# METHODS AND APPARATUS FOR CREATION AND TRANSPORT OF MULTIMEDIA CONTENT FLOWS

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

[0001] The present Application for Patent claims priority to Provisional Application No. 60/564,467 entitled "METHOD AND APPARATUS FOR CREATION OF MULTIMEDIA CONTENT FLOWS AND TRANSPORT OF MULTIMEDIA" filed April 21, 2004, and assigned to the assignee hereof and hereby expressly incorporated by reference herein for all purposes.

## BACKGROUND

### Field

[0002] The present invention relates generally to transporting multimedia content in a data network, and more particularly to a system for creation and transport of multimedia content flows across data networks.

### Background

[0003] 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.

[0004] 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.

Unfortunately, these specialized networks are generally expensive and are provided over only limited operating regions. Over wide operating areas wireless 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 available on a content distribution network to a large number of users on a wireless access network.

## SUMMARY

In a first aspect of the present invention, there is provided a method for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the method including:

transmitting a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

receiving a response message indicating that the content flow will be added to the wireless access network;

waiting until the scheduled delivery time; and

delivering the content flow to the wireless access network.

In a second aspect of the present invention, there is provided an apparatus for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the apparatus including:

transmitting logic that operates to transmit a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

receiving logic that operates to receive a response message indicating that the content flow will be added to the wireless access network;

waiting logic that operates to wait until the scheduled delivery time; and

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

In a third aspect of the present invention, there is provided an apparatus for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the apparatus including:

means for transmitting a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

means for receiving a response message indicating that the content flow will be added to the wireless access network;

means for waiting until the scheduled delivery time; and means for delivering the content flow to the wireless access network.

In a fourth aspect of the present invention, there is provided a computer-readable media including instructions, which when executed by processing logic, operate to transport a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the computer-readable media including:

instructions for transmitting a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

instructions for receiving a response message indicating that the content flow will be added to the wireless access network;

instructions for waiting until the scheduled delivery time; and

instructions for delivering the content flow to the wireless access network.

In a fifth aspect of the present invention, there is provided a method for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the method including:

receiving a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

transmitting a response message indicating that the content flow will be added to the wireless access network; and

receiving the content flow at the scheduled delivery time for broadcast to the devices.

In a sixth aspect of the present invention, there is provided an apparatus for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the apparatus including:

receiving logic that operates to receive a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

transmitting logic that operates to transmit a response message indicating that the content flow will be added to the wireless access network; and

content receiving logic that operates to receive the content flow for broadcast to the devices.

In a seventh aspect of the present invention, there is provided an apparatus for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the apparatus including:

means for receiving a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

means for transmitting a response message indicating that the content flow will be added to the wireless access network; and

means for receiving the content flow at the scheduled delivery time for broadcast to the devices.

In an eighth aspect of the present invention, there is provided a computer-readable media including instructions, which when executed by processing logic, operate to transport a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the computer-readable media including:

instructions for receiving a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

instructions for transmitting a response message indicating that the content flow will be added to the wireless access network; and

instructions for receiving the content flow at the scheduled delivery time for broadcast to the devices.

In a ninth aspect of the present invention, there is provided at least one processor configured to implement a method for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access
network, the method including:

transmitting a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

receiving a response message indicating that the content flow will be added to the wireless access network;

waiting until the scheduled delivery time; and

delivering the content flow to the wireless access network.

In a tenth aspect of the present invention, there is provided at least one processor configured to implement a method for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the method including:

receiving a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

transmitting a response message indicating that the content flow will be added to the wireless access network; and

receiving the content flow at the scheduled delivery time for broadcast to the devices.

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

## BRIEF DESCRIPTION OF THE DRAWINGS

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:

[0018] **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 across data networks;

[0019] **FIG. 2** shows a detailed diagram of one embodiment of a transport system that operates to create and transport multimedia content flows across data networks;

[0020] **FIG. 3** shows one embodiment of transport messages used in one or more embodiments of a transport system;

[0021] **FIG. 4** shows one embodiment of a messaging protocol for use in one or more embodiment of a transport system;

[0022] **FIG. 5** shows one embodiment of a method for operating a content server in one embodiment of a transport system; and

[0023] **FIG. 6** shows one embodiment of a method for operating a broadcast base station in one embodiment of a transport system.

