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Prajapat et al.(10) **Pub. No.: US 2005/0021626 A1**(43) **Pub. Date: Jan. 27, 2005**(54) **PEER-TO-PEER DYNAMIC WEB PAGE SHARING**(52) **U.S. Cl. 709/205**(75) Inventors: **Surendra Prajapat**, Santa Clara, CA (US); **Michael P. Lepore**, Marlborough, MA (US); **Andrew R. Cleasby**, Newburyport, MA (US)(57) **ABSTRACT**Correspondence Address:
BAKER BOTTS L.L.P.
2001 ROSS AVENUE
SUITE 600
DALLAS, TX 75201-2980 (US)(73) Assignee: **Cisco Technology, Inc.**(21) Appl. No.: **10/444,482**(22) Filed: **May 22, 2003****Publication Classification**(51) **Int. Cl.⁷ G06F 15/16**

According to a particular embodiment of the present invention, a communication system includes a first browser operable to submit requests for one or more web pages and a request to share the one or more requested web pages with another browser, the request to share specifying the other browser. The communication system also includes a web media server operable, in response to the request to share, to: (1) establish a communication session with the first browser; (2) establish a media session and a signaling session with a remote web media server, the remote web media server being associated with the other browser that the first browser specified in the request to share, the signaling session including a standard signaling protocol; (3) receive web page information from the first browser; and (4) communicate shared web page information to the remote web media server using the media session.

