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(54) **WIDE AREA NETWORK HANDSET ASSISTED CONTENT DELIVERY SYSTEM AND METHOD OF USING SAME**

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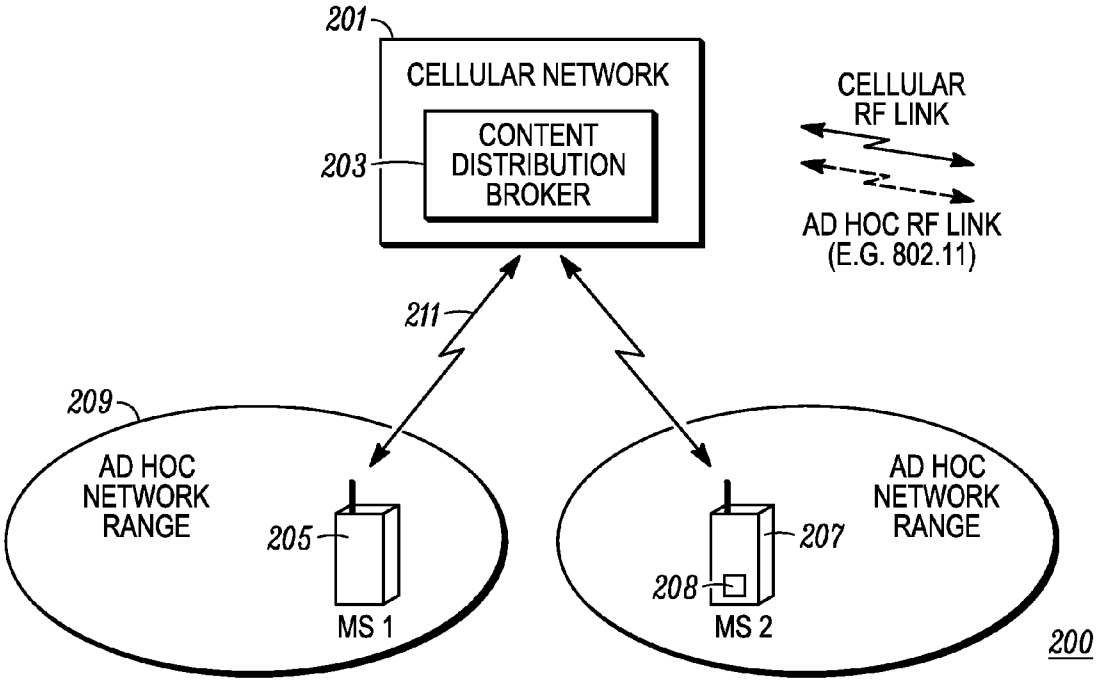
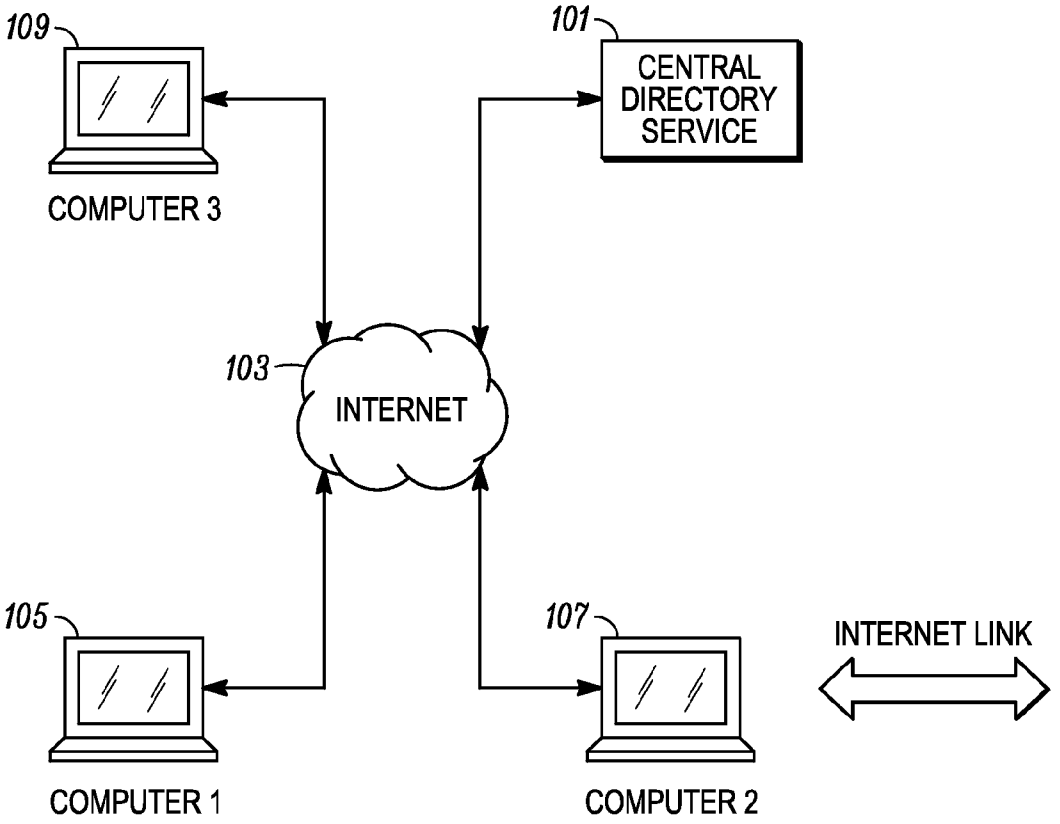
H04Q 7/20 (2006.01)

(52) **U.S. Cl.** **455/517**; 455/66.1

(57) **ABSTRACT**

A wide area network assisted multimedia content delivery system (**200**) includes a first wide area network handset (**205**) and a second wide area network handset (**207**) having one or more transceivers (**208**) for exchanging information over the wide band network as well as multimedia content via an ad hoc communication. A wide area base unit (**201**) is used for communicating with the first wide area network handset (**205**) and second wide area network handset (**207**) where a content distribution broker (**203**) associated with the wide area base unit (**201**) is used for brokering multimedia content (audio, video and text data) between the first wide area network handset (**205**) and the second wide area network handset (**207**). The transceiver (**208**) operates to exchange content in an ad hoc communication directly between the first wide area network handset (**205**) and second wide area network handset (**207**) when within a predetermined proximity.





