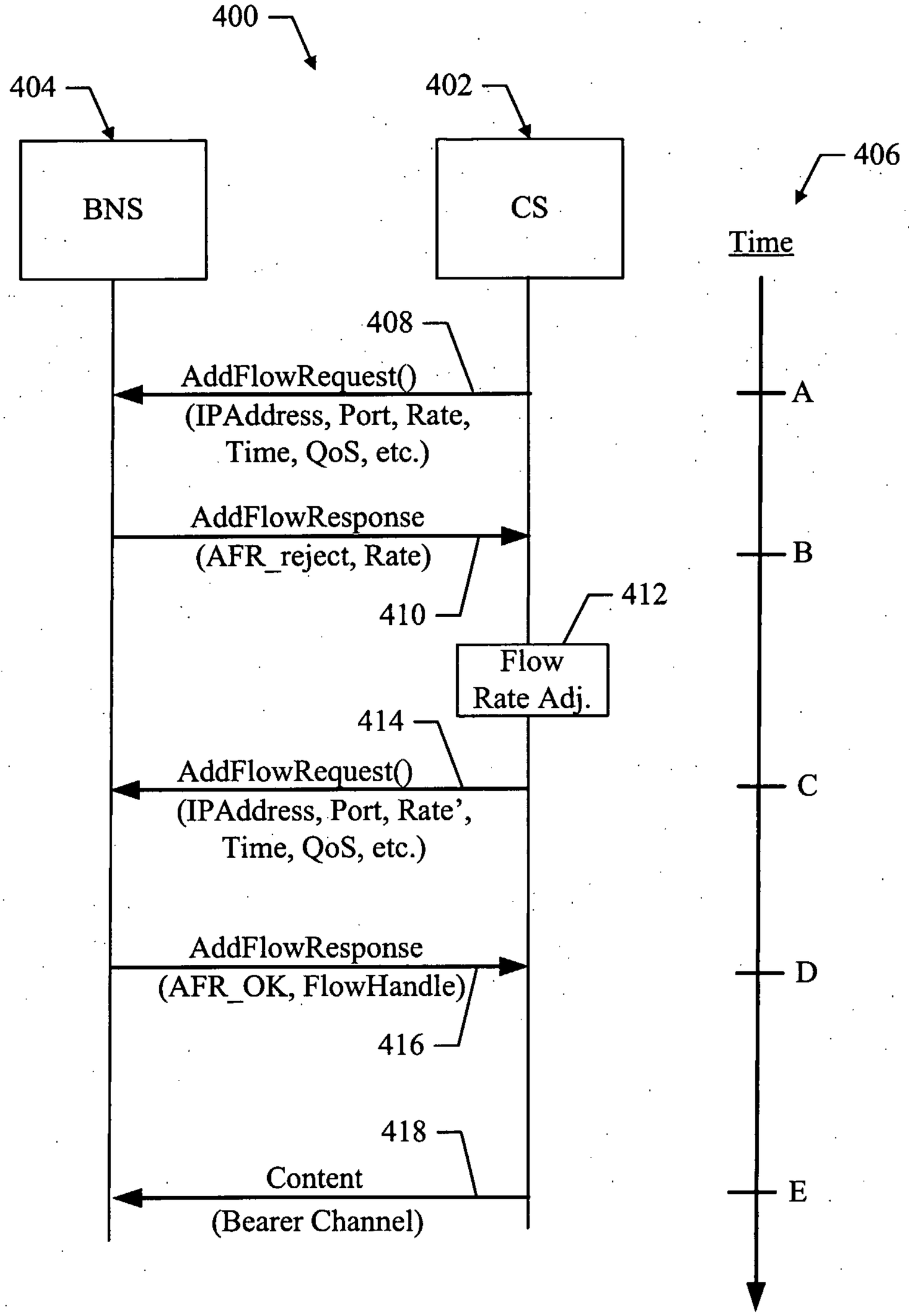

400
404
402
406
BNS
CS
Time
408
AddFlowRequest()
(IPAddress, Port, Rate,
Time, QoS, etc.)
A
AddFlowResponse
(AFR_reject, Rate)
B
410
412
Flow
Rate Adj.
414
AddFlowRequest()
(IPAddress, Port, Rate',
Time, QoS, etc.)
C
AddFlowResponse
(AFR_OK, FlowHandle)
D
416
418
Content
(Bearer Channel)
E

