

SYSTEM AND PROCESS FOR DETERMINATION OF OPTIMUM WIRELESS BEARER FOR DATA TRANSMISSION

Field of the Invention

[0001] The present invention generally relates to wireless communication technologies, and more particularly to a system and process for determination of optimum wireless bearer for data transmission.

Background of the Invention

[0002] The advance in wireless and mobile technologies has empowered wireless communications by not only traditional mobile devices such as PDA and mobile phones, but also wireless-accessible notebooks and personal computers (all are designated as wireless devices hereinafter). At the same time, many wireless devices are not limited to one bearer (channel) for their access to Internet; instead they are usually equipped with multiple bearer channels including WLAN, General Packet Radio Service (GPRS)/3G, and Bluebooth. However, each bearer has its own advantages and limitations. Therefore, it is a challenge to use the available multiple bearers effectively and efficiently.

[0003] US 2005/0125547 A1 discloses a system for transferring information in a wireless data communication network using a chosen bearer between at least two parties. More specifically, it discloses the establishment of a local wireless network among two or more mobile phones when all mobile phones are equipped with Bluetooth server; thus members of the local network can share information without need to gain Internet access. It further discloses that if one mobile phone within the local network has the Internet access via GSM/GPRS, then other members of the local network can retrieve web documents through the Internet-connected mobile phone. It is an excellent example of showing the applications of Bluetooth technology. However, it does not address the issue of how to use the wireless devices for efficient data transmission.

[0004] US 6,973,502 discloses a system for an optimum selection of bearer services using a tag that identifies data as being best transmitted via a special service. Furthermore, it discloses a method retrieving a document with content from a server by

searching for bearer service tags; if present, tags and content are parsed and the content sent using the bearer services identified by the tags. It attempts to improve the efficiency of data transmission by taking the advantages of the fact that different bearers have different capacities of transmitting different information. However, the choice of the bearer for one specific document to be transmitted is fixed by the identifier tag that has been attached to the document before its transmission. Apparently, it does not afford the wireless device any freedom in selecting the optimum bearer for data transmission.

[0005] As is well known, even though each bearer has a theoretically defined transmission rate, the ultimate throughput a user gets is dependent on many factors such as effective bandwidth, level of data packetisation, network congestion, number of devices using the shared media, current network reliability, type of content and the like. Thus, the use of theoretical network speed may not be an effective assessment of the optimum bearer for the user.

[0006] Therefore, there is an imperative need for a system and process that would enable the user of a wireless device to select the optimum bearer for data transmission via the Internet. More importantly, the selection would be an on-going process during the operation of the wireless browser (called "in-operation selection" hereinafter) so that the browser plug-in itself will determine which bearer is the optimum.

Summary of the Invention

[0007] One embodiment of the present invention provides a process for enabling wireless devices with multiple bearer channels to select an optimum bearer for transmission of data to/from the Internet via wireless networks. The process comprises displaying and inputting selectable factors for selecting the optimum bearer; preparing test messages; determining the availability of supported bearer channels within the wireless device; determining the optimum bearer by checking every available bearer channels according to the inputted selectable factors; and transmitting information between the wireless device and Internet via the optimum bearer.

[0008] In another embodiment of process, the selectable factors are one or more of the factors selected from the group consisting of packetisation, current network congestion, effective bandwidth, network reliability, cost, and type of content. In another embodiment

of the process, any of the multiple bearer channels can be made as the default bearer. In another embodiment of the process, the multiple bearer channels include selected from the group consisting of WLAN Access point; Bluetooth Server; 3G Telecommunications/GPRS Telecommunications. In another embodiment of the process, the step of preparing test messages prepares test messages according to the following format: START-LENGTH -MESSAGE - STYPE - MTYPE.