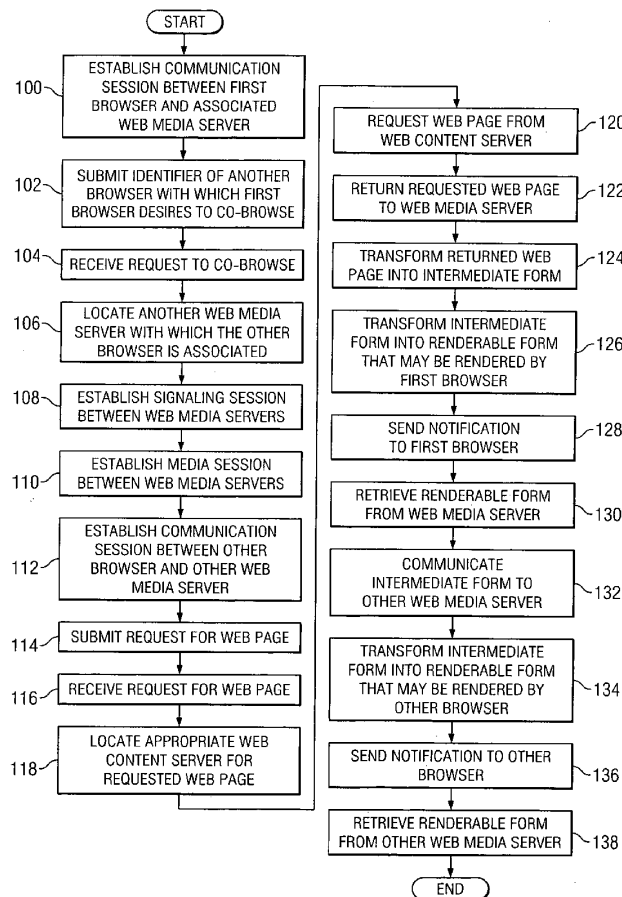


FIG. 1

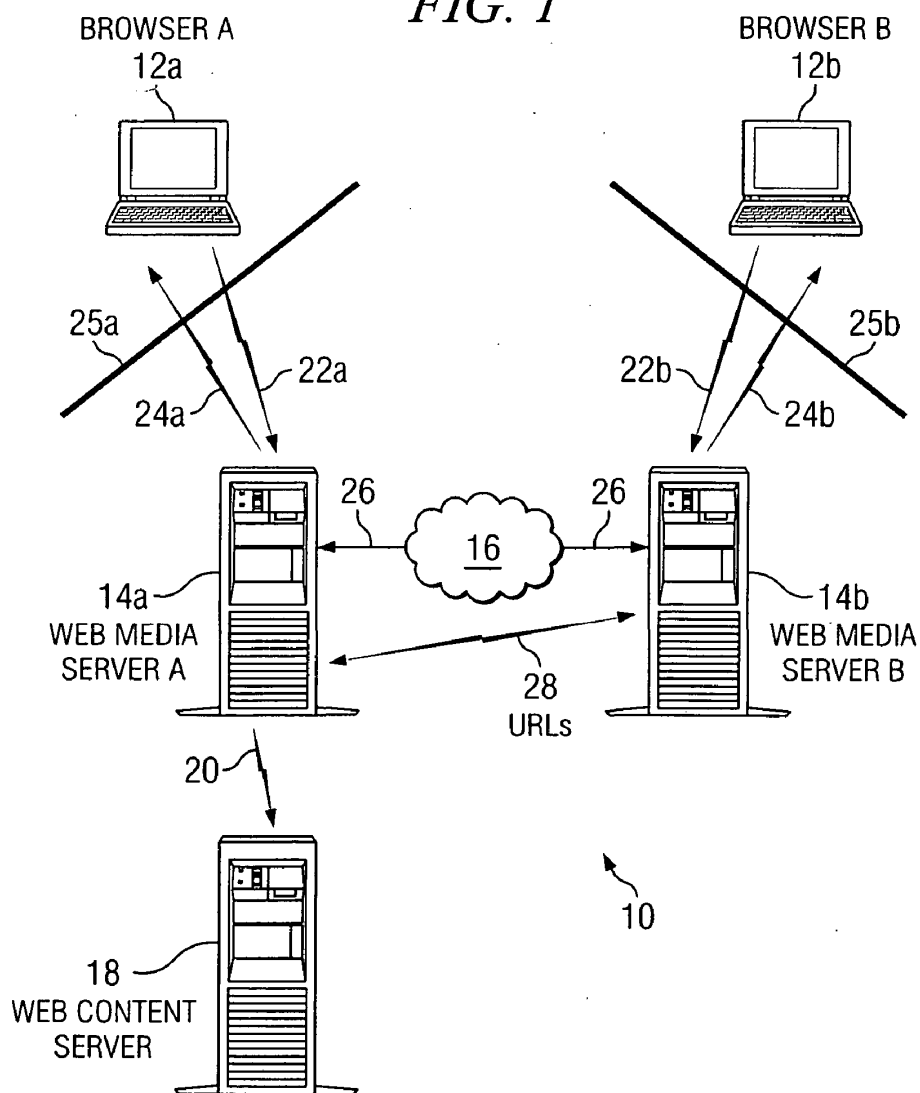
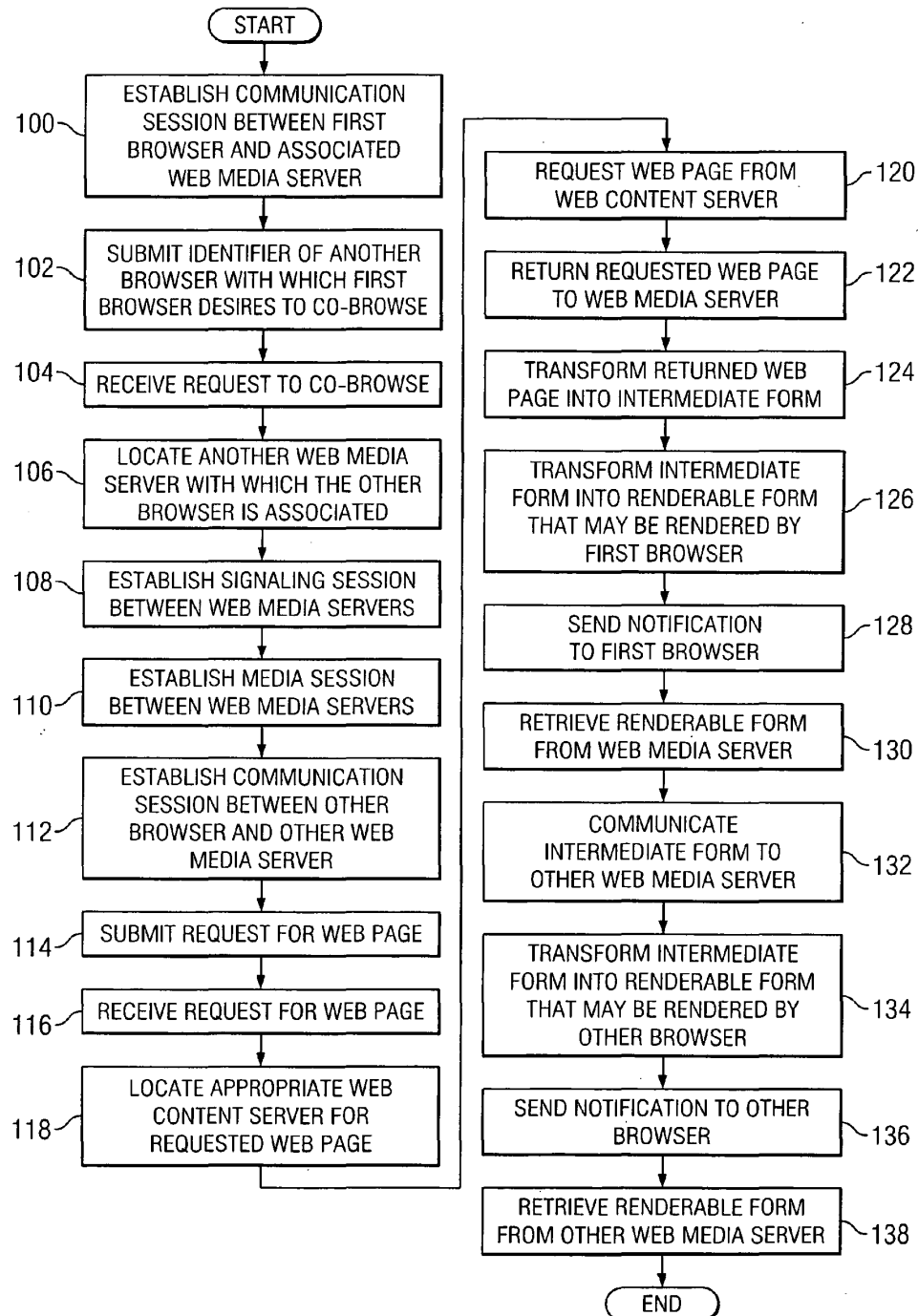
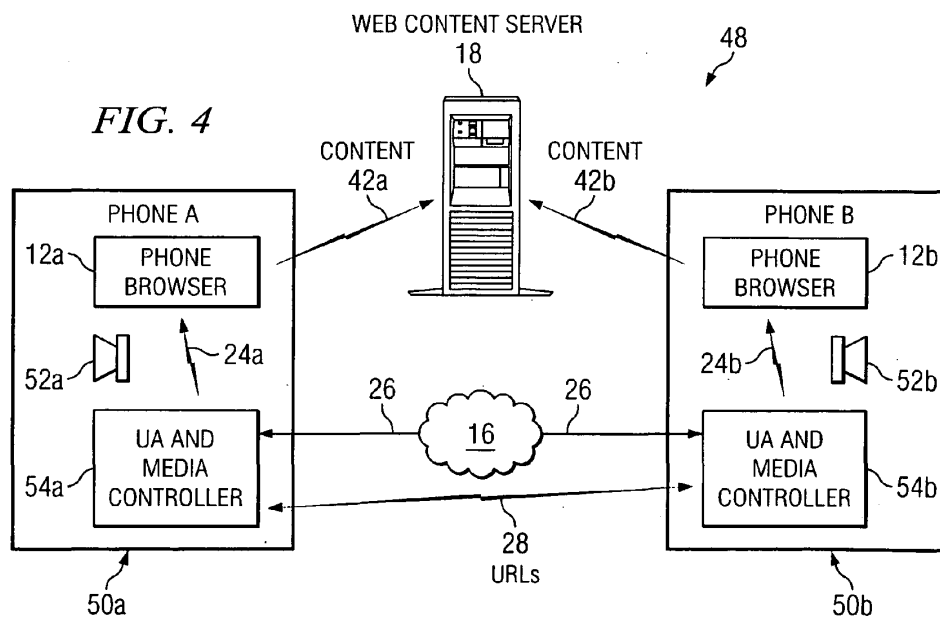
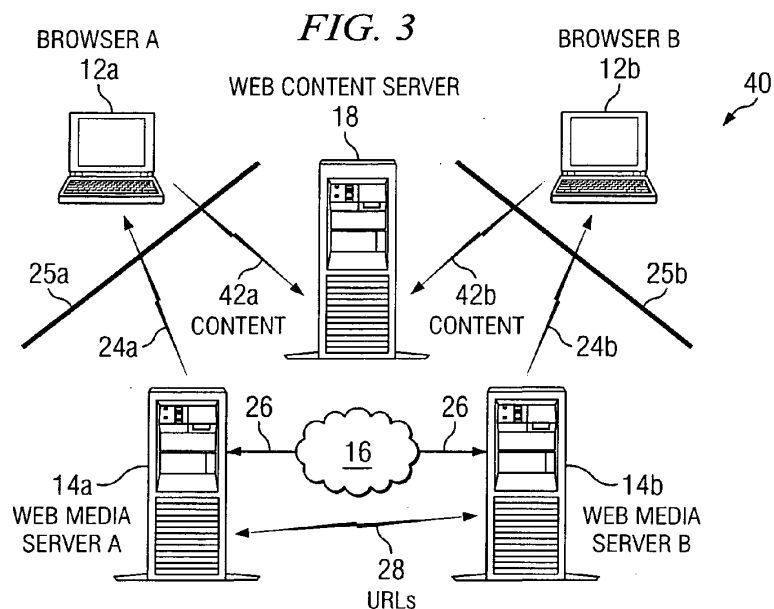


FIG. 2





PEER-TO-PEER DYNAMIC WEB PAGE SHARING

TECHNICAL FIELD OF THE INVENTION

[0001] This invention relates in general to communication sessions, and more particularly to peer-to-peer web page sharing.