PRIOR ART

FIG. 1

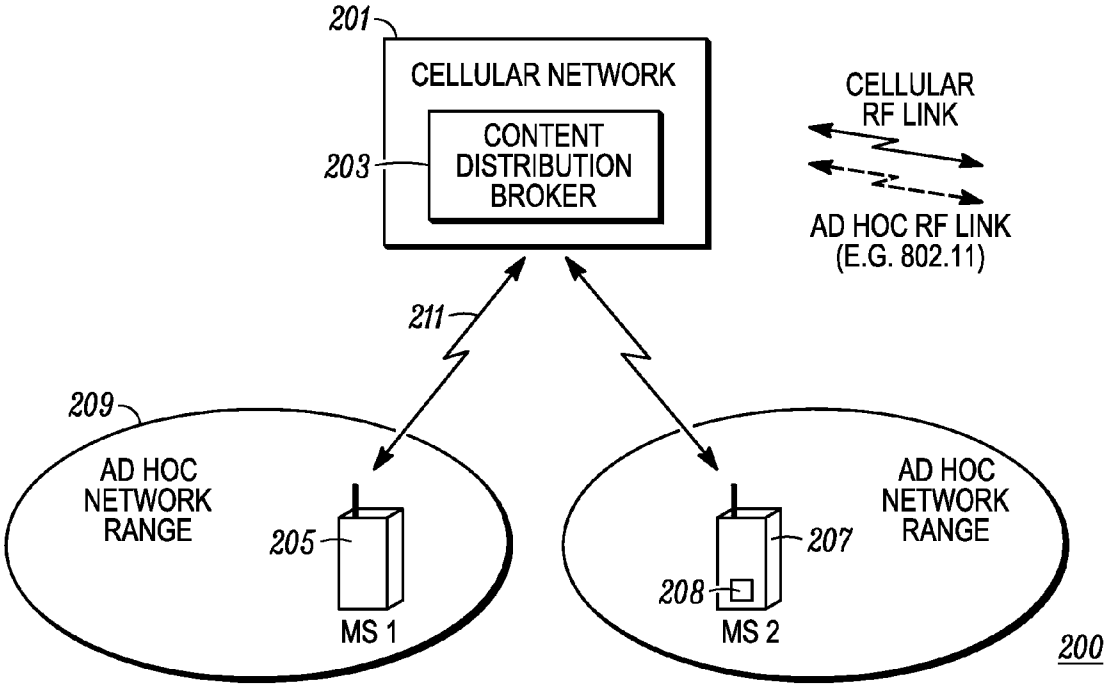

201
CELLULAR NETWORK
CONTENT DISTRIBUTION BROKER
203
CELLULAR RF LINK
AD HOC RF LINK (E.G. 802.11)
211
209
AD HOC NETWORK RANGE
205
MS 1
207
208
MS 2
AD HOC NETWORK RANGE
200

FIG. 2

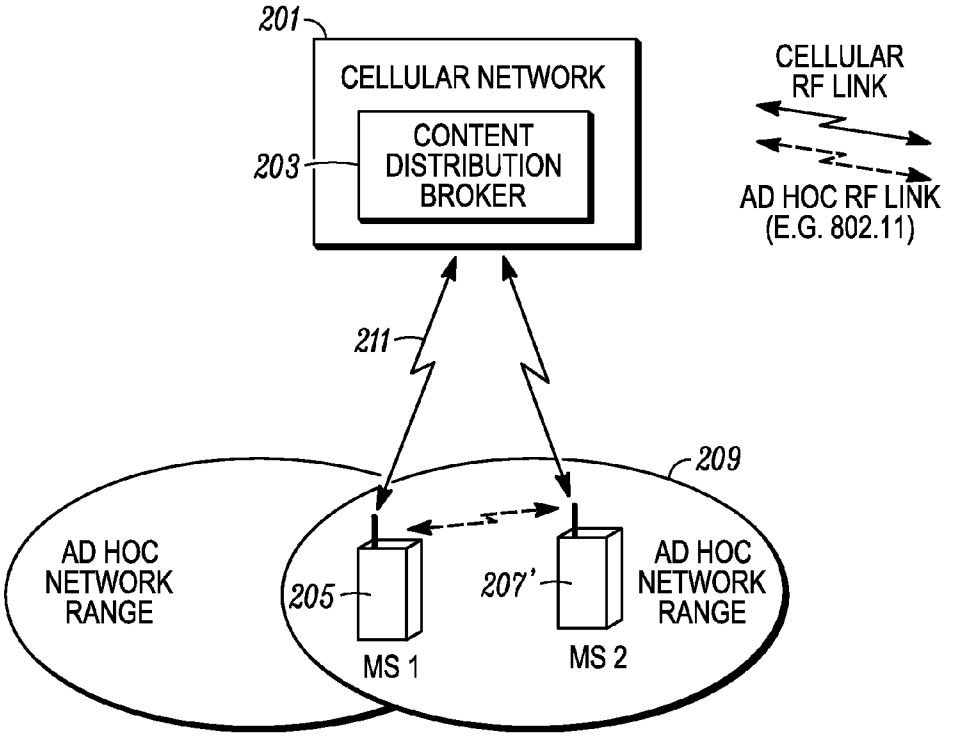

201
CELLULAR NETWORK
CONTENT DISTRIBUTION BROKER
203
CELLULAR RF LINK
AD HOC RF LINK (E.G. 802.11)
211
209
AD HOC NETWORK RANGE
205
MS 1
207'
MS 2
AD HOC NETWORK RANGE