[0009] In another embodiment of the process, the steps of determining the availability of supported bearer channels within the wireless device and determining the optimum bearer by checking every available bearer channels according to the inputted selectable factors perform the following operations for each bearer when they are selected as first, second and so on: checking on whether the first selected bearer is present; wherein, if no, going to the second selected bearer; checking on whether the first selected bearer is supported; wherein, if no, going to the second selected bearer; querying the number of clients served by the selected bearer; calculating the effective bandwidth; time-stamping and sending the test messages (TestMsg) to an Engaging Server (ES) on the Internet via the selected bearer; checking whether a responding message (RespMsg) is received from the ES; calculating the latency experienced by the Internet connection via the selected bearer using the time stamps on the TestMsg and RespMsg; and summarizing the conclusions of each selectable factors for the selected bearer; thereby after all bearers have been checked, the wireless device will select the optimum bearer for sending/receiving the information via Internet. In a further embodiment of the process, the step of determining the optimum bearer by checking every available bearer channels according to the inputted selectable factors performs the further following operations: determining the number of client devices that are currently served by the selected bearer.

[0010] Another embodiment of the present invention provides a wireless device having multiple bearer channels. The wireless device comprises an electronic memory medium within which a microprocessor-executable bearer optimizer program is installed, wherein the microprocessor-executable bearer optimizer program executes the following operations: displaying and inputting selectable factors for selecting the optimum bearer; preparing test messages; determining the availability of supported bearer channels within the wireless device; determining the optimum bearer by checking every available bearer

channels according to the inputted selectable factors; and transmitting information between the wireless device and Internet via the optimum bearer.

[0011] In another embodiment of the wireless device, the selectable factors are one or more of the factors selected from the group consisting of packetisation, current network congestion, effective bandwidth, network reliability, cost, and type of content. In another embodiment of the wireless device, any of the multiple bearer channels can be made as the default bearer. In another embodiment of the wireless device, the multiple bearer channels include selected from the group consisting of WLAN Access point; Bluetooth Server; 3G Telecommunications/GPRS Telecommunications. In another embodiment of the wireless device, the step of preparing test messages prepares test messages according to the following format: START-LENGTH -MESSAGE - STYPE - MTYPE.

[0012] In another embodiment of the wireless device, the steps of determining the availability of supported bearer channels within the wireless device and determining the optimum bearer by checking every available bearer channels according to the inputted selectable factors perform the following operations for each bearer when they are selected as first, second and so on: checking on whether the first selected bearer is present; wherein, if no, going to the second selected bearer; checking on whether the first selected bearer is supported; wherein, if no, going to the second selected bearer; querying the number of clients served by the selected bearer; calculating the effective bandwidth; time-stamping and sending the test messages (TestMsg) to an Engaging Server (ES) on the Internet via the selected bearer; checking whether a responding message (RespMsg) is received from the ES; calculating the latency experienced by the Internet connection via the selected bearer using the time stamps on the TestMsg and RespMsg; and summarizing the conclusions of each selectable factors for the selected bearer; thereby after all bearers have been checked, the wireless device will selected the optimum bearer for sending/receiving the information via Internet. In a further embodiment of the wireless device, the step of determining the optimum bearer by checking every available bearer channels according to the inputted selectable factors performs the further following operations: determining the number of client devices that are currently served by the selected bearer.

[0013] In another embodiment of the wireless device, the bearer optimizer program is installed as a wireless browser plug-in that will be activated whenever the wireless device launches its wireless browser; thereby once activated, the bearer optimizer program

will in-operation select the optimum bearer for data transmission according to the criteria provided by the user. In another embodiment of the wireless device, the wireless device is a PDA, mobile phone, wireless-supported notebook and PC, and any wireless electronic device.