## DETAILED DESCRIPTION

[0024] In one or more embodiments, a transport system is provided for the creation and transport of multimedia content flows across data networks.

[0025] **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 across data networks. For example, the transport system is suitable for use in transporting content clips from a content provider network to a wireless access network for broadcast distribution.

[0026] The network **100** comprises a content provider **102**, a content provider network **104**, an optimized broadcast network **106**, and a wireless access network **108**. The network **100** also includes devices **110** that comprise a mobile telephone **112**, a personal digital assistance (PDA) **114**, and a notebook computer **116**. The devices **110** 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 used in the transport system.

[0027] The content provider **102** operates to provide content for distribution to users in the network **100**. 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 provider **102** provides the content to the content provider network

104 for distribution. For example the content provider 102 communicates with the content provider network 104 via the communication link 118, which comprises any suitable type of wired and/or wireless communication link.

[0028] The content provider network 104 comprises any combination of wired and wireless networks that operate to distribute content for delivery to users. The content provider network 104 communicates with the optimized broadcast network 106 via the link 120. The link 120 comprises any suitable type of wired and/or wireless communication link. The optimized broadcast network 106 comprises any combination of wired and wireless networks that are designed to broadcast high quality content. For example, the optimized broadcast network 106 may be a specialized proprietary network that has been optimized to deliver high quality content to selected devices over a plurality of optimized communication channels.

[0029] In one or more embodiments, the transport system operates to deliver content from the content provider network 104 for distribution over non-specialized networks, such as the wireless access network 108. The transport system comprises a content server (CS) 122 at the content provider network 104 that operates to communicate with a broadcast base station (BBS) 124 at the wireless access network. The CS 122 and the BBS 124 communicate using one or more embodiments of a transport interface 126 that allows the content provider network 104 to deliver content in the form of content flows to the wireless access network 108 for broadcast/multicast to the devices 110. The transport interface 126 comprises a control interface 128 and a bearer channel 130. The control interface 128 operates to allow the CS 122 to add, change, cancel, or otherwise modify contents flows that flow from the content provider network 104 to the wireless access network 108. The bearer channel 130 operates to transport the content flows from the content provider network 104 to the wireless access network 108.

[0030] In one embodiment, the CS 122 uses the transport interface 126 to schedule a content flow to be transmitted to the BBS 124 for broadcast/multicast over the wireless access network 108. For example, the content flow may comprise a non real-time content clip that was provided by the content provider 102 for distribution using the content provider network 104. In one embodiment, the CS 122 operates to negotiate with the BBS 124 to determine one or more parameters associated with the content clip. Once the BBS 124 receives the content clip, it broadcasts/multicasts the content clip over the wireless access network 108 for reception by one or more of the devices 110.

Any of the devices **110** may be authorized to receive the content clip and cache it for later viewing by the device user.

**[0031]** For example the device **110** comprises a client program **132** that operates to provide a program guide that displays a listing of content that is scheduled for broadcast over the wireless access network **108**. The device user may then select to receive any particular content for rendering in real-time or to be stored in a cache **134** for later viewing. For example the content clip may be scheduled for broadcast during the evening hours, and the device **112** operates to receive the broadcast and cache the content clip in the cache **134** 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.

**[0032]** In one or more embodiments, the transport system allows the CS **122** to add, change, modify, or delete flows that are provided over the bearer channel **122** to the BBS **124**. In another embodiment, the transport system allows the CS **122** to obtain statistical information about the distribution of content flows provided by the wireless access network **108**. As a result, the transport system operates to allow scheduled content flows to be transmitted from the provider network **104** to the wireless access network **108** for broadcast to the devices **110**. The system also provides a way for statistical information regarding the broadcast of the content flows to be returned to the CS **122**.

**[0033]** **FIG. 2** shows a detailed diagram of one embodiment of a transport system **200** that operates to create and transport multimedia content flows across data networks. For example, the system **200** may be used as the transport system described in **FIG. 1**.

**[0034]** One embodiment of the transport system **200** allows a content provider network **202** to transport content flows to a wireless access network **204**. The content provider network **202** includes a CS **206** that comprises CS control protocol logic **208** and CS bearer channel logic **210**. The wireless access network **204** includes a BBS **212** that comprises BBS control protocol logic **214** and BBS bearer channel logic **216**.