FIG. 3

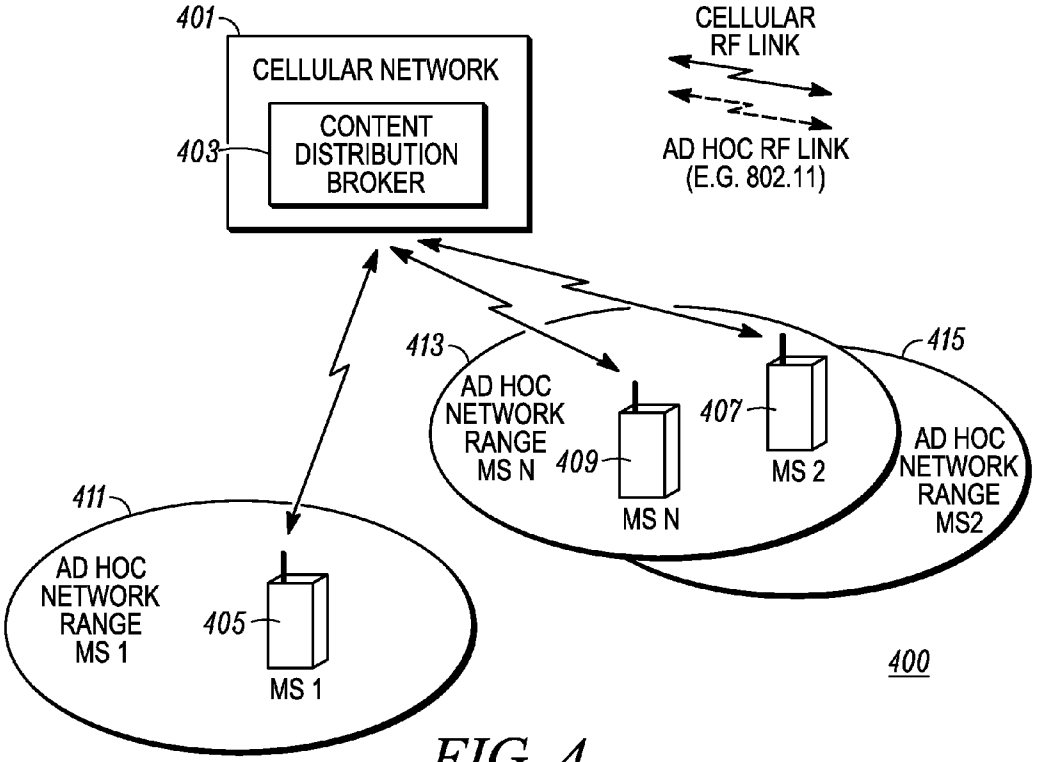

401
CELLULAR NETWORK
403
CONTENT DISTRIBUTION BROKER
CELLULAR RF LINK
AD HOC RF LINK (E.G. 802.11)
413
AD HOC NETWORK RANGE MS N
409
MS N
407
MS 2
415
AD HOC NETWORK RANGE MS2
411
AD HOC NETWORK RANGE MS 1
405
MS 1
400

FIG. 4

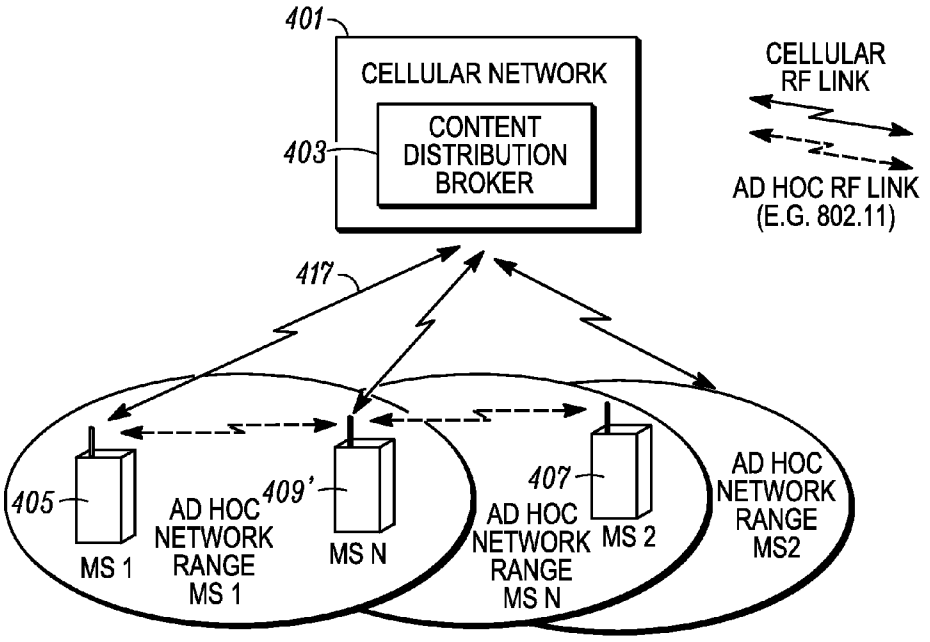

401
CELLULAR NETWORK
403
CONTENT DISTRIBUTION BROKER
CELLULAR RF LINK
AD HOC RF LINK (E.G. 802.11)
417
405
MS 1
AD HOC NETWORK RANGE MS 1
409'
MS N
407
MS 2
AD HOC NETWORK RANGE MS N
AD HOC NETWORK RANGE MS2