[0014] Another embodiment of the present invention provides a wireless communication system. The wireless communication system comprises a wireless device; multiple wireless communication bearers; and engaging server; wherein the wireless device can access the engaging server via Internet through the multiple wireless communication bears so that the information can be efficiently transmitted between the wireless device and the engaging server; and wherein the wireless device comprises: an electronic memory medium within which a microprocessor-executable bearer optimizer program is installed, wherein the microprocessor-executable bearer optimize program executes the following operations: displaying and inputting selectable factors for selecting the optimum bearer; preparing test messages; determining the availability of supported bearer channels within the wireless device; determining the optimum bearer by checking every available bearer channels according to the inputted selectable factors; and transmitting information between the wireless device and Internet via the optimum bearer.

[0015] These and additional objectives and advantages of the invention will become apparent from the following detailed description of preferred embodiments thereof in connection with the accompanying drawings.

Brief Description of the Drawings

[0016] Preferred embodiments according to the present invention will now be described with reference to the Figures, in which like reference numerals denote like elements.

[0017] FIG 1 is a graphic diagram showing the wireless communication system in accordance with one embodiment of the present invention.

[0018] FIG 2 shows an exemplary flowchart showing the operation of the bearer optimizer program in accordance with one embodiment of the present invention.

[0019] FIG 2A shows an exemplary flowchart showing the operation on the Bluetooth channel in accordance with one embodiment of the present invention.

[0020] FIG 2B shows an exemplary flowchart showing the operation on the WLAN channel in accordance with one embodiment of the present invention.

[0021] FIG 2C shows an exemplary flowchart showing the operation on the GPRS/3G channel in accordance with one embodiment of the present invention.

Detailed Description of the Invention

[0022] The present invention may be understood more readily by reference to the following detailed description of certain embodiments of the invention.

[0023] Throughout this application, where publications are referenced, the disclosures of these publications are hereby incorporated by reference, in their entireties, into this application in order to more fully describe the state of art to which this invention pertains.

[0024] The present invention provides a system and method that enables wireless devices with multiple bearer channels to in-operation select an optimum bearer for transmission of data to/from the Internet via wireless network. The selection takes into consideration the factors including packetisation, current network congestion, effective bandwidth, network reliability, cost, and type of content.

[0025] Now referring to FIG 1, there is provided a graphic diagram showing the wireless communication system in accordance with one embodiment of the present invention. The wireless communication system 1 comprises a wireless device 2, multiple bearers including WLAN Access point 3, Bluetooth Server 4, and 3G Telecommunications 5/GPRS Telecommunications 6, Internet 7, and engaging server 8. It is assumed that the wireless device has the means of connecting to the Internet via anyone of the three bearer services. When the wireless device 2 is capable of communicating with the Internet 7 via two or more bearers, the user of the wireless device has the choice of selecting one bearer for transmitting the information to/from the Internet 7.

[0026] In one embodiment, the wireless device 2 has a bearer optimizer program for selecting of one bearer that is optimum for performing the data transmission. In one embodiment, the bearer optimizer program is installed as a wireless browser plug-in that will be activated whenever the wireless device user launches the wireless browser of his wireless device. Once activated, the bearer optimizer program will in-operation select the

optimum bearer for data transmission according to the criteria provided by the user. It is to be appreciated that the bearer optimizer program is fully operable by a user so that the user can set up any parameters for running the program.

[0027] Now referring to FIG 2, there is provided an exemplary flowchart showing the operation of the bearer optimizer program in accordance with one embodiment of the present invention.

[0028] The process **10** of operating the bearer optimizer program will now be described in more details in reference to FIG 2. When the micro browser of a wireless device is launched **11**, the bearer optimizer plug-in will be automatically loaded, and then display selectable factors for selecting the optimum bearer and prepare test messages **12**. The selectable factors may be lowest cost, highest effective bandwidth or lowest latency. Then, the bearer optimizer will determine the availability of supported bearer channels within the wireless device. While the flowchart shows that the presence of Bluetooth Server will be checked first, it is to be appreciated that this choice is only for the sake of simplified illustration and convenient narration. In addition, the choice of GPRS/3G as the default bearer is also only for the sake of simplified illustration and convenient narration. The practice of the bearer optimizer of the present invention is not so limited to those specifics.