BACKGROUND OF THE INVENTION

[0002] A communication session frequently includes providing a user access to one or more web pages. A user may desire to share those web pages with one or more other users such that the users are viewing at least portions of the same web page. For example, in a call center environment, a user calling into the call center may desire to view the same web pages as a customer service representative or an automated attendant associated with the call center.

SUMMARY OF THE INVENTION

[0003] In accordance with the present invention, techniques for sharing web pages are provided.

[0004] According to a particular embodiment of the present invention, a communication system includes a first browser operable to submit requests for one or more web pages and a request to share the one or more requested web pages with another browser, the request to share specifying the other browser. The communication system also includes a web media server operable, in response to the request to share, to: (1) establish a communication session with the first browser; (2) establish a media session and a signaling session with a remote web media server, the remote web media server being associated with the other browser that the first browser specified in the request to share, the signaling session including a standard signaling protocol; (3) receive web page information from the first browser; and (4) communicate shared web page information to the remote web media server using the media session.

[0005] Particular embodiments of the present invention may provide one or more technical advantages. For example, certain embodiments may provide peer-to-peer web page sharing using multiple web media servers. This may improve efficiency in a communication system when sharing web pages. For example, in certain embodiments, processing may be split between the web media servers, which may provide better scalability. In certain embodiments, peer-to-peer dynamic web page sharing may be possible. In certain embodiments, a standard signaling protocol may be used to provide a signaling session between web media servers. In certain embodiments, this may allow one or more other devices or functions to be used that support the standard signaling protocol. For example, in certain embodiments, because a standard signaling protocol such as SIP is being used to provide peer-to-peer web page sharing, a single call may be placed using the standard signaling protocol, and multiple devices may be able to participate in the call, exchanging multiple types of media.

[0006] Other technical advantages of the present invention will be readily apparent to one skilled in the art in the following figures, descriptions, and claims. Moreover, while specific advantages have been enumerated above, various embodiments may include all, some, or none of the enumerated advantages.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] For a more complete understanding of the present invention and its advantages, reference is now made to the following description, taken in conjunction with the accompanying drawings, in which:

[0008] FIG. 1 illustrates an example communication system operable to provide peer-to-peer dynamic web page sharing;

[0009] FIG. 2 illustrates an example method for peer-to-peer dynamic web page sharing;

[0010] FIG. 3 illustrates an example communication system operable to provide peer-to-peer simple web page sharing; and

[0011] FIG. 4 illustrates an example communication system operable to provide peer-to-peer web page sharing using at least two phones.

DESCRIPTION OF EXAMPLE EMBODIMENTS

[0012] FIG. 1 illustrates an example communication system 10 operable to provide peer-to-peer dynamic web page sharing. Communication system 10 includes browsers 12, web media servers 14a and 14b coupled via network 16, and web content server 18 coupled to web media server 14a via link 20. In general, web media servers 14 allow browser 12a to co-browse one or more web pages with browser 12b. The term "co-browse" may include one or more of the following situations: browser 12a and browser 12b display the same web pages at substantially the same time; browser 12a may alter web pages and browser 12b may view those alterations; browser 12b may alter web pages and browser 12a may view those alterations; or any other suitable situations. In one embodiment, system 10 is implemented to enable co-browsing in a call center environment such as a customer service environment. It should be understood, however, that system 10 may be implemented in any suitable environment where co-browsing may be desired.

[0013] While system 10 is illustrated as including particular elements in a specific configuration, the functionalities of these elements may be combined, separated, and/or rearranged as appropriate. Moreover, the operations of some or all of these elements may be implemented by logic encoded in media.

[0014] Browsers 12, web media servers 14, and web content server 18 may each comprise an appropriate combination of hardware and software associated with one or more computers at one or more locations. These components of system 10 may share data storage, communications, or other resources according to particular needs. For example, functionality described in connection with browser 12a, web media server 14a, and web content server 18 may be provided using a single computer system or other device, which in a particular embodiment might include a single server system. Furthermore, functionality described in connection with browsers 12, web media servers 14, and web content server 18 may be provided using any suitable software components. Each computer system may include one or more suitable input devices, output devices, mass storage media, processors, memory, or other components for receiving, processing, storing, and communicating information according to the operation of system 10. In a distributed

embodiment of system 10, particular components of system 10 may be communicatively coupled to one another using one or more local area networks (LANs), metropolitan area networks (MANs), wide area networks (WANs), a global computer network such as the Internet, or any other wireline, optical, wireless, or other links.

[0015] Browsers 12 may include any suitable interface for submitting requests for and displaying media such as web pages. For example, browsers 12 may be associated with any device, application, hardware, and/or software for displaying one or more types of media. Browsers 12 may include analog, digital, or Internet protocol (IP) telephones, personal computers, video-conferencing equipment, wireless communication devices, personal digital assistants (PDAs), software applications, or any other suitable device or application. Furthermore, browsers 12 may be compatible with any suitable operating system according to particular needs. Reference to a browser 12 is meant to include reference to a user of browser 12, reference to a device including browser 12, reference to a user interface of browser 12, or any other suitable references as appropriate. A user of browser 12 may include a computer program or other suitable software for automatically communicating with one or more other users of other browsers 12.

[0016] A user associated with browser 12a may desire to view one or more web pages. The user associated with browser 12a may also desire to co-browse or share the one or more web pages or other web content with another user associated browser 12b. Although only one browser 12b is illustrated and described, the present invention contemplates browser 12a sharing web pages with any number of other browsers 12 (i.e. browser 12b, browser 12c, browser 12d, and so on). To begin a co-browsing session, the user of browser 12a may need to establish a communication session with an associated web media server 14a. For example, the user of browser 12a may click on a desktop icon associated with browser 12a to establish a communication session with web media server 14a. In another embodiment, browser 12a may already have an established communication session with web media server 14a. In certain embodiments, the communication session between browser 12a and web media server 14a includes an outgoing channel 30a and an incoming channel 32a. Outgoing channel 30a may include a hypertext transfer protocol (HTTP) channel or any other suitable type of channel. Incoming channel 32a may include a LongPoll event channel such as that described in U.S. patent application Ser. No. 08/352,764 entitled "_____" and filed _____ with the U.S. Patent and Trademark Office, or any other suitable type of channel. For example, browser 14a may submit requests for web pages and other web content using outgoing channel 30a and web media server 14a may communicate notifications and other information to browser 14a using incoming channel 32a. In one embodiment, the communication session between browser 12a and web media server 14a may be established over a firewall or other security measure 25a. Outgoing channels 30 and incoming channels 32 may not necessarily include "always on" links. For example, in certain embodiments, outgoing channels 30 and incoming channels 32 are established for intermittent communications such as packets.