FIG. 5

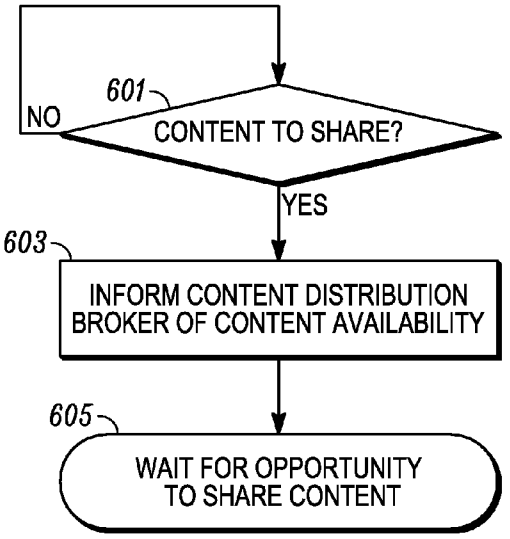


FIG. 6

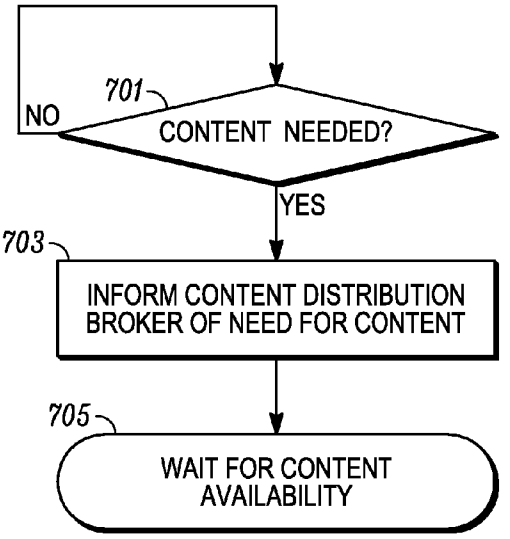


FIG. 7

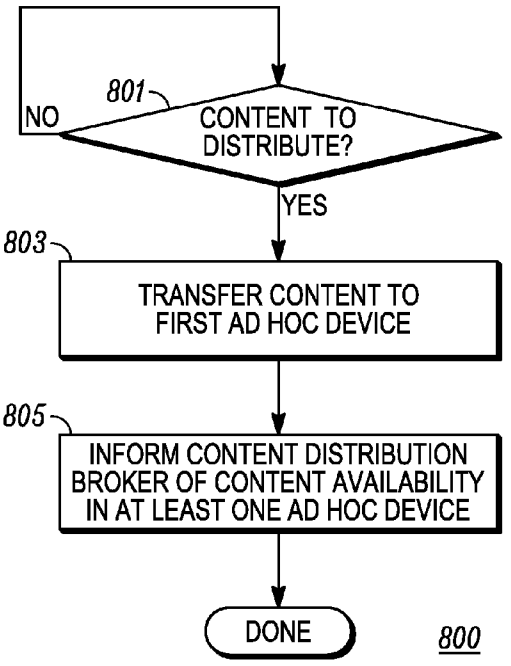


FIG.8

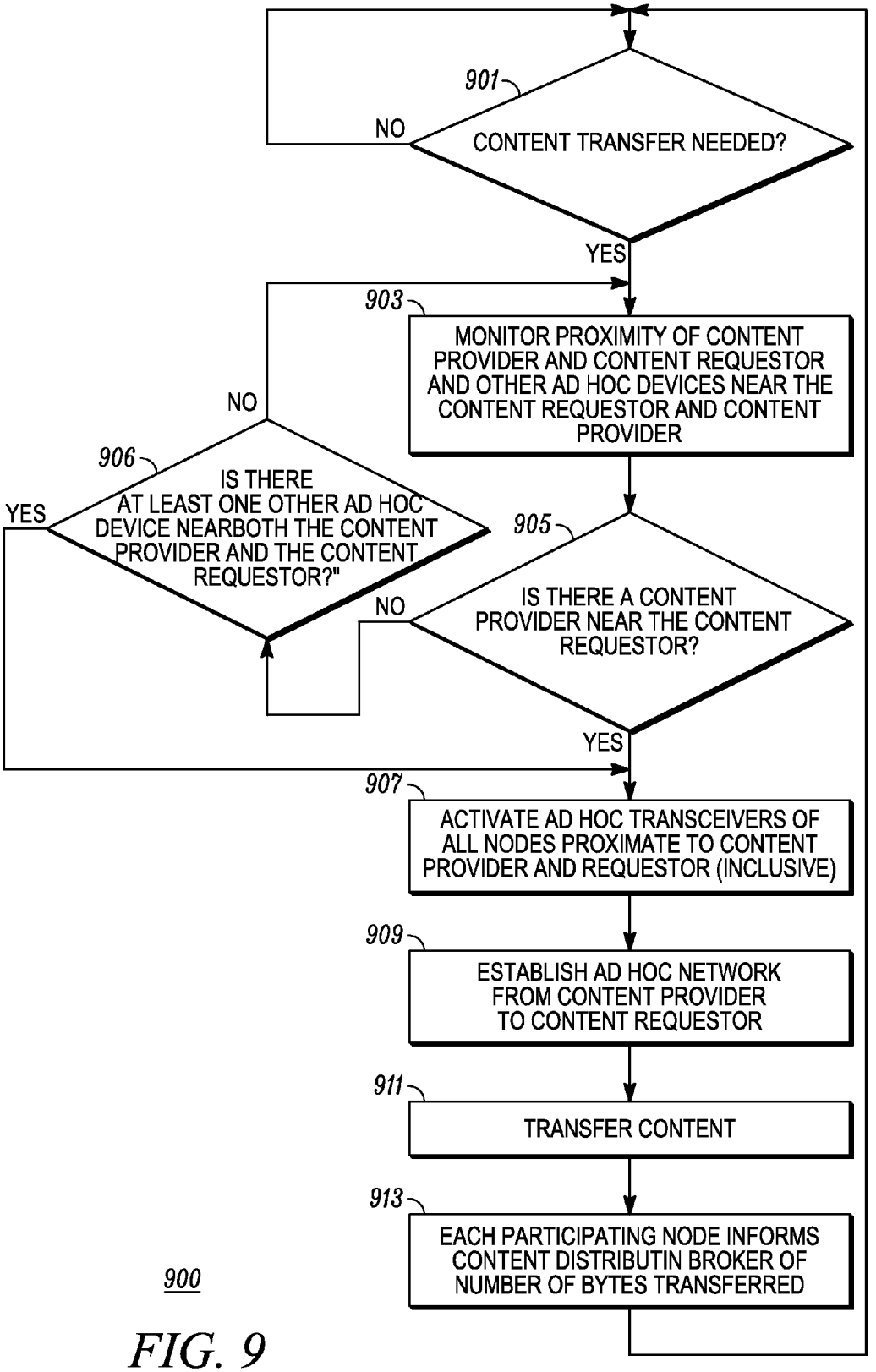

901
CONTENT TRANSFER NEEDED?
NO
YES
903
MONITOR PROXIMITY OF CONTENT PROVIDER AND CONTENT REQUESTOR AND OTHER AD HOC DEVICES NEAR THE CONTENT REQUESTOR AND CONTENT PROVIDER
905
IS THERE A CONTENT PROVIDER NEAR THE CONTENT REQUESTOR?
NO
YES
906
IS THERE AT LEAST ONE OTHER AD HOC DEVICE NEARBOTH THE CONTENT PROVIDER AND THE CONTENT REQUESTOR?"
NO
YES
907
ACTIVATE AD HOC TRANSCEIVERS OF ALL NODES PROXIMATE TO CONTENT PROVIDER AND REQUESTOR (INCLUSIVE)
909
ESTABLISH AD HOC NETWORK FROM CONTENT PROVIDER TO CONTENT REQUESTOR
911
TRANSFER CONTENT
913
EACH PARTICIPATING NODE INFORMS CONTENT DISTRIBUTIN BROKER OF NUMBER OF BYTES TRANSFERRED
900

FIG. 9

WIDE AREA NETWORK HANDSET ASSISTED CONTENT DELIVERY SYSTEM AND METHOD OF USING SAME

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This is a continuation of U.S. patent application Ser. No. 11/269,930, filed Nov. 9, 2005, entitled "WIDE AREA NETWORK HANDSET ASSISTED CONTENT DELIVERY SYSTEM AND METHOD OF USING SAME", and assigned to Motorola, Inc.

FIELD OF THE INVENTION

[0002] The present invention relates generally to delivery of music, text or other content based data through peer-to-peer communication using a second transceiver located within a cellular telephone handset.

BACKGROUND

[0003] Internet based peer-to-peer file sharing has been known for many years particularly as used for sharing music. Those skilled in the art will recognize the name NAPSTER as an online music service that used peer-to-peer music sharing amongst users. NAPSTER made a major impact on how people, especially younger people and students, used the Internet. Its technology allowed music fans to easily share MP3 (MPEG-1 Audio Layer-3) format song files between computers.

[0004] Prior art FIG. **1** illustrates an Internet-based peer-to-peer data sharing system **100** where a central directory service **101** is connected to all file sharing computers **105**, **107** and **109** via the Internet **103**. In operation, the central directory service **101** maintains a list of data files and their location which are available for sharing. If computer **105** were to contact the central directory service **101** with a request for specific data, the central directory service would search its database and direct the computer **105** to a data location if the data requested is available. For example, if the data were available on computer **107**, then computer **105** would contact computer **107** via the Internet to request access to the desired data.