[0029] After the user has input his selectable factors, the bearer optimizer program checks whether the Bluetooth support **13** is present. It is to be appreciated that when one bearer is “present”, it means that the wireless device is operational with this bearer; when one bearer is “supported”, it means that the wireless device is able to connect with the Internet via this bearer channel. If the Bluetooth is NOT present, the program will proceed to check whether the WLAN is present **16** (more details hereinafter). If the Bluetooth is present, the program will check whether the Bluetooth Server Network Address is present **14**. If the Bluetooth Server Network Address is NOT present, the program will proceed to summarize **15** Bluetooth Internet connectivity and continue to check **16** whether the WLAN is present.

[0030] If the Bluetooth Server Network address is present, the program will execute the following operations as shown in FIG 2A: determine **A1** the number of peer Bluetooth client devices that are currently served by this Bluetooth server, calculate **A2** the effective bandwidth (B_b); time-stamp and send **A3** the test messages (TestMsg) generated

in step **12** to an Engaging Server (ES) on the Internet via the Bluetooth Server; check **A4** whether a responding message (RespMsg) is received from the ES, where the ES receives the TestMsg, generates the RespMsg, and time-stamp and send the RespMsg back to the plug-in bearer optimizer program; calculate **A5** the latency experienced by the Internet connection via Bluetooth using the time stamps on the TestMsg and RespMsg if the RespMsg is received; conclude **A6** that Bluetooth connection to the Internet is not possible if no RespMsg is not received because the Bluetooth server's network connectivity is absent or Bluetooth is not supported within the wireless device; and then proceed from both **A5** and **A6** to step **15** as discussed above.

[0031] After summarizing **15** the Bluetooth Internet connectivity, the program next checks **16** whether the WLAN is present. If the WLAN is NOT present, the program will summarize **17** the WLAN Internet connectivity concluding that WLAN connection to the Internet is not possible.

[0032] If the WLAN is present, the program will execute the following operations as shown in FIG 2B: determine **B1** the number of peer Wireless LAN devices connected to the same Access Point (AP); calculate **B2** the effective bandwidth, B_w ; time-stamp and send **B3** the test messages (TestMsg) generated in step **12** to an Engaging Server (ES) on the Internet via the WLAN AP; check **B4** whether a responding message (RespMsg) is received from the ES, where the ES receives the TestMsg, generates the RespMsg, and time-stamp and send the RespMsg back to the plug-in bearer optimizer program; calculate **B5** the latency experienced by the Internet connection via WLAN using the time stamps on the TestMsg and RespMsg if the RespMsg is received; conclude **B6** that WLAN connection to the Internet is not possible if no RespMsg is not received because the WLAN server's network connectivity is absent; and then proceed to step **17** as discussed above from both **B5** and **B6**.

[0033] After summarizing **17** the WLAN Internet connectivity, the program next proceed to FIG 2C. In this embodiment, it is assumed that any mobile device containing a micro browser application will have either GPRS or 3G services available by default. Then the program will execute the following operations as shown in FIG 2C: modifies **C1** TestMsg to include queries on rate and number of wireless devices served by cell; calculate **C2** the effective bandwidth of GPRS/3G; time-stamp and send **C3** the test messages (TestMsg) generated in step **12** to an Engaging Server (ES) on the Internet via the

GPRS/3G; check **C4** whether a responding message (RespMsg) is received from the ES, where the ES receives the TestMsg, generates the RespMsg, and time-stamp and send the RespMsg back to the plug-in bearer optimizer program; calculate **C5** the latency experienced by the Internet connection via GPRS/3G using the time stamps on the TestMsg and RespMsg if the RespMsg is received; conclude **C6** that GPRS/3G connection to the Internet is not possible if no RespMsg is not received because the GPRS/3G server's network connectivity is absent; and then proceed from both **B5** and **B6** to summarize **19** GPRS/3G Internet connectivity.