[0017] In a request to co-browse or otherwise, browser 12a may specify one or more names or other identifiers of other browsers 12 with which browser 12a desires to co-

browse. For example, a user of browser 12a may submit a request to co-browse with chachi@happydaycompany.com who is associated with browser 12b. Browser 12a may also submit requests for one or more web pages, for example by requesting a particular web site, to web media server 14a. The request for a web page may specify the web page to retrieve and display, as well as any other suitable information. For example, the request for the web page may include information that may be required to properly render the web page on browser 12a, such as session information, cookies, parameters to send to web content server 18, and any other suitable information.

[0018] Web media servers 14 may include any server, processor, computer, or other suitable component for communicating with browsers 12 and for communicating with each other. Web media servers 14 may communicate with other web media servers using network 16. In a particular embodiment, web media servers 14 are equipped to negotiate communication sessions with other web media servers 14 using session initiated protocol (SIP) or any other suitable standard signaling protocol. For example, web media servers 14 may be equipped to use a network 16 that includes a preexisting SIP network. Although web media servers 14 may use any suitable standard signaling protocol to perform their associated functionalities, this description focuses on an embodiment in which web media servers 14 are SIP-enabled endpoints and communicate using a preexisting SIP network 16. It should be understood, however, that any suitable standard signaling protocol such as media gateway control protocol (MGCP) or H.323 may be used without departing from the scope of the present invention.

[0019] In response to a request to co-browse from browser 12a, web media server 14a may participate in the establishment of the communication session between web media server 14a and browser 12a. For example, web media server 14a may participate in the establishment of outgoing channel 30a and incoming channel 32a with browser 12a. Web media server 14a may be operable to receive one or more names or other identifiers of other browsers 12 with which browser 12a desires to co-browse. For example, browser 12a may request to co-browse one or more web pages with browser 12b. Web media server 14a may locate the web media server 14b associated with browser 12b. This may be done in any suitable manner. In one embodiment in which web media servers 14 are SIP endpoints, web media server 14a may locate web media server 14b using presence functionality of SIP network 16 such as SIP softswitch, for example. In one embodiment, web media servers 14 are already registered with SIP network 16. Web media server 14a may establish a signaling session 26 with web media server 14b using network 16. In an embodiment in which network 16 is a SIP network, signaling session 26 may be a SIP signaling session. In one embodiment, once web media servers 14 have found each other using network 16, the established signaling session 26 is a direct connection between web media servers 14.

[0020] Web media server 14a may also establish a media session 28 with web media server 14b using any suitable means. Media session 28 may allow web media servers 14 to communicate one or more types of media between each other. For example, media session 28 may allow web media servers 14 to communicate one or more web pages between each other. In one embodiment, media session 28 includes a

direct connection between web media servers **14**. It should be understood that any suitable media protocol such as Real-time Transport Protocol (RTP), transport control protocol (TCP), or user datagram protocol (UDP) may be used to provide media session **28**.

[0021] A communication session between web media server **14b** and browser **12b** may be established in any suitable manner. In one embodiment, web media server **14b** contacts browser **12b** to establish the communication session. In another embodiment, a communication session between web media server **14b** and browser **12b** already exists. In another embodiment (as will be discussed below in more detail), a user of browser **12a** and a user of browser **12b** are engaged in a telephone conversation. In this example, the user of browser **12a** may verbally tell the user of browser **12b** to establish a communication session with web media server **14b**. In certain embodiments, the communication session between browser **12b** and web media server **14b** may include an outgoing channel **30b** and an incoming channel **32b**. Outgoing channel **30b** may include a hypertext transfer protocol (HTTP) channel or any other suitable type of channel, and incoming channel **32b** may include a LongPoll event channel or any other suitable type of channel. For example, browser **14b** may submit requests for web pages and other web content using outgoing channel **30b** and web media server **14b** may communicate notifications and other information to browser **14b** using incoming channel **32b**. In one embodiment, the communication session between browser **12b** and web media server **14b** may be established over a firewall or other security measure **25b**.

[0022] Via outgoing channel **30a** or in any other suitable manner, web media server **14a** may receive requests from browser **12a** for one or more web pages. For example, browser **12a** may submit requests for one or more web pages by communicating a request to web media server **14a** for a particular web site using the uniform resource locator (URL) of the web site. As discussed above, the request for a web page may specify the web page to retrieve and display, as well as any other suitable information. For example, the request for the web page may include information that may be required to properly render the web page such as session information, cookies, parameters to send to the web content server **18** associated with the requested web page, or any other suitable information. In one embodiment, web media server **14a** may retrieve any suitable information from browser **12a** using a signed Applet, plugin, or by other suitable means. Web media server **14a** may derive any suitable information regarding browser **12a** during a session with web content server **18**.

[0023] Web media server **14a** may locate the appropriate web content server **18** that includes the web page requested by browser **12a**. For example, browser **12a** may submit a web site address to web media server **14a**, and web media server **14a** may locate web content server **18** using the web site address.

[0024] Web content server **18** may include any suitable server or other computer for storing and communicating web pages. Web content server **18** may return a requested web page to web media server **14a**. Web media server **14a** may transform the returned web page into some intermediate form. In one embodiment, one or more links on the web page may be transformed into references and one or more links to

images on the web page may also be transformed. The details of the transformation may depend on the syntax of the content being served. As merely an example, in an embodiment in which the retrieved web page includes HTML content, one transformation may need to be applied, while in the case of an IP phone display, another transformation may need to be applied.

[0025] Web media server **14a** may transform the intermediate form of the retrieved web page into a renderable form that may be rendered by browser **12a**. In one embodiment, each internal link in the renderable form may point back to a unique location on web media server **14a** rather than web content server **18**. Web media server **14a** may send a notification to browser **12a**, using incoming channel **32a** for example, indicating that the requested web page has been retrieved. In one embodiment, incoming channel **32a** includes a LongPoll event channel and web media server **14a** sends a notification message using the LongPoll event channel to browser **12a**. In one embodiment, browser **12a** may automatically, and without any input from a user associated with browser **12a**, retrieve the renderable form from web media server **14a**. However, the present invention contemplates browser **12a** retrieving the renderable form from web media server **14a** in any suitable manner.