[0005] The disadvantage of using this type of service is that it is Internet based and is therefore dependent on availability of file sharing computers with fixed connectivity to the Internet. If a computer is not connected to the Internet, its files cannot be shared. Moreover, the Internet is a physical communication network that provides near ubiquitous access for the file sharing computers. So once connected, file sharing can occur between designated computers virtually anywhere in the industrialized world. No provision is made for file sharing devices that form short-range wireless communication networks, that have the ability to move away from or move within range of the communication network, and that can only transfer content when both the source and destination file sharing devices are within the same short-range communication network.

[0006] Thus, the need exists to provide a system and method for sharing content-based data such as music or text without the necessity of an Internet connection.

BRIEF DESCRIPTION OF THE FIGURES

[0007] The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the specification, serve to further illustrate various embodiments and to explain various principles and advantages all in accordance with the present invention.

[0008] FIG. **1** is a prior art block diagram illustrating operation of Internet based peer-to-peer file sharing.

[0009] FIG. **2** is a block diagram illustrating a wireless connection of two cellular handsets to a cellular network using a content distribution broker.

[0010] FIG. **3** is a block diagram illustrating an ad hoc wireless link between the two cellular handsets depicted in FIG. **2**.

[0011] FIG. **4** is a block diagram illustrating a wireless connection of three cellular handsets in a cellular network using a content distribution broker.

[0012] FIG. **5** is a block diagram illustrating an ad hoc wireless link between the three cellular handsets shown in FIG. **4** where the peer-to-peer sharing of data is exchanged using one cellular handset acting as an intermediary.

[0013] FIG. **6** is a flow chart diagram illustrating communication between a cellular handset and the content distribution broker where the cellular handset indicates that it has content availability.

[0014] FIG. **7** is a flow chart diagram illustrating communication between a cellular handset and the content distribution broker where the cellular handset indicates that it desires specific content.