[0034] This TestMsg serves three purposes: First, it activates the ES to query the number of GPRS / 3G users within the cell in which the mobile device is connected and generate a Response Message (RespMsg) back to the plug-in. From this, the effective bandwidth is calculated. Second, it also activates the ES to query the latest GPRS / 3G rates from the Telco and send this information back to the plug-in within the same RespMsg, time stamped. From this, the cost will be calculated. Third, the time stamps facilitate the calculation of round trip time and hence the latency experienced by the mobile device using the GPRS / 3G service. The TestMsg is used in both Bluebooth's and WLAN's cases to calculate latency. For the GPRS/3G case, it is also used to query the number of devices served by the current cell and the rate of GPRS/3G charges.

[0035] Then the program consolidates **20** the statistics collected by the plug-in and displays to the user. Plug-in will proceed to fetch information according to the URL keyed in by the user using the optimal bearer.

[0036] In one embodiment of the present invention, plug-in continues to monitor and calculates which bearer would satisfy the optimizing factor(s) required by a user.

[0037] Now there is provided more details of the test messages and responding messages suitable for the present invention. The design of the TestMsg and RespMsg are as follows:

[0038]

START	LENGTH	STYPE	MTYPE	MESSAGE
8 bits	8 bits	8 bits	8 bits	n bytes

[0039] The START field defines a unique 8-bit pattern to identify the start of the message. LENGTH specifies the length of the MESSAGE in Bytes, excluding the first 4

bytes. STYPE specifies the system type that is running the application. There are currently 3 defined system types: Bluetooth Client, WLAN Client, and GPRS / 3G Client. MTYPE defines the message type that the application is sending. Currently defined message types are: Query: TestMsg that will be generated as a query in the peer's plug-in; Response: RespMsg that will be generated by the ES to reply to the plug-in. 8 bits for STYPE allows a definition of 256 types of devices. Current design specification defines 3 types as mentioned above. 8 bits for MTYPE allows a definition of 256 types of messages. There is no pre-defined format for the MESSAGE field except that its content will be in byte-array form. This provides flexibility and scalability in the type of content to be sent.

[0040] The program can be installed on a compatible mobile device running the Symbian OS. Mobile devices with other OS can be deployed with these functionalities when the program is available.

[0041] While the present invention has been described with reference to particular embodiments, it will be understood that the embodiments are illustrative and that the invention scope is not so limited. Alternative embodiments of the present invention will become apparent to those having ordinary skill in the art to which the present invention pertains. Such alternate embodiments are considered to be encompassed within the spirit and scope of the present invention. Accordingly, the scope of the present invention is described by the appended claims and is supported by the foregoing description.

CLAIMS

What is claimed is:

1. A process for enabling a wireless devices with multiple bearer channels to select an optimum bearer for transmission of data to/from the Internet via wireless networks, said process comprising:
 - inputting into a wireless device selectable factors for selecting the optimum bearer channel for data to be transmitted;
 - preparing a test message in a format containing preselected characteristics of the to-be-transmitted data and at least one of the selectable factors for selecting the optimum bearer channel;
 - determining the availability of supported bearer channels within the range of the wireless device;
 - determining the optimum bearer channel by checking every available bearer channels using the test message; and
 - transmitting the to-be-transmitted data between the wireless device and Internet via the optimum bearer channel;
 - thereby the transmission of the to-be-transmitted data is performed by real-time determination of the optimum bearer channel using the test message containing preselected characteristics of the to-be-transmitted data and at least one of the selectable factors for selecting the optimum bearer channel.
2. The process of claim 1, wherein the selectable factors are one or more of the factors selected from the group consisting of packetisation, current network congestion, effective bandwidth, network reliability, cost, and type of content.
3. The process of claim 1, wherein any of the multiple bearer channels can be made as the default bearer channel.
4. The process of claim 1, wherein the multiple bearer channels include one or more bearer channels selected from the group consisting of WLAN Access point; Bluetooth Server; 3G Telecommunications/GPRS Telecommunications.