[0026] Web media server **14a** may communicate the intermediate form to web media server **14b**. In one embodiment, web media server **14a** communicates the intermediate form to web media server **14b** using media session **28**. Web media server **14b** may transform the intermediate form of the retrieved web page into a renderable form that may be rendered by browser **12b**. In one embodiment, the renderable form generated by web media server **14b** and the renderable form generated by web media server **14a** are different due, in part, to possible differences in browsers **12a** and **12b**. In one embodiment, each internal link in the renderable form may point back to a unique location on web media server **14b** rather than web content server **18**. Web media server **14b** may send a notification to browser **12b**, using incoming channel **32b** for example, indicating that the requested page has been retrieved. In one embodiment, incoming channel **32b** includes a LongPoll event channel and web media server **14b** sends a notification message using the LongPoll event channel to browser **12b**. In one embodiment, browser **12b** automatically, and without any input from a user associated with browser **12b**, retrieve the renderable form from web media server **14b**. However, the present invention contemplates browser **12b** retrieving the renderable form from web media server **14b** in any suitable manner.

[0027] Thus, in certain embodiments web media servers **14a** and **14b** may have the same intermediate form of the web page and browsers **12a** and **12b** may display the same web page. In one embodiment, web media servers **14a** and **14b** may communicate information about the status of all transactions between them, and possibly forward the information about the status to browsers **12**. For example, browser **12a** may receive a message when browser **12b** finishes loading a requested web page. Web media servers **14a** may also be operable to disable one or more links of the web page such that browser **12b** may not be able to display those links. For example, web media server **14a** may disable one or more links in the intermediate form of the web page before sending the intermediate form of the web page to web

media server 14b. As merely an example, a user of browser 12a may include a caller to a customer service call center, and the user of browser 12b may include a customer service representative or an automated assistant associated with the call center. The user of browser 12b may be assisting the user of browser 12a with making a purchase on a web site. As the user associated with browser 12a (the caller to the call center) enters credit card information to complete a purchase, web media server 14a may prevent that information from being displayed by browser 12b. In certain embodiments, any web media server 14 associated with system 10 may be operable to disable one or more links of the web page such that other browser 12 (i.e. those not associated with the web browser 14 performing the disabling) may not be able to display those links.

[0028] In certain embodiments, either browser 12a or browser 12b may submit new action requests such as requests for web pages, requests to alter currently displayed web pages, or perform any other suitable actions according to particular needs. As an example, browser 12a may desire to perform a new action such as posting a form or clicking on a link within the current displayed web page. Browser 12a may contact web media server 14a based on, for example, the fact that links in the displayed web page have been transformed to references. Web media server 14a may register the new action request from browser 12a and may perform any suitable action. For example, web media server 14a may contact web content server 18 to retrieve another web page.

[0029] As another example, browser 12b may desire to perform a new action such as posting a form or clicking on a link with the current displayed web page. Browser 12b may contact web media server 14b based on, for example, the fact that links in the displayed web page have been transformed to references. Web media server 14b may receive the new action request and forward the new action request, including any appropriate data, in a message to web media server 14a. Web media server 14a may perform any appropriate action based on the forwarded message received from web media server 14b. For example, web media server 14a may contact web content server 18 to retrieve another web page. In certain embodiments, web media server 14a may reject the new action request forwarded by web media server 14b. This may be based on, for example, various business rules or other factors relevant to particular implementations of the present invention. An error message may be generated when web media server 14a rejects a new action request forwarded by web media server 14b, such as a "no-op" or other suitable message.

[0030] In certain embodiments, browsers 12 may be rendering multiple pages at the same time, using frames, iframes, or any other suitable techniques. It may be possible to represent the rendering of multiple pages at the same time as a content tree. The web media server 14 associated with each browser 12 may maintain this content tree. In one embodiment, the web media server 14 associated with each browser 12 maintains and preserves the content tree only while a given web page is being rendered. As the content tree in an associated browser 12 changes, changes to the content tree may be propagated back to the web media server 14 associated with the browser 12 to facilitate maintenance of an accurate reflection of the content tree of the browser 12. As an example, changes to the content tree in browser 12a

may then be synchronized with other browsers 12 in a web page sharing session. As a content tree associated with a browser 12 is updated on the web media server 14 associated with the browser 12, multiple page load events may be generated from the web media server 14 to the browser 12 to cause full content synchronization.

[0031] In certain embodiments, web page form content, such as fields in web page forms for example, are kept in sync on web pages in browsers 12 involved in a web page sharing session by using JavaScript or other suitable events. As an example, at appropriate times when data in a web page form field changes, a JavaScript or other suitable event may be triggered to send a command to the appropriate web media server 14. If web media server 14b receives the command, for example, it may then be forwarded to web media server 14a. Web media server 14a may then send the updated metadata to web media server 14b, and events may be generated to the browsers 12 to update the web page form content if necessary (i.e. the originating browser 12 may not need the event).

[0032] In certain embodiments, JavaScript events, such as onMouseOver events for example, may be kept in sync on the browsers 12 in a substantially similar manner. The JavaScript in the web pages rendered to browsers 12 may be modified so that in addition to performing the regular action, the respective web media server 14 may be notified. This may then be handled similarly to other events received by a web media server 14.

[0033] Particular embodiments of the present invention may provide one or more technical advantages. For example, certain embodiments provide peer-to-peer web page sharing using multiple web media servers 14. This may improve efficiency in communication system 10 when sharing web pages. For example, in certain embodiments, processing is split between web media servers 14, which may provide better scalability. In certain embodiments, peer-to-peer dynamic web page sharing may be possible. In certain embodiments, a standard signaling protocol may be used to provide signaling session 26 between web media servers 14. In certain embodiments, this allows one or more other devices or functions to be used that support the standard signaling protocol. For example, in certain embodiments, because a standard signaling protocol such as SIP is being used to provide peer-to-peer web page sharing, a single call may be placed using the standard signaling protocol, and multiple devices may be able to participate in the call, exchanging multiple types of media.

[0034] FIG. 2 illustrates an example method for peer-to-peer dynamic web page sharing. At step 100, browser 12a establishes a communication session with its associated web media server 14a. This may include clicking on an icon on a desktop of browser 12a to initiate page sharing. However, in certain embodiments, browser 12a may be registered with web media server 14a without actually sharing web pages with another browser 12. In certain embodiments, the communication session between browser 12a and web media server 14a includes outgoing channel 30a and incoming channel 32a. Browser 14a may submit requests for web pages and other web content using outgoing channel 30a and web media server 14a may communicate notifications and other information to browser 12a using incoming channel 32a. At step 102, browser 12a submits to web media server

14a one or more names or other identifiers of other browsers **12** with which browser **12a** desires to co-browse. For example, browser **12a** may submit a request to co-browse with chachi@happydaycompany.com. For purposes of this description, it will be assumed that the browser **12** with which browser **12a** desires to share is browser **12b**; however, as discussed above, browser **12a** may share with any suitable number of other browsers **12** according to particular needs.

