US 20110050704A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2011/0050704 A1

(43) Pub. Date: Mar. 3, 2011

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(54) METHOD AND SYSTEM FOR ZOOMABLE ATTACHMENT HANDLING ON A PORTABLE ELECTRONIC DEVICE

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(21) Appl. No.: **12/871,165**

(22) Filed: **Aug. 30, 2010**

Related U.S. Application Data

(63) Continuation of application No. 11/554,755, filed on Oct. 31, 2006, now Pat. No. 7,812,852.

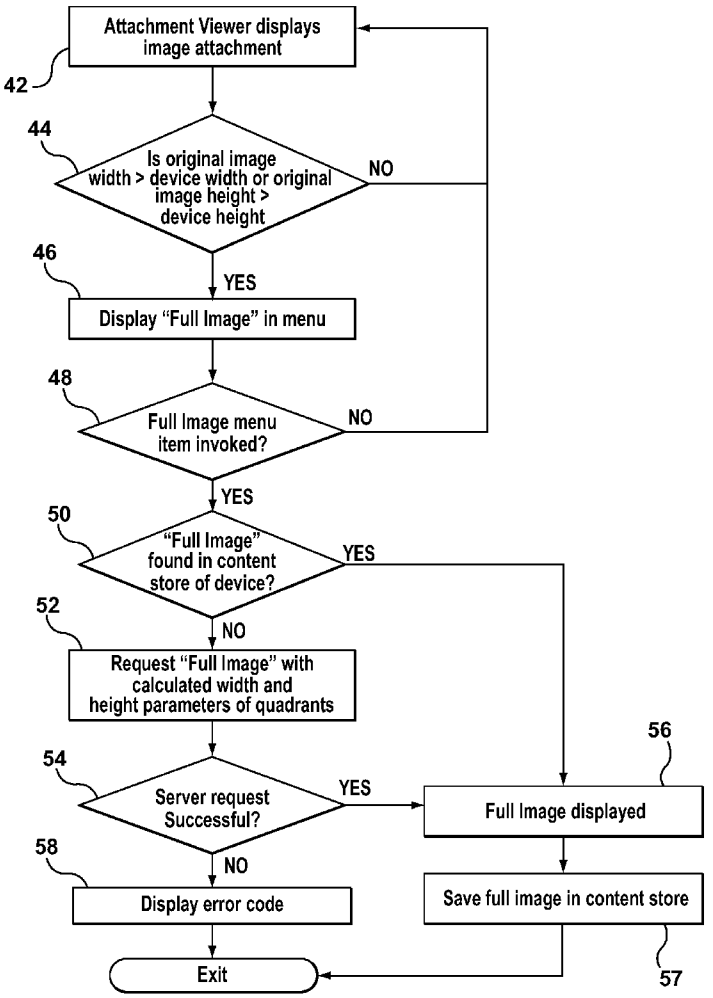
Publication Classification

(51) **Int. Cl.**
G06T 11/20 (2006.01)

(52) **U.S. Cl.** **345/440**

(57) **ABSTRACT**

A method for viewing a full image of a server stored original attachment on a portable electronic device including: building a graph structure within the server representing a map of the original image, downloading and displaying a re-sized image from the server to the portable electronic device, the original image exceeding an image size limit of the portable electronic device indicative of screen size of the portable electronic device, dividing the original image into four individual quadrants and calculating width and height parameters of the four individual quadrants, sending a request from the portable electronic device to the server to enlarge the image displayed on the device based on the width and height parameters, the request including the image size limit, retrieving and traversing the graph structure within the server to locate a separate image component constructed for the image size limit, collecting image binary data from the separate image component and modifying the image binary data based on the width and height parameters to create the full image of the original image, downloading each of the four resized quadrants to the attachment viewer and assembling the resized quadrants to display the full image of the original image on the portable electronic device.