**[0035]** The CS control protocol logic **208** communicates with the BBS 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 BBS control protocol logic **214** that request to add, change, or delete content flows, or request statistical information. The response channel

220 allows the BBS 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 BBS 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. .

[0036] The CS bearer channel logic 210 operates to transmit content flows from the provider content network 202 to the wireless 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 provider content network 202. After the CS control protocol logic 208 gets authorization to add the content flow 228 to the wireless access network 204, the CS bearer channel logic 210 operates to transmit the content flow 228 over the bearer channel 222 to the BBS bearer channel logic 216, which in turn broadcasts the content flow 228 over its output channel 226 to devices coupled to the wireless access network 204.

[0037] In one embodiment, the bearer channel 222 utilizes a generic routing encapsulation (GRE) protocol to transmit flows from the CS 206 to the BBS 212. For example, the CS bearer protocol logic 210 and the BBS 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.

[0038] In one embodiment, the CS 206 and BBS 212 comprise a CPU, processor, gate array, hardware logic, memory elements, virtual machine, software, and/or any combination of hardware and software. Thus, the CA 206 and BBS 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 BBS 212 shown in **FIG. 2** represent just one implementation and that other implementations are possible within the scope of the embodiments.

[0039] In one embodiment, the transport system comprises program instructions stored on a computer-readable media, which when executed by a processing logic in a device, for instance, the CS 206 or the BBS 212, provide the functions of the transport system described herein. For example, instructions may be loaded into the CS 206 and/or the BBS 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 BBS **212** from an external device or network resource that interfaces to the CS **206** or the BBS **212**. The instructions, when executed by the processing logic at the CS **206** or the BBS **212**, provide one or more embodiments of a transport system as described herein.

**[0040]** **FIG. 3** shows one embodiment of transport messages **300** used in one or more 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 BBS 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 wireless access network **204**. In another embodiment, the transport messages **300** allow the CS **206** to obtain statistical information about flows in the wireless access network **204**.

**[0041]** In one embodiment, one or more of the transport messages **300** comprise parameters that are associated with any particular message. For example, the AddFlowRequest message **302** comprises one or more parameters to indicate a proposed delivery time, rate, 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 BBS 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.

**[0042]** The transport messages **300** comprise messages **302** through **312** that operate to add, modify, and remove a flow from the wireless access network **204**. For example, the message **302** contains flow parameters and operates to request that a content flow be added to the wireless 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.

**[0043]** The messages **314** through **324** operate to obtain registration, statistics, and latency information about flows in the wireless access network **204** that are identified in the respect 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. Thus, in one or more embodiments, the messages **300** operates to process content flows transmitted from the content provider network **202** to the wireless access network **204**, and also to allow status information about those flows to be returned from the wireless access network **204** to the content provider network **202**.

**[0044]** **FIG. 4** shows one embodiment of a messaging protocol **400** for use in one or more embodiment of a transport system. For example the messaging protocol **400** may be used to transmit the messages **300** between a CS **402** and a BBS **404**. A time indicator **406** is provided which indicates a relative time for each message.

**[0045]** At time A, an add flow request message **302** is transmitted, as shown at **408**, from the CS **402** to the BBS **404**. The add flow request message **302** is a request to add a flow to the wireless access network, and the request includes flow parameters such as a flow address (IPAddress), a flow port (Port), a flow rate (Rate), a scheduled delivery time (Time), quality of service (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 wireless access network. The QoS may include information such as bandwidth, delay, jitter, etc.

**[0046]** At time B, which may be a relatively short time after time A, the BBS **404** responds with an add flow response message **304**, as shown at **410**, that indicates whether or not the flow may be added. For example, if the rate and/or QoS are acceptable to the wireless access network, the flow will be accepted. Otherwise the flow may be rejected. It will be assumed that the response message **410** indicates that the flow can be added and provides a flow handle (FlowHandle) to identify the flow in the wireless access network. The response message may include information such as the number, characteristics, and other information of the devices registered to receive content flow.

**[0047]** At time C, which corresponds to the time (Time) indicated in the add flow request **302**, the content flow is transmitted from the CS **402** to the BBS **404** via the bearer channel as shown at **412**. 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 BBS **404**.

[0048] **FIG. 5** shows one embodiment of a method **500** for operating a CS in one embodiment 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.