[0035] At step **104**, web media server **14a** receives the request to co-browse with chachi@happydaycompany.com. At step **106**, web media server **14a** may locate another web media server **14b** with which browser **12b** is associated, possibly using the email address or other identifier provided by browser **12a**. In an embodiment in which web media servers **14** are equipped to establish a communication session with other web media servers **14** using a standard signaling protocol (e.g., SIP), web media server **14a** may locate web media server **14b** using standard, pre-existing functionality, such as presence functionality or a SIP registrar/location function. At step **108**, web media server **14a** may establish signaling session **26** with web media server **14b**. In one embodiment, signaling session **26** includes a SIP signaling session. At step **110**, web media server **14a** establishes media session **28** with web media server **14b**. At step **112**, a communication session is established between web media server **14b** and browser **12b**. In certain embodiments, the communication session between browser **12b** and web media server **14b** includes an outgoing channel **30b** and an incoming channel **32b**. Outgoing channel **30b** may include an HTTP channel or any other suitable type of channel, and incoming channel **32b** may include a LongPoll event channel or any other suitable type of channel. For example, browser **14b** may submit requests for web pages and other web content using outgoing channel **30b** and web media server **14b** may communicate notifications and other information to browser **14b** using incoming channel **32b**.

[0036] At step **114**, browser **12a** may submit a request using outgoing channel **30a** for a web page, for example by requesting a particular web site, to web media server **14a**. The request for a web page may specify the web page to retrieve and display, as well as any other suitable information. For example, the request for the web page may include information that may be required to properly render the web page on browser **12a**, such as session information, cookies, parameters to send to web content server **18**, and any other suitable information. At step **116**, via outgoing channel **30a** or in any other suitable manner, web media server **14a** may receive the request from browser **12a** for the web page. In one embodiment, web media server **14a** may retrieve any suitable information from browser **14a** using a signed applet, plugin, or by other suitable means. Web media server **14a** may derive any suitable information regarding browser **14a** during a session with web content server **18**.

[0037] At step **118**, web media server **14a** may locate the appropriate web content server **18** that includes the web page requested by browser **12a**. For example, browser **12a** may submit a web site address to web media server **14a**, and web media server **14a** may locate web content server **18** using the web site address. At step **120**, web media server **14a** may request from web content server **18** the web page requested by browser **12a**. Web content server **18** may return a requested web page to web media server **14a** at step **130**. At step **132**, web media server **14a** may transform the

returned web page into some intermediate form. In one embodiment, one or more links on the web page may be transformed into references and one or more links to images may also be transformed. The details of the transformation may depend on the syntax of the content being served. As merely an example, in an embodiment in which the retrieved web page includes HTML content, one transformation may need to be applied, while in the case of an IP phone display, another transformation may need to be applied.

[0038] At step **126**, web media server **14a** may transform the intermediate form of the retrieved web page into a renderable form that may be rendered by browser **12a**. In one embodiment, each internal link in the renderable form may point back to a unique location on web media server **14a**, not web content server **18**. At step **128**, web media server **14a** may send a notification to browser **12a**, using incoming channel **32a** for example, indicating that the requested page has been retrieved. In one embodiment, incoming channel **32a** includes a LongPoll event channel and web media server **14a** sends a notification message using the LongPoll event channel to browser **12a**. At step **130**, browser **12a** retrieves the renderable form of the web page from web media server **14a**. In one embodiment, browser **12a** may automatically, and without any input from a user associated with browser **12a**, retrieve the renderable form from web media server **14a**. However, the present invention contemplates browser **12a** retrieving the renderable form from web media server **14a** in any suitable manner.

[0039] At step **132**, web media server **14a** may communicate the intermediate form to web media server **14b**. In one embodiment, web media server **14a** communicates the intermediate form to web media server **14b** using media session **28**. At step **134**, web media server **14b** may transform the intermediate form of the retrieved web page into a renderable form that may be rendered by browser **12b**. In one embodiment, the renderable form generated by web media server **14b** and the renderable form generated by web media server **14a** are different due, in part, to possible differences in browsers **12a** and **12b**. In one embodiment, each internal link in the renderable form may point back to a unique location on web media server **14b**, not web content server **18**. At step **136**, web media server **14b** may send a notification to browser **12b**, using incoming channel **32b** for example, indicating that the requested page has been retrieved. In one embodiment, incoming channel **32b** includes a LongPoll event channel and web media server **14b** sends a notification message using the LongPoll event channel to browser **12b**. At step **138**, browser **12b** retrieves the renderable form of the web page from web media server **14b**. In one embodiment, browser **12b** automatically, and without any input from a user associated with browser **12b**, retrieve the renderable form from web media server **14b**. However, the present invention contemplates browser **12b** retrieving the renderable form from web media server **14b** in any suitable manner.

[0040] While the steps of the method are described as sequential, those skilled in the art will understand that in certain embodiments, these steps may be occurring substantially simultaneously or in different orders than shown during execution of the method. Moreover, browsers **12**, web media servers **14**, and web content server **18** may use methods with additional steps, fewer steps, and/or different

steps, so long as the methods remain appropriate, and the steps of the methods may be repeated according to particular needs. For example, browser 12a and/or web media server 14a may disable one or more links in a web page before communicating the intermediate form to web media server 14b. Furthermore, certain steps of the method may occur substantially continuously, as long as a web page sharing session is ongoing between browser 12a and browser 12b. For example, browser 12a, browser 12b, or both may submit requests for new web pages, requests to alter currently displayed web pages, or perform any other suitable actions according to particular needs.

[0041] FIG. 3 illustrates an example communication system 40 operable to provide peer-to-peer simple web page sharing. System 40 includes browsers 12, web media servers 14, and web content server 18. In certain embodiments, system 40 includes firewalls or other security measures 25. In operation of system 40, browser 12a may request a web page sharing session with one or more other browsers 12 (in this example, browser 12b) and may submit this request to web media server 14a. Web media server 14a may locate the web media server associated with browser 12b in a substantially similar manner to that described above with reference to FIGS. 1 and 2. In one embodiment in which web media servers 14 are SIP endpoints, web media server 14a may locate web media server 14b using presence functionality or a SIP registrar/location function of SIP network 16 such as SIP softswitch, for example. In one embodiment, web media servers 14 are already registered with SIP network 16. Web media server 14a may establish a signaling session 26 with web media server 14b using network 16. In an embodiment in which network 16 is a SIP network, signaling session 26 may be a SIP signaling session. In one embodiment, once web media servers 14 have found each other using network 16, the established signaling session 26 is a direct connection between web media servers 14.

[0042] Web media server 14a may also establish a media session 28 with web media server 14b using any suitable means. Media session 28 may allow web media servers 14 to communicate one or more types of media between each other. For example, media session 28 may allow web media servers 14 to communicate one or more URLs between each other. In one embodiment, media session 28 includes a direct connection between web media servers 14.

[0043] Browser 12a may submit a request to web content server 18 for one or more web pages using link 42a, for example. Links 42 may include an HTTP link or any other suitable type of link. The request may be submitted in any suitable format such as HTTP. Web content server 18 may return the requested web page to browser 12a. Browser 12a may communicate the URL or other suitable information regarding the requested web page to web media server 14a. Web media server 14a may communicate the URL and any other suitable information to web media server 14b, using media session 28 for example. Web media server 14b may communicate the URL and any other suitable information to browser 12b. Browser 12b may use the URL and any other suitable information to request from web content server 18 the web page that browser 12a requested.