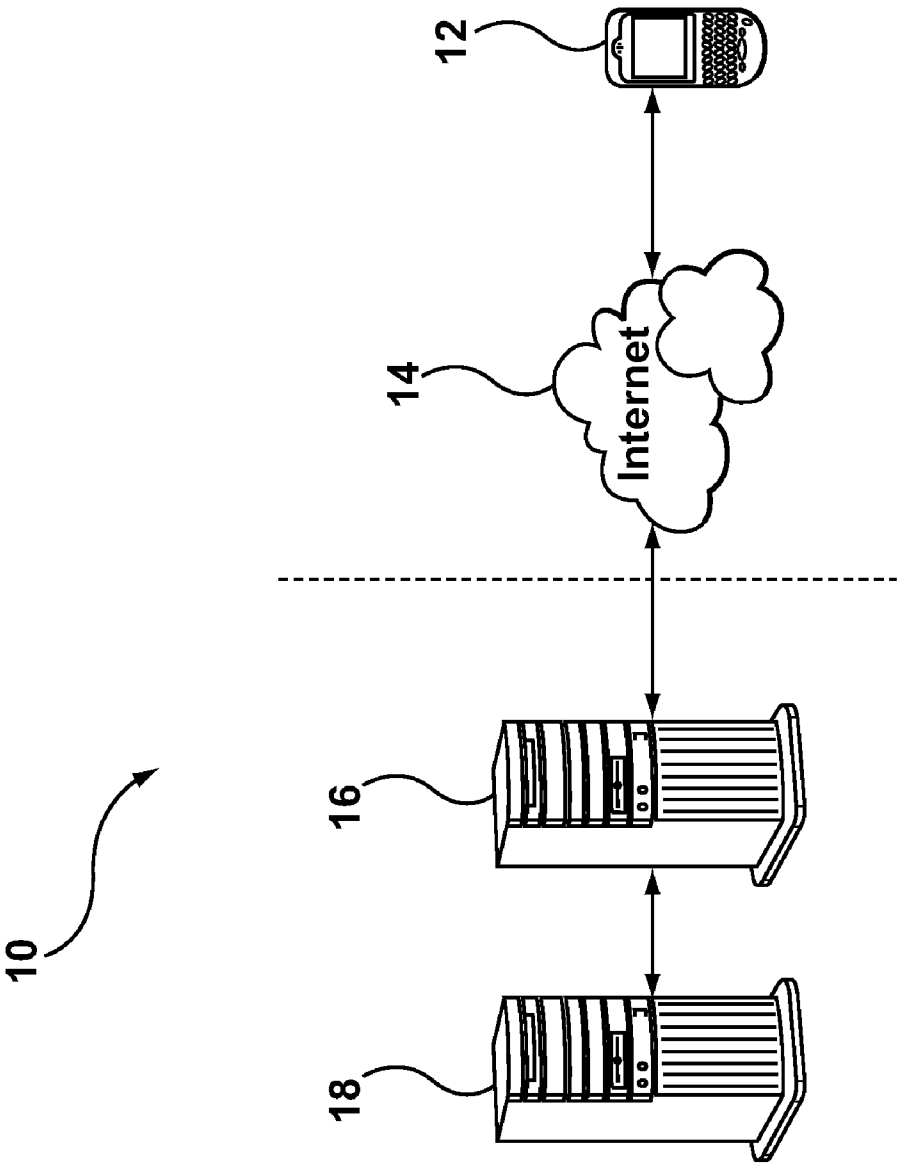


FIG. 1

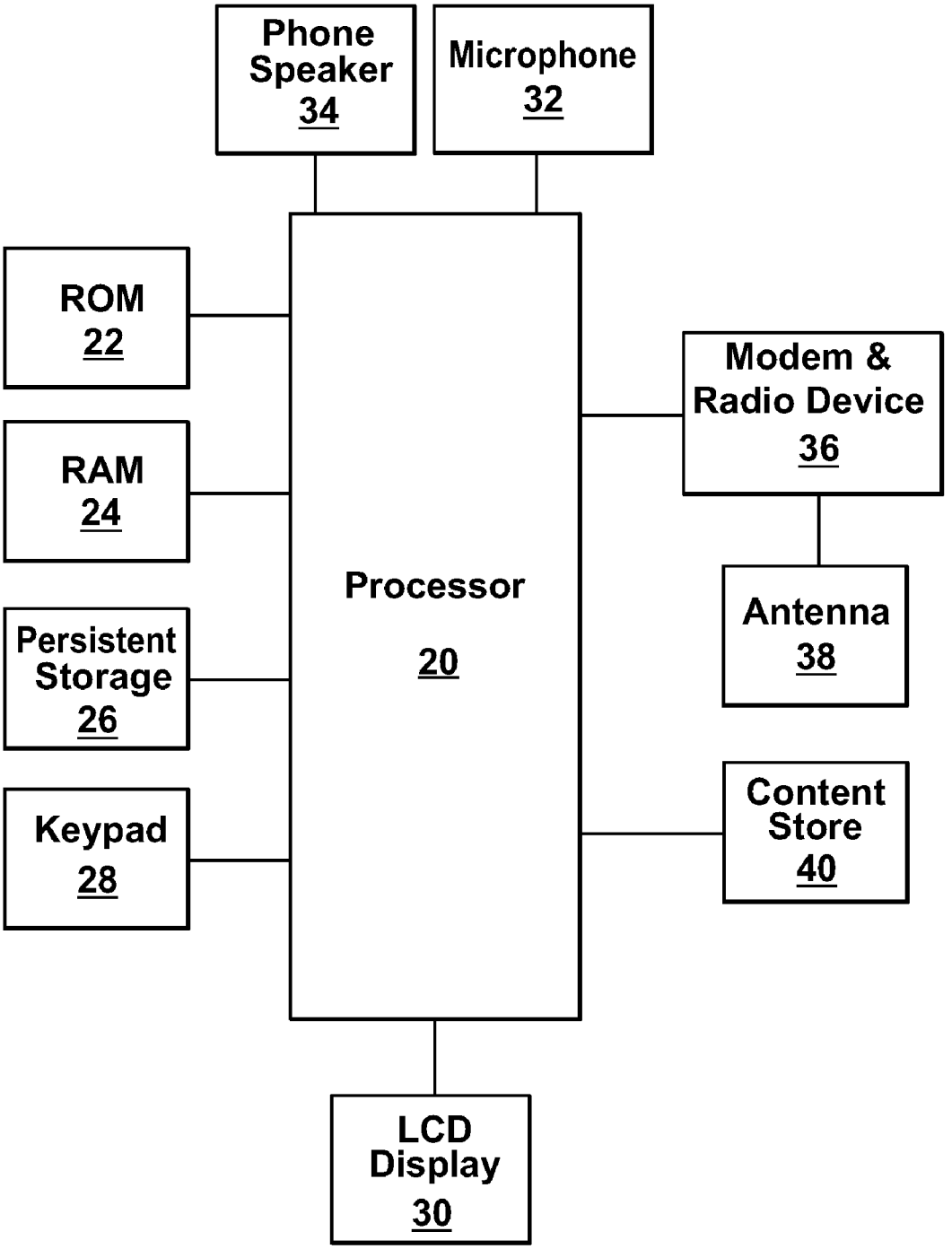

Phone Speaker 34
Microphone 32
ROM 22
RAM 24
Persistent Storage 26
Keypad 28
Processor 20
Modem & Radio Device 36
Antenna 38
Content Store 40
LCD Display 30

FIG. 2

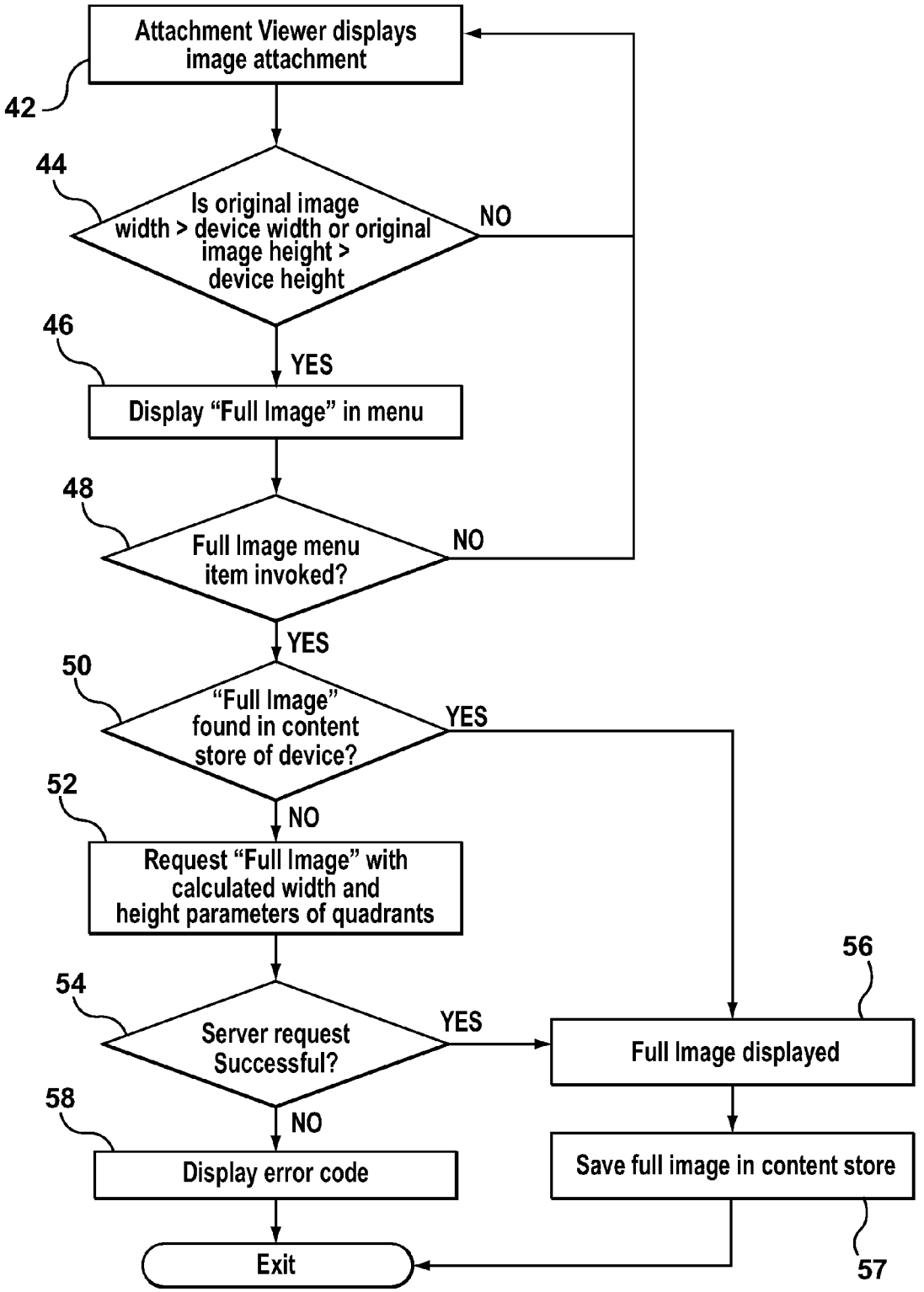

Attachment Viewer displays image attachment
42
44
Is original image width > device width or original image height > device height
NO
YES
46
Display "Full Image" in menu
48
Full Image menu item invoked?
NO
YES
50
"Full Image" found in content store of device?
YES
NO
52
Request "Full Image" with calculated width and height parameters of quadrants
54
Server request Successful?
YES
NO
56
Full Image displayed
Save full image in content store
57
58
Display error code
Exit