[0049] At block **502**, a request is transmitted that requests to add a content flow to a wireless access network. For example the request is an AddFlowRequest message **302** transmitted to a BBS associated with the wireless access network. The request includes flow parameters that describe the flow (i.e., rate, QoS, etc.) and indicate a scheduled time that the flow is to be added to the wireless network. For example, the CS control protocol logic **208** transmits the request over the request channel **218** to the BBS control protocol logic **214**.

[0050] At block **504**, a response is received that indicates whether or not the flow will be added to the wireless access network. For example, the response is an AddFlowResponse message **304** received by the CS control protocol logic **208**. In one embodiment, the wireless 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 wireless 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 wireless access network, (i.e., scheduled time, QoS, etc.). If the request is granted, the method proceeds to block **508**.

[0051] 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 wireless 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**.

[0052] At block **506**, the flow and/or its associated parameters are adjusted so that it may be transmitted on the wireless 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 wireless network. For example, the flow data rate may be adjusted to a data rate that can be supported by the wireless 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.

**[0053]** It should be noted that the block **502, 504,** and **506** operate to allow the CS to negotiate one or more parameters associated with the flow. For example, if the wireless 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 parameters, start time, or end time may be negotiated until parameters are determined that are acceptable to the wireless access network.

**[0054]** 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 wireless 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**.

**[0055]** 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**.

**[0056]** 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 BBS control protocol logic **214** via the request channel **218**.

**[0057]** 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** via the response channel **220**. The method then proceeds to block **508** to determine if it is time to delivery the flow.

**[0058]** At block **516**, a transmission of the content flow to the wireless 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 BBS bearer channel logic **216**.

**[0059]** 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 other functions as described with reference to the messages **300** shown in **FIG. 3**. 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**.

**[0060]** 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 BBS control protocol logic **214** via the request channel **218**.

**[0061]** 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**.

**[0062]** 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**.

[0063] 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.

[0064] **FIG. 6** shows one embodiment of a method **600** for operating a BBS in one embodiment of a transport system. For clarity, the method **600** will be described with reference to the BBS **212** shown in **FIG. 2**. In one or more embodiments, the BBS control protocol logic **214** executes program instructions and controls the operation of the BBS **212** to perform the functions described below.

[0065] At block **602**, a request is received to add a content flow for broadcast over a wireless access network. For example, the request is an AddFlowRequest message **302** received by the BBS control protocol logic **214**, and the request includes flow parameters associated with the flow that may include a rate, QoS, scheduled delivery time, etc.

[0066] At block **604**, a determination is made whether or not the flow will be accepted given the stated flow parameters. For example, the BBS 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**.

[0067] At block **606**, a negative response is transmitted in response to the add flow request. For example, the BBS 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 BBS control protocol logic 214 may determine acceptable parameters that would allow the flow to be broadcast in the wireless 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 wireless network. The method then ends at block **608**.

[0068] At block **610**, a positive response is transmitted that authorizes the content flow to be added to the wireless access network. For example, the BBS control protocol logic **214** transmits a positive response message that authorizes the content flow to be added to the wireless 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 wireless access network.

**[0069]** It should be noted that the block **602**, **604**, **606**, and **610** operate to allow parameters associated with the flow to be negotiated between the CS and the BBS. Fore example, if the BBS **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 BBS **212** accepts the flow and transmits a positive response at block **610**. Thus, the BBS **212** and the CS **206** may operate to negotiate any flow parameter associated with the flow.

**[0070]** 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 BBS 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**.

**[0071]** At block **614**, a determination is made to determine if any more flow requests have been received. For example, the BBS 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**.

**[0072]** 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 BBS 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 wireless access network. The BBS 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 BBS control protocol logic **214** operates to perform the requested function.

**[0073]** At block **618**, a response is transmitted in response to the flow request. For example, the BBS 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 may devices in the wireless access network are registered to receive the flow, as provided by the message **314**. The BBS 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.

**[0074]** At block **620**, the BBS begins receiving the flow at the scheduled time. For example, the content flow is received over the bearer channel **222** by the BBS bearer channel logic **216**.

**[0075]** At block **622**, the content flow is broadcast over the wireless access network. For example, the BBS bearer channel logic **216** operates to broadcast the received content flow over the wireless 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 BBS for later broadcast to the devices in the wireless access network.