[0044] FIG. 4 illustrates an example communication system 48 operable to provide peer-to-peer web page sharing using at least two phones 50. Although phones 50 are

described, any suitable device may be used in place of a phone 50, such as a computer or computer/phone combination for example. In one embodiment, phones 50 include SIP phones. Phones 50 may each include a browser 12, a speaker 52, and a user agent (UA) and media controller 54. The SIP term "user agent" refers to an endpoint such as phone 50a handling SIP call signaling and a particular media type (e.g., voice, data, web pages, etc.). In certain embodiments, UA and media controllers 54 may perform certain functions substantially similar to web media servers 14 described above. The UA portion of UA and web media servers 52 may allow phone 50 to handle both voice and web pages or other media. Although UA and media controllers 54 are illustrated as being packaged together, UA and media controllers 54 may be packaged separately according to particular needs.

[0045] In operation, a user of phone 50a may make a telephone call to a user of phone 50b and may include in the phone call a request to share web pages. The request to share web pages may be made using UA and media controller 54a. For purposes of web page sharing, UA and media controller 54a may locate UA and media controller 54b in substantially the same manner as described above with reference to FIGS. 1, 2, and 3. For example, UA and media controllers 54 may use a standard signaling protocol such as SIP and may use one or more functions associated with the standard signaling protocol to locate each other.

[0046] In the illustrated embodiment, a user of phone 50a may request one or more web pages from web content server 18 using phone browser 12a and link 42. Link 42 may include an HTTP link or any other suitable type of link. Phone 50a may request the one or more web pages using the URL of the web pages for example. Browser 12a may communicate the URL and any other suitable information to UA and media controller 54a, which may communicate the URL and any other suitable information to UA and media controller 54b using media session 28. UA and media controller 54b may communicate a notification to phone browser 12b, using incoming channel 32b for example, and phone browser 12b may retrieve the URL from UA and media controller 54b. Phone browser 12b may use the URL to request the web page from web content server 18. In one embodiment, the users of browsers 12 may continue to engage in a voice session during the web page sharing session.

[0047] Although the illustrated embodiment depicts browsers 12 retrieving web pages from web content server 18, system 48 may be constructed such that UA and web media controller 54a is operable to retrieve web pages from web content server 18. In this example, web pages may be shared in a substantially similar manner to that described above with reference to FIGS. 1 and 2.

[0048] In one embodiment, UA and media controllers 54 may be packaged separately such that a user of phone 50a may also share web pages using an associated computer or other device. In this embodiment, voice media may be exchanged using phones 50 and web page media may be exchanged using the computers or other devices. This embodiment may be constructed using a composite controller, discussed in more detail in U.S. patent application Ser. No. 10/334,546 entitled "Composite Controller for Multimedia Sessions" and filed Dec. 30, 2002 with the U.S. Patent and Trademark Office. In certain embodiments, because a

standard signaling protocol such as SIP is being used to provide peer-to-peer web page sharing, a single call may be placed using the standard signaling protocol, and multiple devices may be able to participate in the call, exchanging multiple types of media. For example, this embodiment may allow an interactive voice response (IVR) session to include an interactive content response (ICR) session.

[0049] Although the present invention has been described in several embodiments, a myriad of changes and modifications may be suggested to one skilled in the art, and it is intended that the present invention encompass such changes and modifications as fall within the scope of the present appended claims.

What is claimed is:

1. A communication system comprising:

a first browser operable to submit requests for one or more web pages and a request to share the one or more requested web pages with another browser, the request to share specifying the other browser; and

a web media server operable, in response to the request to share, to:

establish a communication session with the first browser;

establish a media session and a signaling session with a remote web media server, the remote media server being associated with the other browser that the first browser specified in the request to share, the signaling session comprising a standard signaling protocol;

receive web page information from the first media browser; and

communicate shared web page information to the remote web media server using the media session.

2. The system of claim 1, wherein the web page information and the shared web page information each comprise a uniform resource locator (URL) of the web page.

3. The system of claim 2, wherein the first browser is operable to retrieve the requested web page from a web content server associated with the requested web page using the URL of the web page.

4. The system of claim 2, wherein the web page information comprises a URL of the web page and the web media server is further operable to:

using the web page information, retrieve the requested web page from a web content server associated with the requested web page;

communicate a notification to the first browser indicating that the requested web page has been retrieved, the first browser further operable to request the retrieved web page in response to the notification; and

communicate the requested web page to each of the one or more remote media servers, the shared web page information comprising the requested web page.

5. The system of claim 4, wherein the web media server is further operable to transform the requested web page retrieved from the web content server into an intermediate form by transforming one or more links of the retrieved web page into references, the shared web page information comprising the intermediate form.

6. The system of claim 4, wherein the web media server is operable to, in response to the first browser's request for the retrieved web page in response to the notification, communicate a renderable form of the web page to the first browser, the renderable form comprising a form of the web page that is renderable by the first browser.

7. The system of claim 1, wherein the shared web page information is sufficient to enable the remote web media server to generate a renderable form of the web page that is renderable by the other browser.

8. The system of claim 1, wherein the web media server is operable to:

receive a new action request from the first browser, the new action request comprising a request to perform a new action;

perform the new action; and

provide a result to the first browser and new shared web page information to the remote web media server.

9. The system of claim 8, wherein the new action request comprises a request for a new web page, the new action being retrieving the new web page, and the web media server is further operable to:

retrieve the new web page from the web content server; and

transform the requested new web page into an new intermediate form by transforming one or more links of the retrieved new web page into references, the new shared web page information comprising the new intermediate form.

10. The system of claim 1, wherein the communication session between the first browser and the web media server comprises:

a first communication protocol for communication from the first browser to the web media server; and

a second communication protocol for communication from the web media server to the first browser.

11. The system of claim 10, wherein:

the first communication protocol comprises hypertext transfer protocol (HTTP); and

the second communication protocol comprises a LongPoll event channel.

12. The system of claim 1, wherein the standard signaling protocol comprises at least one of:

session initiation protocol (SIP);

media gateway control protocol (MGCP); and

H.323.

13. The system of claim 1, wherein the media session uses a web media protocol comprising at least one of:

real-time transport protocol (RTP);

transport control protocol (TCP); and

user datagram protocol (UDP).

14. The system of claim 1, wherein the web media server uses standard functionality provided by the signaling session of the standard signaling protocol to locate the remote web media server.