FIG. 3

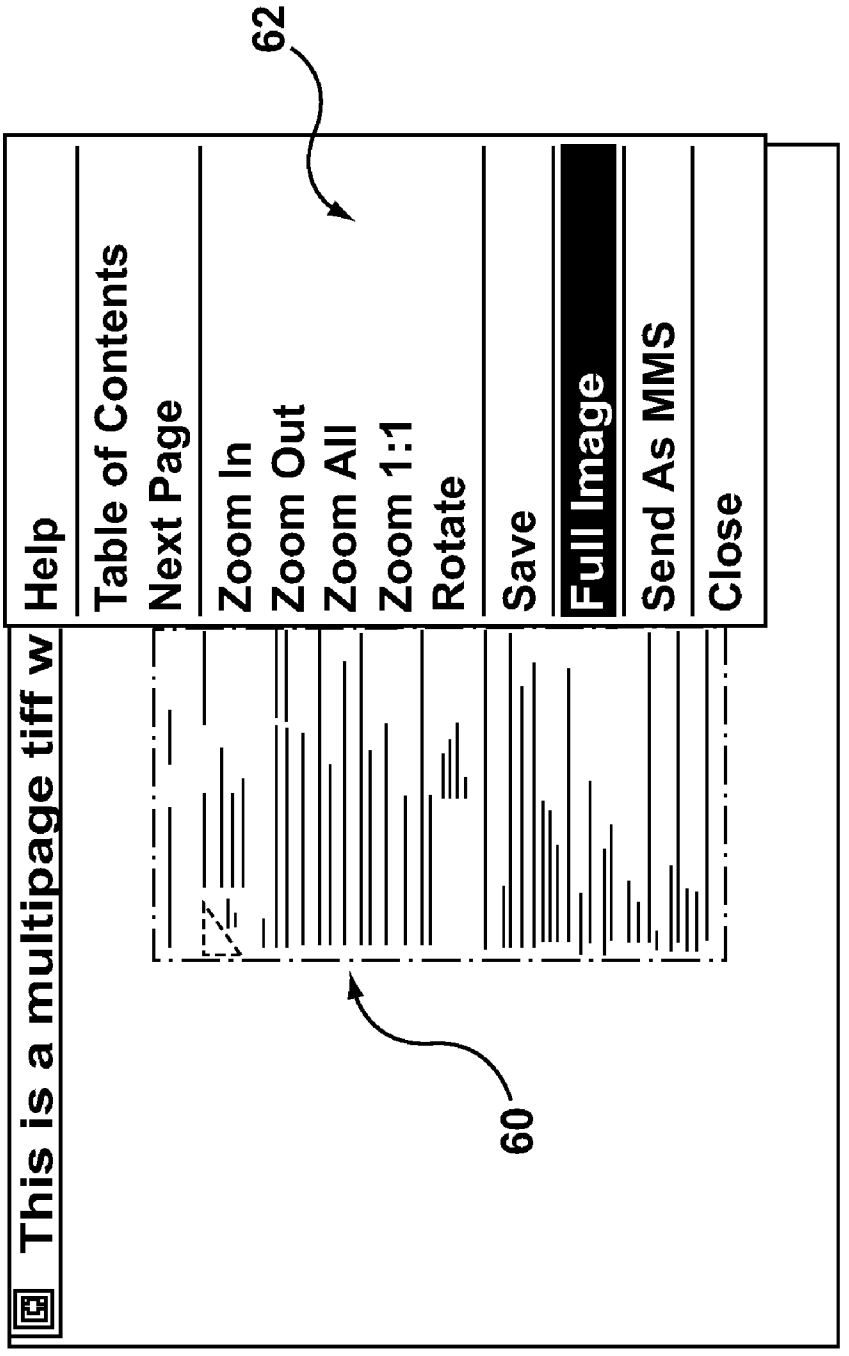

62
This is a multipage tiff w
Help
Table of Contents
Next Page
Zoom In
Zoom Out
Zoom All
Zoom 1:1
Rotate
Save
Full Image
Send As MMS
Close
60