**[0076]** At block **624**, a determination is made whether or not the flow has been completely received. For example, the BBS 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 receive, the method ends at block **632**.

**[0077]** At block **626**, a determination is made to determine if any more flow requests have been received. For example, the BBS 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 **624** to determine if the flow has been completely received. If additional flow requests are received, the method proceeds to block **628**.

**[0078]** 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 BBS 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 wireless access network. The BBS 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 BBS control protocol logic **214** operates to perform the requested function.

**[0079]** At block **630**, a response is transmitted in response to the flow request. For example, the BBS 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 may devices in the wireless access network are registered to receive the flow, as provided by the message **314**. The BBS 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.

**[0080]** 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.

**[0081]** 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.

**[0082]** 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.

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.

The previous 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 will 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.

It will be understood that the term "comprise" and any of its derivatives (eg. comprises, comprising) as used in this specification is to be taken to be inclusive of features to which it refers, and is not meant to exclude the presence of any additional features unless otherwise stated or implied.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgement of any form of suggestion that such prior art forms part of the common general knowledge.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the method including:

transmitting a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

receiving a response message indicating that the content flow will be added to the wireless access network;

waiting until the scheduled delivery time; and

delivering the content flow to the wireless access network.

2. The method of claim 1, further including:

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 including:

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 including:

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 act of transmitting includes transmitting the request message to add the content flow, wherein the content flow includes a non real-time media clip.

6. The method of any preceding claim, wherein the act of delivering includes transmitting the content flow over a bearer channel to the wireless access network.

7. The method of any preceding claim, wherein the step of receiving includes:

receiving the response message indicating that the content flow is not authorized to be added to the wireless access network;

adjusting one or more parameters associated with the content flow;

transmitting a new request message to add the content flow to the wireless access network, wherein the new request message includes the one or more adjusted parameters; and

receiving a new response message indicating that the content flow is authorized to be added to the wireless access network.

8. The method of claim 7, wherein the step of adjusting includes adjusting the one or more parameters associated with the content flow, wherein the one or more parameters include at least one of a rate parameter and a quality of service rate parameter.

9. The method of any preceding claim, wherein the response includes information such as number of devices registered to receive the content flow.

10. The method of any preceding claim, further including negotiating one or more parameters associated with the content flow based on one or more acceptable parameters included in the response message.

11. Apparatus for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the apparatus including:

transmitting logic that operates to transmit a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

receiving logic that operates to receive a response message indicating that the content flow will be added to the wireless access network;

waiting logic that operates to wait until the scheduled delivery time; and

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

12. The apparatus of claim 11, 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.

13. The apparatus of claim 11, 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.

14. The apparatus of claim 11, 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.

15. The apparatus of any one of claims 11 to 14, wherein the content flow includes a non real-time media clip.

16. The apparatus of any one of claims 11 to 15, wherein the receiving logic includes:

logic that operates to receive the response message indicating that the content flow is not authorized to be added to the wireless access network;

logic that operates to adjust one or more parameters associated with the content flow;

logic that operates to transmit a new request message to add the content flow to the wireless access network, wherein the new request message includes the one or more adjusted parameters; and

logic that operates to receive a new response message indicating that the content flow is authorized to be added to the wireless access network.

17. The apparatus of claim 16, wherein the logic that operates to adjust includes logic that operates to adjust the one or more parameters associated with the content flow, wherein the one or more parameters include at least one of a rate parameter and a quality of service rate parameter.

18. The apparatus of claim 16, wherein the response includes information such as number of devices registered to receive the content flow.

19. The apparatus of any one of claims 11 to 18, further including logic that operates to negotiate one or more parameters associated with the content flow based on one or more acceptable parameters included in the response message.

20. Apparatus for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the apparatus including:

means for transmitting a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

means for receiving a response message indicating that the content flow will be added to the wireless access network;

means for waiting until the scheduled delivery time; and means for delivering the content flow to the wireless access network.

21. The apparatus of claim 20, further including:

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

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

22. The apparatus of claim 20, further including:

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

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

23. The apparatus of claim 20, further including:

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

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

24. The apparatus of claim 20, wherein the means for transmitting includes means for transmitting the request message to add the content flow, wherein the content flow includes a non real-time media clip.