FIG. 4

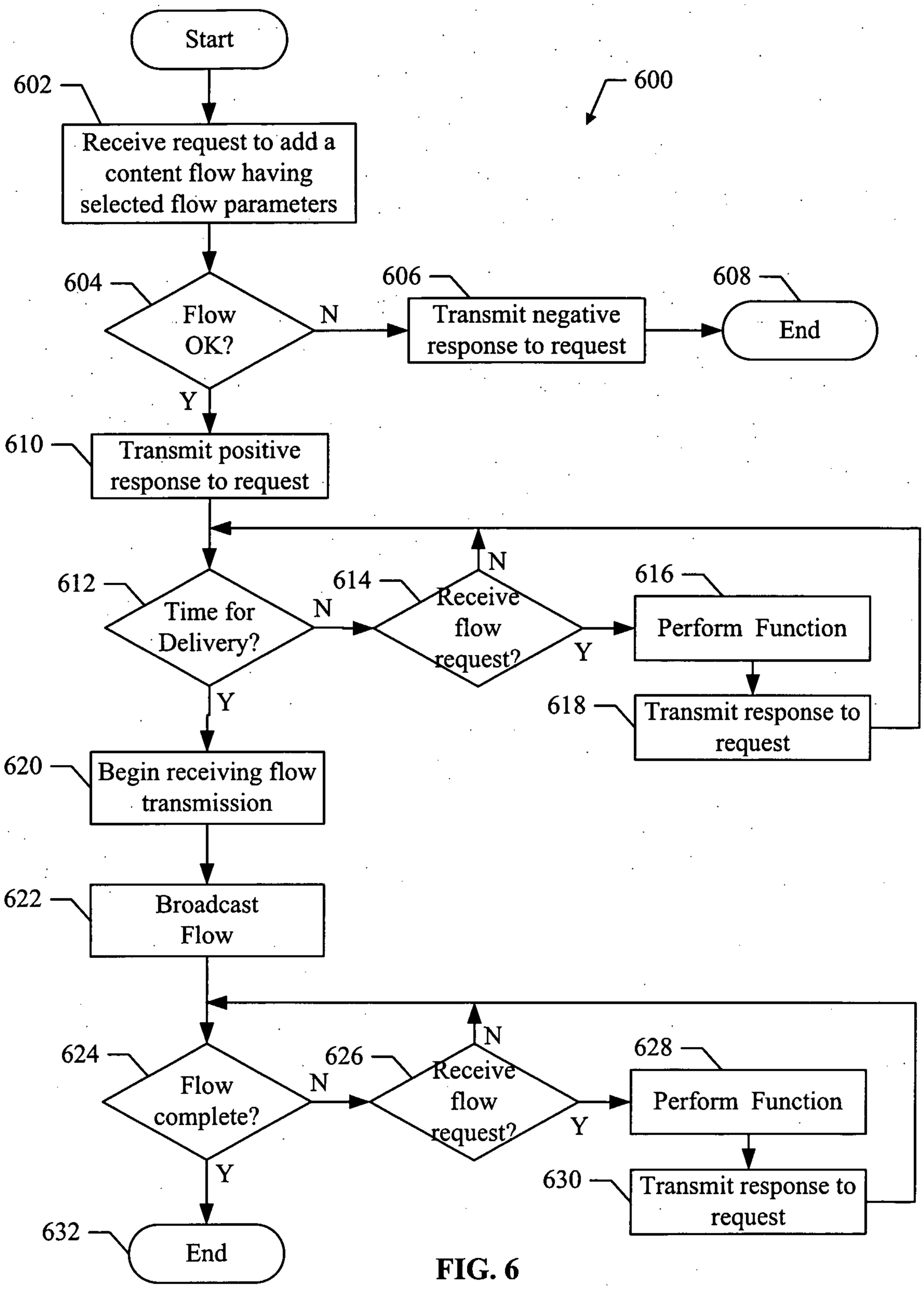

Start
602
600
Receive request to add a content flow having selected flow parameters
604
Flow OK?
N
606
Transmit negative response to request
608
End
Y
610
Transmit positive response to request
612
Time for Delivery?
N
614
Receive flow request?
N
Y
616
Perform Function
618
Transmit response to request
Y
620
Begin receiving flow transmission
622
Broadcast Flow
624
Flow complete?
N
626
Receive flow request?
N
Y
628
Perform Function
630
Transmit response to request
Y
632
End