[0015] FIG. **8** is a flow chart diagram illustrating the transfer of multimedia content between a fixed network application in the cellular network and a cellular handset and subsequent communication to the content distribution broker of content availability in the cellular handset.

[0016] FIG. **9** is a flow chart diagram illustrating communication between a cellular handset desiring content, the content distribution broker and a cellular handset that has content availability.

[0017] Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of embodiments of the present invention.

DETAILED DESCRIPTION

[0018] Before describing in detail embodiments that are in accordance with the present invention, it should be observed that the embodiments reside primarily in combinations of method steps and apparatus components related to a cellular assisted content delivery system and method of using same. Accordingly, the apparatus components and method steps have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present invention so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

[0019] In this document, relational terms such as first and second, top and bottom, and the like may be used solely to distinguish one entity or action from another entity or action without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms "comprises,""comprising," or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by "comprises . . . a" does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises the element.

[0020] It will be appreciated that embodiments of the invention described herein may be comprised of one or more conventional processors and unique stored program instructions that control the one or more processors to implement, in conjunction with certain non-processor circuits, some, most, or all of the functions of a cellular assisted content delivery system as described herein. The non-processor circuits may include, but are not limited to, a radio receiver, a radio transmitter, signal drivers, clock circuits, power source circuits, and user input devices. As such, these functions may be interpreted as steps of a method to perform cellular assisted content delivery. Alternatively, some or all functions could be implemented by a state machine that has no stored program instructions, or in one or more application specific integrated circuits (ASICs), in which each function or some combinations of certain of the functions are implemented as custom logic. Of course, a combination of the two approaches could be used. Thus, methods and means for these functions have been described herein. Further, it is expected that one of ordinary skill, notwithstanding possibly significant effort and many design choices motivated by, for example, available time, current technology, and economic considerations, when guided by the concepts and principles disclosed herein will be readily capable of generating such software instructions and programs and ICs with minimal experimentation.

[0021] FIG. **2** is a block diagram illustrating a wireless connection of two wide area handsets in a typical wide area communications system **200** using a content distribution broker **203** in accordance with an embodiment of the invention. Although the invention is described in a manner using a cellular telephone system, those skilled in the art will recognize that the invention may be implemented using any wide area communications system capable of exchanging multimedia content and other data. Such wide area communications include but are not limited to second generation (2G/2.5G) systems like the Global System for Mobile Communications (GSM), Code Division Multiple Access (CDMA) and Tme Division Multiple Access (TDMA) as well as improved third generation (3G) systems such as Enhanced Data Rates for Global Evolution (EDGE), Wideband CDMA (W-CDMA) and CDMA 2000.

[0022] The cellular network **201** is associated with the content distribution broker **203**. The content distribution broker is a computer which stores a database of music, text or other electronic data (hereinafter "multimedia content") that is available for exchange and sharing by one or more of the cellular handsets in the network. The content distribution broker works to "broker" information, acting to notify handsets with sharable information with those which are in need of information. Each cellular handset **205**, **207** can communicate through the cellular network **201** and also includes a second transceiver that works to provide ad hoc peer-to-peer communication. This communication may use a Bluetooth, an Institute of Electrical and Electronics Engineers (IEEE 802.11, IEEE 802.16 etc.), WiFi, or wide area network standard. It will also be evident to those skilled in the art that each cellular handset includes at least one radio frequency (RF) transceiver (**208**) capable of operating on multiple frequency bands. A software defined radio transceiver (SDR) may also be used to provide simultaneous communications on multiple frequency bands using only one transceiver.

[0023] FIG. **3** is a block diagram illustrating the cellular communications system as in FIG. **2**, where a wireless ad hoc connection is established between two cellular handsets after notification by a content distribution broker. For example, when the cellular handset **207'** moves within the ad hoc network range **209**, an ad hoc link is established where content may be exchanged between the cellular handset **205** and cellular handset **207'**. As seen in FIG. **3**, the second transceiver that is operable within the cellular handset **207** communicates with the second transceiver operable within the cellular handset **205** only when within a range identified by an ad hoc network range **209**. When cellular handsets or other devices in the network have content to share, they can notify the content distribution broker **203** through a cellular radio frequency (RF) channel **211** that they have this information to share. When other handsets are desirous of finding information, these requests can also be stored at the content distribution broker **203**. When the content information broker **203** determines that there is a match and/or correlation between information requested and information available, the cellular handset which requested information is notified of the Internet protocol (IP) address of the cellular handset with information available. This notification is transmitted through the cellular RF channel **211**.

[0024] This information will thereafter be exchanged when both cellular handsets come into proximity of one another such as within the ad hoc network range **209**. Content distribution broker **203** periodically queries cellular network **201** for location information concerning cellular handsets **205** and **207**. Based on the determination that cellular handsets **205** and **207** are within ad hoc network range of each other, the content distribution broker **203** will notify cellular handsets **205** and **207** that they should activate their second transceiver (if not already active). This allows both handsets to identify each other using an ad hoc networking protocol such as an Ad-hoc On-demand Distance Vector (AODV). Thus, an ad hoc network is established for a content transfer between cellular handset **205** and **207**. This notification is transmitted via a cellular radio frequency (RF) channel **211** which may be a dedicated messaging channel or the like.