25. The apparatus of any one of claims 20 to 24, wherein the means for delivering includes means for transmitting the content flow over a bearer channel to the wireless access network.

26. The apparatus of any one of claims 20 to 25, wherein the means for receiving includes:

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

means for adjusting one or more parameters associated with the content flow;

means for transmitting a new request message to add the content flow to the wireless access network, wherein the new request message includes the one or more adjusted parameters; and

means for receiving a new response message indicating that the content flow is authorized to be added to the wireless access network.

27. The apparatus of claim 26, wherein the means for adjusting includes means for adjusting the one or more parameters associated with the content flow, wherein the one or more parameters include at least one of a rate parameter and a quality of service rate parameter.

28. The apparatus of claim 26, wherein the response includes information such as number of devices registered to receive the content flow.

29. The apparatus of any one of claims 20 to 28, further including means for negotiating one or more parameters associated with the content flow based on one or more acceptable parameters included in the response message.

30. A computer-readable media including instructions, which when executed by processing logic, operate to transport a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the computer-readable media including:

instructions for transmitting a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

instructions for receiving a response message indicating that the content flow will be added to the wireless access network;

instructions for waiting until the scheduled delivery time; and

instructions for delivering the content flow to the wireless access network.

31. The computer-readable media of claim 30, further including:

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

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

32. The computer-readable media of claim 30, further including:

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

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

33. The computer-readable media of claim 30, further including:

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

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

34. The computer-readable media of claim 30, wherein the instructions for transmitting include instructions for transmitting the request message to add the content flow, wherein the content flow includes a non real-time media clip.

35. The computer-readable media of any one of claims 30 to 34, wherein the instructions for delivering include instructions for transmitting the content flow over a bearer channel to the wireless access network.

36. The computer-readable media of any one of claims 30 to 35, wherein the instructions for receiving include:

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

instructions for adjusting one or more parameters associated with the content flow;

instructions for transmitting a new request message to add the content flow to the wireless access network, wherein the new request message includes the one or more adjusted parameters; and

instructions for receiving a new response message indicating that the content flow is authorized to be added to the wireless access network.

37. The computer-readable media of claim 36, wherein the instructions for adjusting include instructions for adjusting the one or more parameters associated with the content flow, wherein the one or more parameters include at least one of a rate parameter and a quality of service rate parameter.

38. The computer-readable media of claim 36, wherein the response includes information such as number of devices registered to receive the content flow.

39. The computer-readable media of any one of claims 30 to 38, further including instructions for negotiating one or more parameters associated with the content flow based on one or more acceptable parameters included in the response message.

40. A method for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the method including:

receiving a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

transmitting a response message indicating that the content flow will be added to the wireless access network; and

receiving the content flow at the scheduled delivery time for broadcast to the devices.

41. The method of claim 40, further including:

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

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

42. The method of claim 40, further including:

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

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

43. The method of claim 40, further including:

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.

44. The method of any one of claims 40 to 43, wherein the act of receiving the request message includes receiving the request message to add the content flow, wherein the content flow includes a non real-time media clip.

45. The method of any one of claims 40 to 44, wherein the act of receiving the content flow includes receiving the content flow over a bearer channel.

46. The method of any one of claims 40 to 45, further including broadcasting the content flow over the wireless access network.

47. The method of claim 40, wherein the act of transmitting includes transmitting a negative response message indicating that the content flow will not be added to the wireless access network, wherein the negative response message includes one or more acceptable parameters.

48. Apparatus for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the apparatus including:

receiving logic that operates to receive a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

transmitting logic that operates to transmit a response message indicating that the content flow will be added to the wireless access network; and

content receiving logic that operates to receive the content flow for broadcast to the devices.

49. The apparatus of claim 48, wherein the receiving logic operates to receive a second request message to modify the content flow, and the transmitting logic operates to transmit a second response message indicating that the modification to the content flow will be accepted.

50. The apparatus of claim 48, wherein the receiving logic operates to receive a second request message to delete the content flow, and the transmitting logic operates to transmit a second response message indicating that the content flow will be deleted.

51. The apparatus of claim 48, wherein the receiving logic operates to receive a second request message to obtain a latency time of the content flow, and the transmitting logic operates to transmit the latency time of the content flow.