5. The process of claim 1, wherein the step of preparing a test message prepares the test message according to the following format: START-LENGTH -MESSAGE - STYPE - MTYPE.

6. The process of claim 1, wherein the steps of determining the availability of supported bearer channels within the range of the wireless device and determining the optimum bearer channel by checking every available bearer channels according to the inputted selectable factors perform the following operations for each bearer channel when they are selected as first, second and so on:
 - checking on whether the first selected bearer channel is present; wherein, if no, going to the second selected bearer channel;
 - checking on whether the first selected bearer channel is supported; wherein, if no, going to the second selected bearer channel;
 - querying the number of clients served by the selected bearer channel;
 - calculating the effective bandwidth;
 - time-stamping and sending the test message (TestMsg) to an Engaging Server (ES) on the Internet via the selected bearer channel;
 - checking whether a responding message (RespMsg) is received from the ES;
 - calculating the latency experienced by the Internet connection via the selected bearer channel using the time stamps on the TestMsg and RespMsg; and
 - summarizing the conclusions of each selectable factors for the selected bearer channel;

thereby after all bearers have been checked, the wireless device will select the optimum bearer channel for sending/receiving the information via Internet.

7. The process of claim 6, wherein the step of determining the optimum bearer channel by checking every available bearer channels according to the inputted selectable factors performs the further following operations: determining the number of client devices that are currently served by the selected bearer channel.

8. A wireless device having multiple bearer channels, comprising:

an electronic memory medium within which a microprocessor-executable bearer optimizer program is installed, wherein the microprocessor-executable bearer optimizer program executes the following operations:

inputting into a wireless device selectable factors for selecting an optimum bearer channel for data to be transmitted;

preparing a test message in a format containing preselected characteristics of the to-be-transmitted data and at least one of the selectable factors for selecting the optimum bearer channel;

determining the availability of supported bearer channels within the range of the wireless device;

determining the optimum bearer channel by checking every available bearer channels using the test message; and

transmitting the to-be-transmitted data between the wireless device and Internet via the optimum bearer channel;

thereby the transmission of the to-be-transmitted data is performed by real-time determination of the optimum bearer channel using the test message containing preselected characteristics of the to-be-transmitted data and at least one of the selectable factors for selecting the optimum bearer channel.

9. The wireless device of claim 8, wherein the selectable factors are one or more of the factors selected from the group consisting of packetisation, current network congestion, effective bandwidth, network reliability, cost, and type of content.

10. The wireless device of claim 8, wherein any of the multiple bearer channels can be made as the default bearer.

11. The wireless device of claim 8, wherein the multiple bearer channels include one or more bearer channels selected from the group consisting of WLAN Access point; Bluetooth Server; 3G Telecommunications/GPRS Telecommunications.

12. The wireless device of claim 8, wherein the step of preparing a test message prepares the test message according to the following format: START-LENGTH - MESSAGE - STYPE - MTYPE.

13. The wireless device of claim 8, wherein the steps of determining the availability of supported bearer channels within the wireless device and determining the optimum bearer channel by checking every available bearer channels according to the inputted selectable factors perform the following operations for each bearer when they are selected as first, second and so on:

- checking on whether the first selected bearer channel is present; wherein, if no, going to the second selected bearer channel;

- checking on whether the first selected bearer channel is supported; wherein, if no, going to the second selected bearer channel;

- querying the number of clients served by the selected bearer channel;

- calculating the effective bandwidth;

- time-stamping and sending the test message (TestMsg) to an Engaging Server (ES) on the Internet via the selected bearer channel;

- checking whether a responding message (RespMsg) is received from the ES;

- calculating the latency experienced by the Internet connection via the selected bearer channel using the time stamps on the TestMsg and RespMsg; and

- summarizing the conclusions of each selectable factors for the selected bearer channel;

- thereby after all bearers have been checked, the wireless device will select the optimum bearer channel for sending/receiving the information via Internet.