[0025] FIG. **4** is a block diagram illustrating yet another embodiment of the present invention where a cellular communications system **400** uses a cellular network **401** and a content distribution broker **403** to exchange peer-to-peer content that is relayed between multiple devices without using the cellular network **401**. In this embodiment, cellular handsets **405**, **407** and **409** can communicate with one

another through the cellular network **401** and each also include a second transceiver that provides ad hoc peer-to-peer communication. Each cellular handset **405**, **407**, and **409** operates with a second transceiver operable within the cellular handset with an ad hoc network range **411**, **413**, and **415**, respectively. When cellular handsets or other devices in the network have content to share, they can notify the content distributing broker **403** via a cellular RF channel **417** that they have this information to share. When other handsets are desirous of finding information, these requests can also be stored at the content distribution broker **403**. When the content information broker determines that there is a match or correlation between information requested and information available, the cellular handset which requested information is notified of the IP (Internet Protocol) address of the cellular handset with information available. This notification is transmitted via a cellular RF channel **417**. This information will be exchanged when the ad hoc network range **411**, **413**, and **415** overlap to enable cellular handsets **405** and **407** to establish a wireless ad hoc connection via cellular handset **409**.

[**0026**] Content distribution broker **403** periodically queries cellular network **401** for location information concerning cellular handsets **405** and **407**. The content distribution broker **403** also queries the cellular network **401** for the location of other ad hoc capable cellular handsets that are within proximity of cellular handsets **405** and **407**. Based on the determination that cellular handsets **405** and **407** are either within ad hoc network range of each other or that cellular handset **409** is within ad hoc network range of both cellular handset **405** and **407**, the content distribution broker **403** will notify cellular handsets **405**, **407**, and **409** that they should activate their second transceiver (if not already active), discover each other using an ad hoc networking protocol such as AODV, and establish an ad hoc network for a content transfer between cellular handset **405** and **407**. This notification is transmitted via a cellular RF channel **417** such as a dedicated messaging channel or the like.

[**0027**] In yet another embodiment of the invention, in order to provide a mechanism for the cellular service network **401** and the content distribution broker **403** to charge for the service of facilitating the content transfer, each cellular handset can store the number of bytes of data that were transmitted and received. The service provider and broker can charge or credit users of the service as appropriate. Credit may be provided to the cellular handset which performs relays as an incentive to encourage participation in the ad hoc network as described herein.

[**0028**] As seen in FIG. **5**, when the cellular handset **409'** moves into a position where it can communicate with both cellular handset **405** and cellular handset **407**, an ad hoc network is established. In this embodiment, the cellular handset **409'** acts as a bridge or intermediary where an ad hoc communication cannot directly established between cellular handset **405** and cellular handset **407**. In this case, content can first be transmitted to the cellular handset **409'**, where it can then be communicated to cellular handset **405** or cellular handset **407**.

[**0029**] In an alternative embodiment, the availability of content to share can be made known to the content distribution broker **403** by a fixed network application contained within cellular network **401**. Content may initially be made available to at least one cellular handset **405** by the fixed network application contained within cellular network **401**. This content is transferred via a cellular RF channel **417** such as a user data channel. Once the fixed network application knows that at least one cellular handset **405** has the content, the fixed network application will inform the content distribution broker **403** that the content is available in at least one cellular handset **405** and that it should distribute the content to all cellular handsets that are within ad hoc network range of the cellular handsets that already have the content such as cellular handset **405**. Content distribution broker **403** periodically queries cellular network **401** for location information concerning cellular handsets **405** and other ad hoc capable cellular handsets that are within proximity of cellular handsets **405** that have not yet received the content. Based on a need to deliver content to cellular handset **407** and based on determining that cellular handsets **405** and **407** are either within ad hoc network range of each other or that cellular handset **409** is within ad hoc network range of both cellular handset **405** and **407**, the content distribution broker will notify cellular handsets **405**, **407**, and **409** that they should activate their second transceiver (if not already active). Handsets **405**, **407** and **409** will then detect one another using an ad hoc networking protocol such as AODV, and establish an ad hoc network for a content transfer between cellular handset **405** and **407**. This notification is transmitted via a cellular RF channel **417**, such as a dedicated paging channel or the like.

[**0030**] FIG. **6** is a flow chart diagram **600** illustrating the process associated with a communication between a cellular handset and the content distribution broker where the cellular handset indicates that it has content availability. The cellular handset first determines whether it has content to share **601**. If not, it will continue to check but, if it does have content, it then informs the content distribution broker **603** through a cellular communication of its content availability. The content information is then stored locally within the cellular handset and the content distribution broker waits **605** for the opportunity to share the content with another user in need of that content.

[**0031**] FIG. **7** is a flow chart diagram **700** illustrating the process associated with a communication between a cellular handset and the content distribution broker where the cellular handset indicates that it is in need of specific content. The cellular handset first determines from the user whether content is needed **701**. If not, it continues checking. However, if content is desired, then the content distribution broker is informed through a cellular communication that content is needed **703**. The cellular handset waits some period of time **705** for the content distribution broker to inform the cellular handset that that content is available.

[**0032**] FIG. **8** is a flow chart diagram **800** illustrating the distribution of multimedia content to a multitude of handsets. When a fixed network application with the cellular network has content to distribute **801**, the fixed network application transfers content to a first cellular handset **803** through a cellular communication channel. Thereafter, the fixed network application in the cellular network informs the content distribution broker of the content availability **805** for distribution to any other ad hoc device and the process is complete **807**.

[**0033**] FIG. **9** is a flow chart diagram **900** illustrating one embodiment of the operation of a content distribution broker

which manages communication between a cellular handset desiring content and a cellular handset that has content availability. The process begins when the content distribution broker determines **901** that a content transfer is needed. If it is not needed, the content distribution broker continues checking to see whether there is a match between available content and desired content. If a transfer is needed, the proximity of the content provider and the content requester is determined **903**. This process may be done using computer triangulation of radio signal strength (RSSI) signals or through the use of a global positioning system (GPS) located with the cellular handset. This location information is maintained by the cellular network.

[**0034**] It is then determined **905** whether the content provider is in proximity to the content requester. If not, the proximity of the provider and requester is again monitored. A determination is also made whether there is at least one cellular handset or other ad hoc device that that is in proximate range to both the sending and receiving handset **906**. If so, then that handset may be used as an intermediary to transfer the multimedia content to the requesting handset. If no handset is within proximity, then the monitoring begins again **903** until the handsets are within range.