FIG. 4

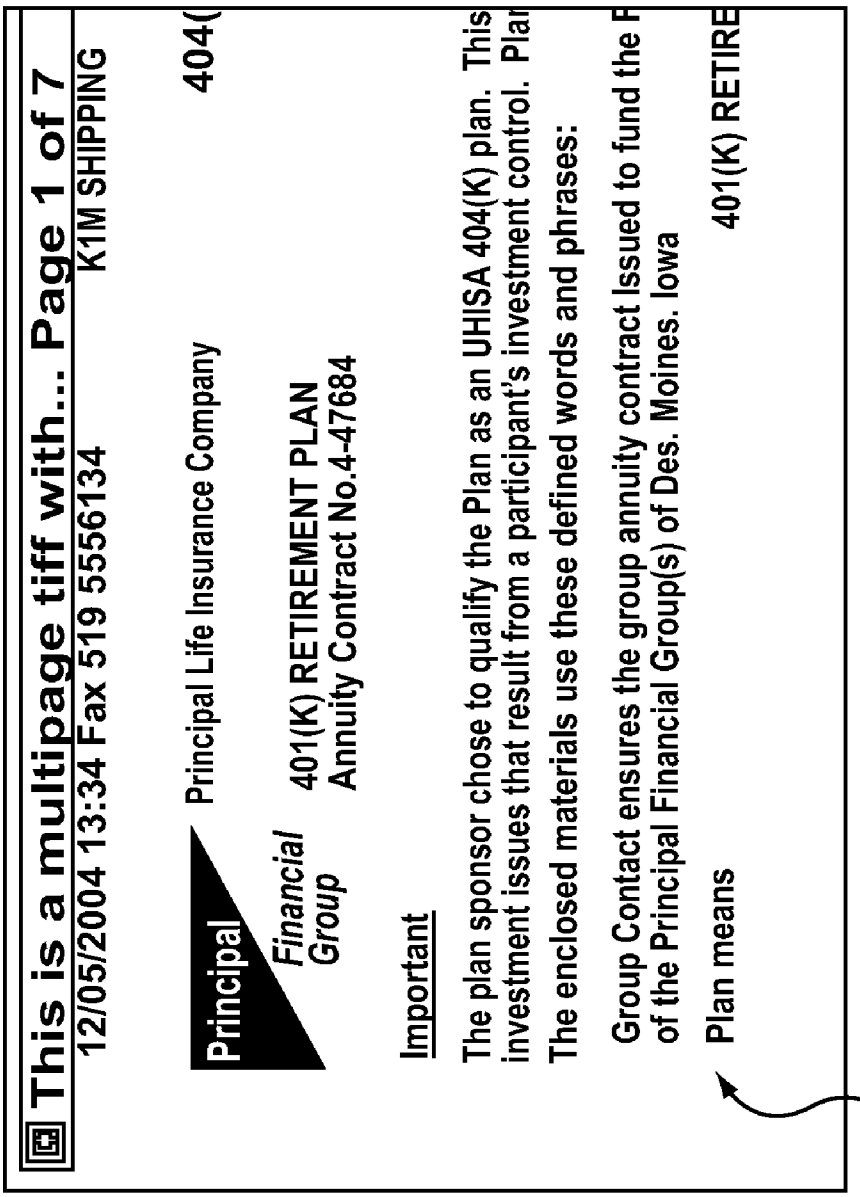

This is a multipage tiff with... Page 1 of 7
12/05/2004 13:34 Fax 519 5556134 K1M SHIPPING
Principal
Financial Group
Principal Life Insurance Company
404(
401(K) RETIREMENT PLAN
Annuity Contract No.4-47684
Important
The plan sponsor chose to qualify the Plan as an UHISA 404(K) plan. This investment issues that result from a participant's investment control. Plan
The enclosed materials use these defined words and phrases:
Group Contact ensures the group annuity contract Issued to fund the P of the Principal Financial Group(s) of Des. Moines. Iowa
Plan means
401(K) RETIRE
64