FIG. 6

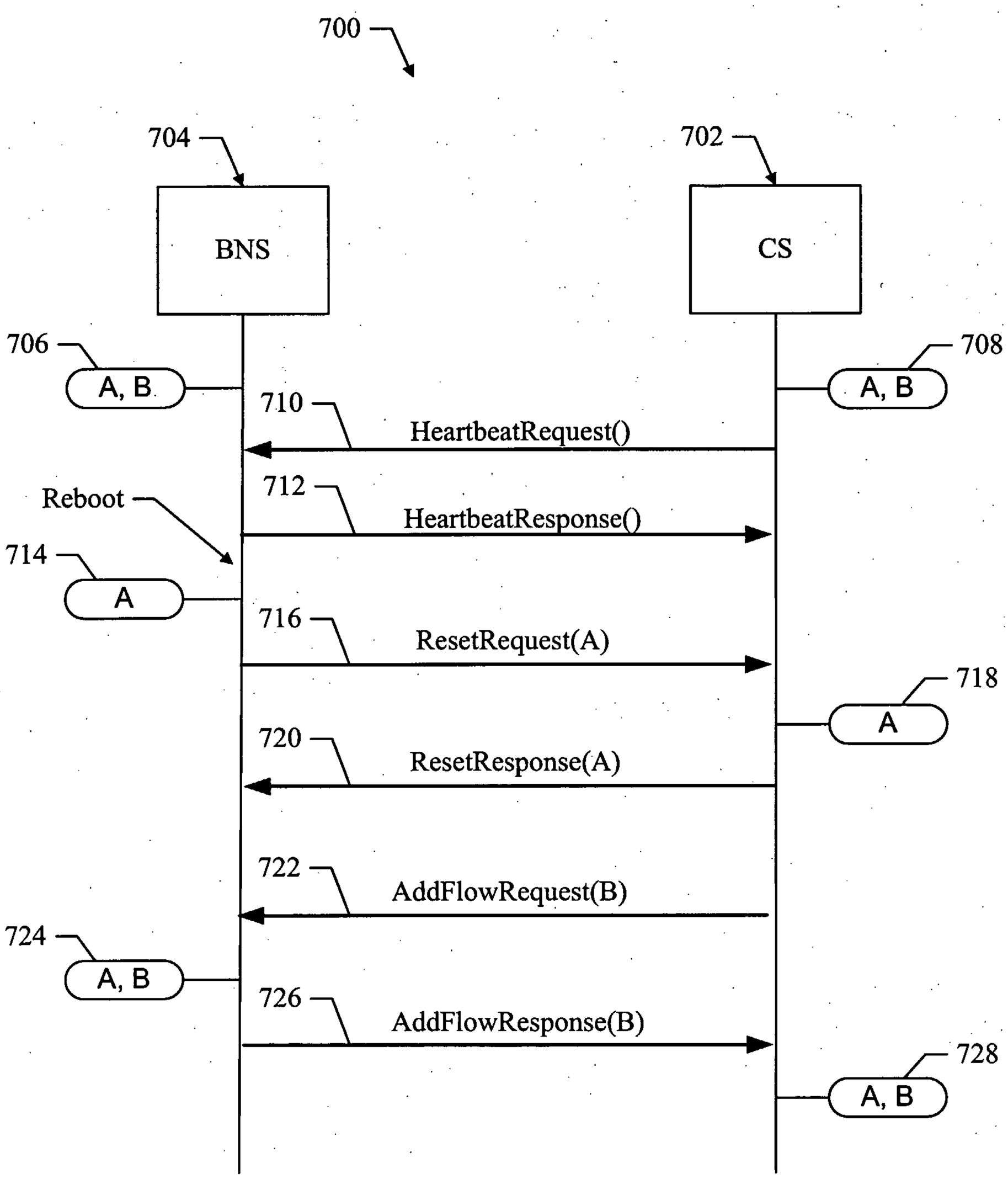
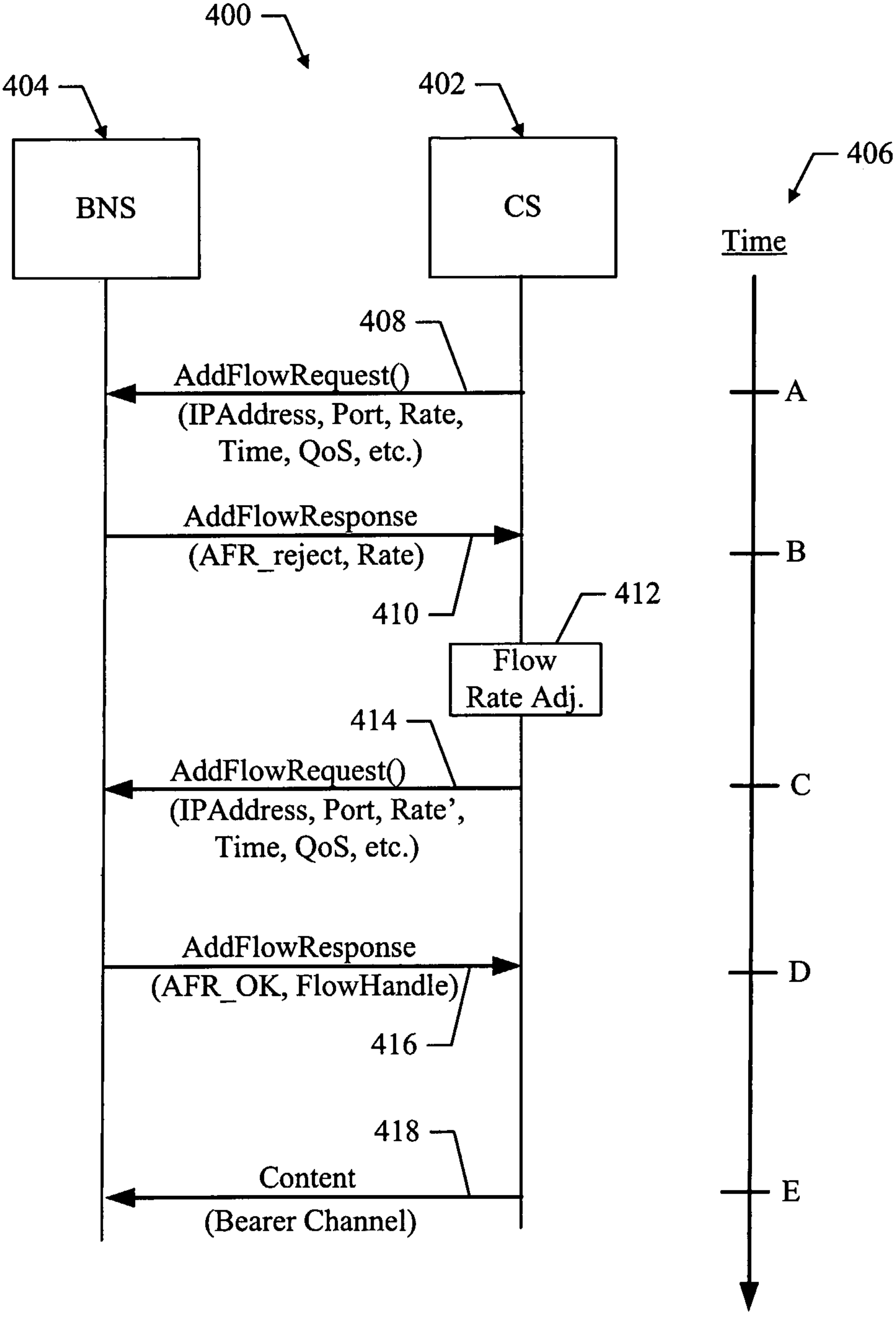

700
704
BNS
702
CS
706
A, B
708
A, B
710
HeartbeatRequest()
712
HeartbeatResponse()
Reboot
714
A
716
ResetRequest(A)
718
A
720
ResetResponse(A)
722
AddFlowRequest(B)
724
A, B
726
AddFlowResponse(B)
728
A, B

FIG. 7


400
404
BNS
402
CS
406
Time
408
AddFlowRequest()
(IPAddress, Port, Rate,
Time, QoS, etc.)
A
AddFlowResponse
(AFR_reject, Rate)
B
410
412
Flow
Rate Adj.
414
AddFlowRequest()
(IPAddress, Port, Rate',
Time, QoS, etc.)
C
AddFlowResponse
(AFR_OK, FlowHandle)
D
416
418
Content
(Bearer Channel)
E