14. The wireless device of claim 13, wherein the step of determining the optimum bearer channel by checking every available bearer channels according to the inputted selectable factors performs the further following operations: determining the number of client devices that are currently served by the selected bearer channel.

15. The wireless device of claim 8, wherein the bearer optimizer program is installed as a wireless browser plug-in that will be activated whenever the wireless device launches its

wireless browser; thereby once activated, the bearer optimizer program will in-operation select the optimum bearer for data transmission according to the criteria provided by the user.

16. The wireless device of claim 8, wherein the wireless device is a PDA, mobile phone, wireless-supported notebook and PC, and any wireless electronic device

17. A wireless communication system comprising:

a wireless device;

multiple wireless communication bearers; and

an engaging server; wherein the wireless device can access the engaging server via Internet through the multiple wireless communication bears so that information can be efficiently transmitted between the wireless device and the engaging server; and wherein the wireless device comprises:

an electronic memory medium within which a microprocessor-executable bearer optimizer program is installed, wherein the microprocessor-executable bearer optimize program executes the following operations:

displaying and inputting selectable factors for selecting an optimum bearer channel;

preparing a test messages;

determining the availability of supported bearer channels within the range of the wireless device;

determining the optimum bearer channel by checking every available bearer channels according to the inputted selectable factors; and

transmitting information between the wireless device and Internet via the optimum bearer channel.

18. The wireless communication system of claim 17, wherein the selectable factors are one or more of the factors selected from the group consisting of packetisation, current network congestion, effective bandwidth, network reliability, cost, and type of content.

19. The wireless communication system of claim 17, wherein any of the multiple bearer channels can be made as the default bearer channel.

20. The wireless communication system of claim 17, wherein the multiple bearer channels include selected from the group consisting of WLAN Access point; Bluetooth Server; 3G Telecommunications/GPRS Telecommunications.
21. The wireless communication system of claim 17, wherein the step of preparing a test message prepares the test message according to the following format: START-LENGTH-MESSAGE - STYPE – MTYPE.
22. The wireless communication system of claim 17, wherein the steps of determining the availability of supported bearer channels within the wireless device and determining the optimum bearer by checking every available bearer channels according to the inputted selectable factors perform the following operations for each bearer when they are selected as first, second and so on:
 - checking on whether the first selected bearer channel is present; wherein, if no, going to the second selected bearer channel;
 - checking on whether the first selected bearer channel is supported; wherein, if no, going to the second selected bearer channel;
 - querying the number of clients served by the selected bearer channel;
 - calculating the effective bandwidth;
 - time-stamping and sending the test message (TestMsg) to an Engaging Server (ES) on the Internet via the selected bearer channel;
 - checking whether a responding message (RespMsg) is received from the ES;
 - calculating the latency experienced by the Internet connection via the selected bearer channel using the time stamps on the TestMsg and RespMsg; and
 - summarizing the conclusions of each selectable factors for the selected bearer channel;

thereby after all bearers have been checked, the wireless device will select the optimum bearer channel for sending/receiving the information via Internet.
23. The wireless communication system of claim 22, wherein the step of determining the optimum bearer by checking every available bearer channels according to the inputted

selectable factors performs the further following operations: determining the number of client devices that are currently served by the selected bearer channel.

24. The wireless communication system of claim 17, wherein the bearer optimizer program is installed as a wireless browser plug-in that will be activated whenever the wireless device launches its wireless browser; thereby once activated, the bearer optimizer program will in-operation select the optimum bearer channel for data transmission according to the criteria provided by the user.

25. The wireless communication system of claim 17, wherein the wireless device is a PDA, mobile phone, wireless-supported notebook and PC, and any wireless electronic device.