FIG. 5

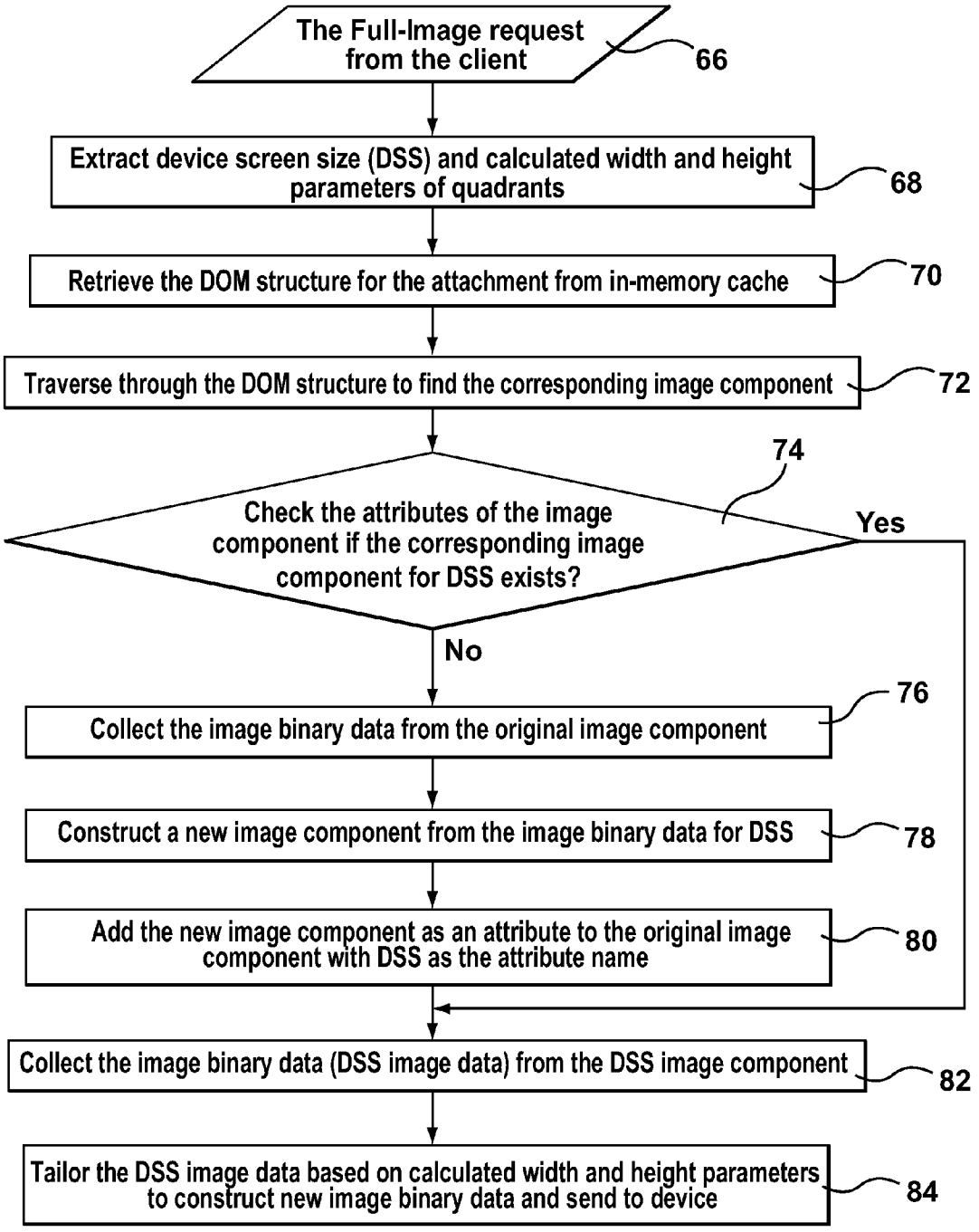

The Full-Image request from the client
66
Extract device screen size (DSS) and calculated width and height parameters of quadrants
68
Retrieve the DOM structure for the attachment from in-memory cache
70
Traverse through the DOM structure to find the corresponding image component
72
74
Check the attributes of the image component if the corresponding image component for DSS exists?
Yes
No
Collect the image binary data from the original image component
76
Construct a new image component from the image binary data for DSS
78
Add the new image component as an attribute to the original image component with DSS as the attribute name
80
Collect the image binary data (DSS image data) from the DSS image component
82
Tailor the DSS image data based on calculated width and height parameters to construct new image binary data and send to device
84

FIG. 6

METHOD AND SYSTEM FOR ZOOMABLE ATTACHMENT HANDLING ON A PORTABLE ELECTRONIC DEVICE

FIELD

[0001] The present application relates to displaying attachments on a portable electronic device and, in particular, a method for requesting and viewing an attachment image on a portable electronic device.

BACKGROUND

[0002] Wireless technology has made it possible for email messages to be received and displayed by various portable electronic devices including Personal Digital Assistants (PDAs), for example. Sending email messages including attachments, such as photographs or scanned documents, is becoming increasingly popular, however, most attachments are formatted for a rich desktop or printer experience and generally require a desktop PC with a large screen display for proper viewing. As such, viewing these attachments on the small screens of most portable electronic devices presents a challenge.

[0003] Currently, when a user makes a request to view an attachment, the request is received at a server where the attachment is scaled down to fit on the portable electronic device screen and then returned to the portable electronic device. When viewing high resolution attachments, such as scanned documents, for example, details of the scaled down image are often difficult to distinguish. In order to view text or other details of the scaled down image, the user may enlarge a desired portion by selecting an appropriate menu option. Each time the user requests enlargement of an area of the scaled down image, the request is sent to the server and a higher resolution image of the selected area is returned to the portable electronic device. Often, the enlargement process must be performed multiple times before the user is able to view the details of the entire scanned document.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The embodiments will be better understood with reference to the following Figures in which like numerals denote like parts and in which:

[0005] FIG. **1** is a schematic diagram of a wireless communication system;

[0006] FIG. **2** is a block diagram of components of a portable electronic device according to an embodiment;

[0007] FIG. **3** is a flowchart depicting device side operation for viewing an attachment on the portable electronic device of FIG. **2**;

[0008] FIG. **4** is a screen shot of the portable electronic device of FIG. **2**;

[0009] FIG. **5** is another screen shot of the portable electronic device of FIG. **2**;

[0010] FIG. **6** is a flowchart depicting server side operation for viewing an attachment on the portable electronic device corresponding to the device side flowchart of FIG. **3**.