15. A method for peer-to-peer web page sharing, comprising:

submitting requests for one or more web pages from a first browser;

submitting, from the first browser, a request to share the one or more requested web pages with another browser, the request to share specifying the other browser;

at a web media server and in response to the request to share:

establishing a communication session with the first browser;

establishing a media session and a signaling session with a remote web media server, the remote web media server being associated with the other browser that the first browser specified in the request to share, the signaling session comprising a standard signaling protocol;

receiving web page information from the first browser; and

communicating shared web page information to the remote web media server using the media session.

16. The method of claim 15, wherein the web page information and the shared web page information each comprise a uniform resource locator (URL) of the web page.

17. The method of claim 16, further comprising retrieving, using the first browser, the requested web page from a web content server associated with the requested web page using the URL of the web page.

18. The method of claim 16, wherein the web page information comprises a URL of the web page, the method further comprising:

retrieving the requested web page from a web content server associated with the requested web page using the web page information;

communicating a notification to the first browser indicating that the requested web page has been retrieved, the first browser requesting the retrieved web page in response to the notification; and

communicating the requested web page to each of the one or more remote media servers, the shared web page information comprising the requested web page.

19. The method of claim 18, further comprising transforming the requested web page retrieved from the web content server into an intermediate form by transforming one or more links of the retrieved web page into references, the shared web page information comprising the intermediate form.

20. The method of claim 18, further comprising, in response to the first browser's request for the retrieved web page in response to the notification, communicating a renderable form of the web page to the first browser, the renderable form comprising a form of the web page that is renderable by the first browser.

21. The method of claim 15, wherein the shared web page information is sufficient to enable the remote web media server to generate a renderable form of the web page that is renderable by the other browser.

22. The method of claim 15, further comprising, at the web media server:

receiving a new action request from the first browser, the new action request comprising a request to perform a new action;

performing the new action; and

providing a result to the first browser and new shared web page information to the remote web media server.

23. The method of claim 22, wherein the new action request comprises a request for a new web page, the new action being retrieving the new web page, the method comprising, at the web media server:

retrieving the new web page from the web content server; and

transforming the requested new web page into an new intermediate form by transforming one or more links of the retrieved new web page into references, the new shared web page information comprising the new intermediate form.

24. The method of claim 15, wherein the communication session comprises:

a first communication protocol for communication from the first browser; and

a second communication protocol for communication to the first browser.

25. The method of claim 24, wherein:

the first communication protocol comprises hypertext transfer protocol (HTTP); and

the second communication protocol comprises a LongPoll event channel.

26. The method of claim 15, wherein the standard signaling protocol comprises at least one of:

session initiation protocol (SIP);

media gateway control protocol (MGCP); and

H.323.

27. The method of claim 15, wherein the media session uses a web media protocol comprising at least one of:

real-time transport protocol (RTP);

transport control protocol (TCP); and

user datagram protocol (UDP).

28. The method of claim 15, further comprising locating the remote web media server using standard functionality provided by the signaling session of the standard signaling protocol.

29. Logic embodied in a computer readable medium operable to:

submit requests for one or more web pages from a first browser;

submit, from the first browser, a request to share the one or more requested web pages with another browser, the request to share specifying the other browser;

in response to the request to share:

establish a communication session with the first browser;

establish a media session and a signaling session with a remote web media server, the remote web media server being associated with the other browser that

the first browser specified in the request to share, the signaling session comprising a standard signaling protocol;

receive web page information from the first browser; and

communicate shared web page information to the remote web media server using the media session.

30. The logic of claim 29, wherein the web page information and the shared web page information each comprise a uniform resource locator (URL) of the web page.

31. The logic of claim 30, further operable to retrieve the requested web page from a web content server associated with the requested web page using the URL of the web page.

32. The logic of claim 30, wherein the web page information comprises a URL of the web page, the logic further operable to:

using the web page information, retrieve the requested web page from a web content server associated with the requested web page;

communicate a notification to the first browser indicating that the requested web page has been retrieved, the first browser further operable to request the retrieved web page in response to the notification; and

communicate the requested web page to each of the one or more remote media servers, the shared web page information comprising the requested web page.

33. The logic of claim 32, further operable to transform the requested web page retrieved from the web content server into an intermediate form by transforming one or more links of the retrieved web page into references, the shared web page information comprising the intermediate form.

34. The logic of claim 32, further operable to, in response to the first browser's request for the retrieved web page in response to the notification, communicate a renderable form of the web page to the first browser, the renderable form comprising a form of the web page that is renderable by the first browser.

35. The logic of claim 29, wherein the shared web page information is sufficient to enable the remote web media server to generate a renderable form of the web page that is renderable by the other browser.

36. The logic of claim 29, further operable to:

receive a new action request from the first browser, the new action request comprising a request to perform a new action;

perform the new action; and

provide a result to the first browser and new shared web page information to the remote web media server.

37. The logic of claim 36, wherein the new action request comprises a request for a new web page, the new action being retrieving the new web page, and the logic is server is further operable to:

retrieve the new web page from the web content server; and

transform the requested new web page into an new intermediate form by transforming one or more links of

the retrieved new web page into references, the new shared web page information comprising the new intermediate form.

38. The logic of claim 29, wherein the communication session comprises:

a first communication protocol for communication from the first browser; and

a second communication protocol for communication from to the first browser.

39. The logic of claim 38, wherein:

the first communication protocol comprises hypertext transfer protocol (HTTP); and

the second communication protocol comprises a LongPoll event channel.

40. The logic of claim 29, wherein the standard signaling protocol comprises at least one of:

session initiation protocol (SIP);

media gateway control protocol (MGCP); and

H.323.

41. The logic of claim 29, wherein the media session uses a web media protocol comprising at least one of:

real-time transport protocol (RTP);

transport control protocol (TCP); and

user datagram protocol (UDP).

42. The logic of claim 29, operable to locate the remote web media server using standard functionality provided by the signaling session of the standard signaling protocol.

43. A communication system comprising:

means for submitting requests for one or more web pages from a first browser;

means for submitting, from the first browser, a request to share the one or more requested web pages with another browser, the request to share specifying the other browser;

in response to the request to share:

means for establishing a communication session with the first browser;

means for establishing a media session and a signaling session with a remote web media server, the remote web media server being associated with the other browser that the first browser specified in the request to share, the signaling session comprising a standard signaling protocol;

means for receiving web page information from the first browser; and

means for communicating shared web page information to the remote web media server using the media session.

44. A communication system comprising:

a first browser operable to submit requests for one or more web pages and a request to share the one or more requested web pages with another browser, the request to share specifying the other browser;

a web media server operable, in response to the request to share, to:

establish a communication session with the first browser;

establish a media session and a signaling session with a remote web media server, the remote web media server being associated with the other browser that the first browser specified in the request to share, the signaling session comprising a standard signaling protocol;

receive a request for a web page from the first browser;

retrieve the requested web page from a web content server associated with the requested web page;

communicate a notification to the first browser indicating that the requested web page has been retrieved, the first browser further operable to request the retrieved web page in response to the notification;

communicate the requested web page to the remote web media server using the media session.

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