52. The apparatus of any one of claims 48 to 51, wherein the content flow includes a non real-time media clip.

53. The apparatus of any one of claims 48 to 52, wherein the content receiving logic operates to receive the content flow over a bearer channel.

54. The apparatus of any one of claims 48 to 53, further including logic that operates to broadcast the content flow over the wireless access network.

55. The apparatus of claim 48, wherein the transmitting logic includes logic that operates to transmit a negative response message indicating that the content flow will not be added to the wireless access network, wherein the negative response message includes one or more acceptable parameters.

56. Apparatus for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the apparatus including:

means for receiving a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

means for transmitting a response message indicating that the content flow will be added to the wireless access network; and

means for receiving the content flow at the scheduled delivery time for broadcast to the devices.

57. The apparatus of claim 56, further including:

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

means for transmitting a second response message indicating that the modification to the content flow will be accepted.

58. The apparatus of claim 56, further including:

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

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

59. The apparatus of claim 56, further including:

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

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

60. The apparatus of any one of claims 56 to 59, wherein the means for receiving the request message includes means for receiving the request message to add the content flow, wherein the content flow includes a non real-time media clip.

61. The apparatus of any one of claims 56 to 60, wherein the means for receiving the content flow includes means for receiving the content flow over a bearer channel.

62. The apparatus of any one of claims 56 to 61, further including means for broadcasting the content flow over the wireless access network.

63. The apparatus of claim 56, wherein the means for transmitting includes transmitting a negative response message indicating that the content flow will not be added to the wireless access network, wherein the negative response message includes one or more acceptable parameters.

64. A computer-readable media including instructions, which when executed by processing logic, operate to transport a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the computer-readable media including:

instructions for receiving a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

instructions for transmitting a response message indicating that the content flow will be added to the wireless access network; and

instructions for receiving the content flow at the scheduled delivery time for broadcast to the devices.

65. The computer-readable media of claim 64, further including:

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

instructions for transmitting a second response message indicating that the modification to the content flow will be accepted.

66. The computer-readable media of claim 64, further including:

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

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

67. The computer-readable media of claim 64, further including:

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

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

68. The computer-readable media of any one of claims 64 to 67, wherein the instructions for receiving the request message include instructions for receiving the request message to add the content flow, wherein the content flow includes a non real-time media clip.

69. The computer-readable media of any one of claims 64 to 68, wherein the instructions for receiving the content flow include instructions for receiving the content flow over a bearer channel.

70. The computer-readable media of any one of claims 64 to 69, further including instructions for broadcasting the content flow over the wireless access network.

71. The computer-readable media of claim 64, wherein the instructions for transmitting include instructions for transmitting a negative response message indicating that the content flow will not he

added to the wireless access network, wherein the negative response message includes one or more acceptable parameters.

72. At least one processor configured to implement a method for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the method including:

transmitting a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

receiving a response message indicating that the content flow will be added to the wireless access network;

waiting until the scheduled delivery time; and

delivering the content flow to the wireless access network.

73. At least one processor configured to implement a method for transporting a content flow to a wireless access network for broadcast to devices coupled to the wireless access network, the method including:

receiving a request message to add the content flow to the wireless access network, wherein the request message includes a scheduled delivery time;

transmitting a response message indicating that the content flow will be added to the wireless access network; and

receiving the content flow at the scheduled delivery time for broadcast to the devices.

74. A method as claimed in claim 1, substantially as herein described with reference to the accompanying drawings.

75. An apparatus as claimed in claim 11, substantially as herein described with reference to the accompanying drawings.

76. An apparatus as claimed in claim 20, substantially as herein described with reference to the accompanying drawings.

77. A computer readable media as claimed in claim 30, substantially as herein described with reference to the accompanying drawings.

78. A method as claimed in claim 40, substantially as herein described with reference to the accompanying drawings.

79. An apparatus as claimed in claim 48, substantially as herein described with reference to the accompanying drawings.

80. An apparatus as claimed in claim 56, substantially as herein described with reference to the accompanying drawings.

81. A computer readable media as claimed in claim 64, substantially as herein described with reference to the accompanying drawings.

82. At least one processor as claimed in claim 72, substantially as herein described with reference to the accompanying drawings.

83. At least one processor as claimed in claim 73, substantially as herein described with reference to the accompanying drawings.