DETAILED DESCRIPTION

[0011] In one aspect there is provided a method for viewing a full image of a server stored original attachment on a portable electronic device including: building a graph structure within the server representing a map of the original image, downloading and displaying a re-sized image from the server to the portable electronic device, the original image exceeding an image size limit of the portable electronic device indicative of screen size of the portable electronic device, dividing the original image into four individual quadrants and calculating width and height parameters of the four individual quadrants, sending a request from the portable electronic device to the server to enlarge the image displayed on the device based on the width and height parameters, the request including the image size limit, retrieving and traversing the graph structure within the server to locate any corresponding image component for the original image and, upon locating the corresponding image component iterating through attributes of the image component to determine if a separate image component has been constructed for the image size limit, in the event that the separate image component has not been constructed then collecting image binary data from the original image within the server, constructing a new image component from the binary data and caching the new image component as an attribute of the original image in the graph structure, collecting further image binary data from one of either the new image component or the separate image component and modifying the further binary data based on the width and height parameters to provide four resized quadrants of the original image, downloading each of the four resized quadrants to the attachment viewer and assembling the resized quadrants to display the full image of the original image on the portable electronic device.

[0012] In another aspect there is provided a method for viewing a full image of a server stored original attachment on a portable electronic device including: building a graph structure within the server representing a map of the original image, downloading and displaying a re-sized image from the server to the portable electronic device, the original image exceeding an image size limit of the portable electronic device indicative of screen size of the portable electronic device, dividing the original image into four individual quadrants and calculating width and height parameters of the four individual quadrants, sending a request from the portable electronic device to the server to enlarge the image displayed on the device based on the width and height parameters, the request including the image size limit, retrieving and traversing the graph structure within the server to locate a separate image component constructed for the image size limit, collecting image binary data from the separate image component and modifying the image binary data based on the width and height parameters to create four resized quadrants of the original image, downloading each of the four resized quadrants to the attachment viewer and assembling the resized quadrants to display the full image of the original image on the portable electronic device.

[0013] In another aspect there is provided a portable electronic device including: an attachment viewer stored on the portable electronic device, the attachment viewer for dividing an original image attachment into four quadrants and requesting resized quadrants to assemble and display on the portable electronic device and an attachment server in communication with the attachment viewer, the attachment server for building a graph structure representing a map of the original image attachment and sending the resized quadrants to the attachment viewer, wherein the resized quadrants when assembled appear as a single seamless image on a display of the portable electronic device.

[0014] Referring now to FIG. **1**, a communication system **10** for a portable electronic device **12** is generally shown. The

portable electronic device **12** is operable to effect communications over a radio communications channel and communicates with a base station (not shown) while located within a coverage area that is defined by the base station. The base station is part of a wireless network that is in communication with the Internet **14**. Data is delivered to the portable electronic device **12** via wireless transmission from the base station. Similarly, data is sent from the portable electronic device **12** via wireless transmission to the base station.

[0015] It will be appreciated that the portable electronic device **12** is movable within the coverage area and can be moved to coverage areas defined by other base stations. Further, as will be understood by one of ordinary skill in the art, wireless networks include GSM/GPRS, CDPD, TDMA, iDEN Mobitex, DataTAC networks, EDGE or UMTS and broadband networks such as Bluetooth and variants of 802.11.

[0016] A server **18** handles wireless client requests from the portable electronic device **12**. A firewall, or proxy server, **16**, is provided between the server **18** and the Internet **14**. The server **18** further operates as an attachment server, which communicates with an email client and an attachment viewer of the portable electronic device **12** to allow a user to view attachments that are received in email messages. While only one server **18** is shown for illustration purposes, a person skilled in the art will understand that the attachment server may alternatively be a separate server.

[0017] Referring now to FIG. **2**, a block diagram of certain components within the portable electronic device **12** is shown. In the present embodiment, the portable electronic device **12** is based on the computing environment and functionality of a wireless personal digital assistant (PDA). It will be understood, however, that the portable electronic device **12** is not limited to wireless personal digital assistants. Other portable electronic devices are possible, such as smart telephones, and laptop computers.

[0018] The portable electronic device **12** is based on a microcomputer including a processor **20** connected to a read-only-memory (ROM) **22** that contains a plurality of applications executable by the processor **20** that enables each portable electronic device **12** to perform certain functions including, for example, PIN message functions, SMS message functions and cellular telephone functions. The processor **20** is also connected to a random access memory unit (RAM) **24** and a persistent storage device **26** which are responsible for various non-volatile storage functions of the portable electronic device **12**. The processor **20** receives input from various input devices including a keypad **28**. The processor **20** outputs to various output devices including an LCD display **30**. A microphone **32** and phone speaker **34** are connected to the processor **20** for cellular telephone functions. The processor **20** is also connected to a modem and radio device **36**. The modem and radio device **36** is used to connect to wireless networks and transmit and receive voice and data communications through an antenna **38**. A content store **40**, which is generally a file storage system for the portable electronic device **12**, is also provided.