[**0035**] If a direct ad hoc communication can be established or an intermediary handset may be used to relay the content, then the ad hoc transceivers of all cellular handsets proximate to the content provider and requester are activated **907**. An ad hoc network is then established **909** from the content provider to the content requester, and the content is transferred **911** between these devices. Consequently, each participating cellular node may inform the content distribution broker of the number of bytes that have been transferred **913** and the process begins again.

[**0036**] Thus, the invention describes a communications system operable in a wide area network wherein a content transfer broker is used in connection with a wide area network to inform wide area handsets which are in proximity to one another that content and/or other data may be transferred via an ad hoc RF link between handsets. The invention provides an easy and inexpensive way to transfer content between a content provider handset and a content requester handset without utilizing excessive bandwidth on the wide area network.

[**0037**] In the foregoing specification, specific embodiments of the present invention have been described. However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the present invention as set forth in the claims below. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of present invention. The benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential features or elements of any or all the claims. The invention is defined solely by the appended claims including any amendments made during the pendency of this application and all equivalents of those claims as issued.

What is claimed is:

1. A method for establishing an ad hoc network using a cellular telephone handset comprising the steps of:

determining that a first cellular telephone handset has content to share with other users in a wide area network;

informing a content distribution broker of content availability using a first transceiver; and

waiting for an opportunity to share content with at least one second telephone handset.

2. A method for using a cellular telephone handset as in claim 1, further comprising the step of:

receiving a message at the content distribution broker from the at least one second telephone handset that content is needed.

3. A method for using a cellular telephone handset as in claim 2, further comprising the steps of:

transmitting from the content distribution broker to the fist cellular telephone handset information regarding the at least one second telephone handset; and

establishing an ad hoc communication between the first radio handset and the at least one second radio handset using a second transceiver; and

transferring the content from the first cellular telephone handset to the at least one second radio transceiver.

4. A method for using a cellular telephone handset as in claim 1, wherein the content includes at least one from the group of audio data, video data or text data.

5. A method for using a cellular telephone handset as in claim 3, wherein the first transceiver and second transceiver are software defined radios (SDRs).

6. A method for using a cellular telephone handset in an assisted content delivery wide area network comprising the steps of:

establishing communication with at least one cellular telephone site using a first cellular telephone handset; and

informing a content distribution broker with the at least one cellular telephone site that the cellular telephone handset has multimedia content availability to share with others.

7. A method for using a cellular telephone handset as in claim 6, further comprising the step of:

establishing contact with the at least one cellular telephone site using a second cellular telephone handset; and

informing the content distribution broker with the at least one cellular telephone site that the second cellular telephone handset is in need of content.

8. A method for using a cellular telephone handset as in claim 7, further comprising the steps of:

informing the first cellular telephone handset that the second cellular telephone handset is desirous of receiving content;

establishing an ad hoc communication between the first cellular telephone handset and the second cellular telephone handset;

transferring content from the first cellular telephone handset to the second cellular telephone handset via the ad hoc communication; and

informing the content distribution broker that the content has been transferred from the first cellular telephone handset to the second cellular telephone handset.

9. A method for using a cellular telephone handset as in claim 8, wherein communication with the at least one cellular telephone site utilizes a first radio transceiver and the ad hoc communication utilizes a second radio transceiver.

10. A method for using a cellular telephone handset as in claim 8, wherein the ad hoc communication uses a Bluetooth standard.

11. A method for using a cellular telephone handset as in claim 8, wherein the ad hoc communication uses a WiFi standard.

12. A method for using a cellular telephone handset as in claim 9, wherein the first radio transceiver and second radio transceiver are software defined radios (SDRs).

13. A method for using a cellular telephone handset as in claim 6, wherein the multimedia content includes at least one from the group of audio data, video data or text data.

14. A method for using a cellular telephone handset as in claim 6, further comprising the step of:

exchanging multimedia content when the first cellular telephone handset and the second cellular telephone handset are within a predetermined proximity of one another.

15. A cellular subscriber method for use in exchanging data multimedia content over a wide area network communications system comprising the steps of:

establishing communication between a first subscriber and a central station;

indicating to a content delivery broker associated with the central station that the first subscriber has multimedia content to share;

establishing communication between a second subscriber and the central station;

indicating to the content delivery broker associated with the central station that the second subscriber is in need of multimedia content;

sending a communication from the content delivery broker and the first subscriber that the second subscriber is in need of content from the first subscriber;

notifying the first subscriber and second subscriber when they are within a predetermined proximity;

establishing an ad hoc communication between the first subscriber and the second subscriber; and

distributing the multimedia content from the first subscriber to the second subscriber via the ad hoc communication.

16. A cellular subscriber method for use in exchanging multimedia content as in claim 15, further comprising the step of:

communicating to the content delivery broker that the multimedia content has been exchanged.

17. A cellular subscriber method for use in exchanging multimedia content as in claim 15, further comprising the step of:

informing the content delivery broker the number of bytes of multimedia content that have been transferred.

18. A cellular subscriber method for use in exchanging multimedia content as in claim 15, wherein the multimedia content is at least one from the group of audio data, video data or text data.

19. A cellular subscriber method for use in exchanging multimedia content as in claim 15, wherein the first subscriber and second subscriber utilize a first transceiver to communicate with the central station and a second transceiver to establish the ad hoc communication.

20. A cellular subscriber method for use in exchanging multimedia content as in claim 15, wherein the ad hoc communication uses a Bluetooth standard.

21. A cellular subscriber method for use in exchanging multimedia content as in claim 15, wherein the ad hoc communication uses a WiFi standard.

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