[0019] Referring to FIG. **3**, a method for viewing an attachment on portable electronic device **12** according to an embodiment is generally shown. First (step **42**), the attachment viewer displays a resized image of the attachment on the display **30** of portable electronic device **12**. An example of a resized image **60** as it appears on the display **30** is shown in FIG. **4**. The resized image **60** corresponds to a first page of a scanned document that the portable electronic device **12** received in an email message in TIFF format. As shown, the text of the resized image **60** is difficult to read due to the small size thereof.

[0020] Prior to step **42**, the attachment server performs the resize operation on the original image and downloads the resized image to the device **12**. In order to perform the resize operation, the attachment server first builds a Document Object Model (DOM) by parsing the attachment document. In this manner, a graph structure is built within the server representing a map of the original image. The original image is then resized based on the requesting device image size limit, or device screen size width and height (in pixels). DOM structure is disclosed in United States Patent Application Nos. 2006/0055693 and 2002/0161796, which are herein incorporated by reference.

[0021] At step **44**, the attachment viewer determines if the original image width is greater than the device display width and/or if the original image height is greater than the device display height. If one or both of the original image width and original image height are greater than the display width and display height, respectively, then the attachment viewer moves to step **46** and displays a "full image" option in an attachment viewer menu **62**, which is shown in FIG. **4**. If both the width and height of the original image are less than those of the device display, the attachment viewer returns to step **42**, the execution logic of FIG. **3** is terminated and the "full image" option does not appear in the attachment viewer menu **62**.

[0022] As indicated at step **50**, if the user invokes the "full image" option from the menu **62** (step **48**), the attachment viewer first determines if a full image for the particular attachment was previously requested from the attachment server. Previously requested full images are stored locally on the portable electronic device **12** in the content store **40**. Therefore, the attachment viewer searches the content store **40** and if corresponding full image data is available for the requested image, the attachment viewer displays the full image, as indicated at step **56**.

[0023] If no corresponding full image data is found, the attachment viewer requests the "full image" from the attachment server. The original image is divided into four quadrants, or tiles, by the attachment viewer with each quadrant representing approximately % of the original image. The request that is sent to the attachment server includes the device screen size as well as calculated width and height parameters of each of four individual quadrants of the original image, as indicated at step **52**. If the user does not invoke the "full image" option, the attachment viewer returns to step **42** and simply continues to display the resized image.

[0024] If the attachment server successfully resizes each of the four quadrants of the attachment image, the quadrants are returned to the attachment viewer, assembled together and displayed on display **30** of the portable electronic device **12** to provide the appearance of a single image, as indicated at step **56**. At step **57**, the quadrant data is saved in the content store **40** and then the execution logic of FIG. **3** is complete. If the attachment server is unable to execute the "full image" option, an error code is displayed instead, as indicated at step **58**.

[0025] Successful execution of the "full image" option results in an image being displayed in the attachment viewer that is larger and has a higher resolution than the image that is displayed at step **42**. An example of a larger, higher resolution

full image **64** is shown in FIG. **5**. Once the full image has been displayed, image manipulation operations are available to the user. The image appears seamless on the display **30** and movement between quadrants is undetectable by the user. Image manipulation operations include zoom, pan, rotate, enhance and save, for example. These operations are performed in a manner that is known in the art and generally include using a track wheel and arrow key, for example, or another selection device of the portable electronic device **12**.

[0026] Referring now to FIG. **6**, server side operation for the method for viewing an attachment on portable electronic device **12** of FIG. **3** is generally shown. At step **66**, the attachment server receives the "Full Image" request from the attachment viewer of the portable electronic device **12**. At step **68**, the attachment server extracts the device screen size (DSS) and calculated width and height parameters of each quadrant from the attachment viewer request. The attachment server then retrieves the DOM structure for the attachment from in-memory document DOM cache, as indicated at step **70**. Once the DOM has been retrieved, the attachment server traverses through the DOM structure to determine the corresponding image component in the DOM for that image, as indicated at step **72**. At step **74**, the attachment server iterates through the attributes of the corresponding image component to determine if a separate image component specifically for that screen size has already been constructed. The separate image component contains the same graphic information as the original image but is usually of a smaller size than the original image (generally less than or equal to the device screen size) and thus consumes much less memory (usually in ratio of 1:15 to 1:20).

[0027] If the separate image component does not exist, the attachment server collects the image binary data from the original image component in memory, as indicated at step **76**, and constructs a new image component from the binary data, as indicated at step **78**. At step **80**, the attachment server caches the DSS image component as an attribute of the original image component in the DOM structure. The DSS binary image data is collected at step **82** and then tailored to create new binary image data based on the calculated width and height parameters of each of the four quadrants and the new binary image data is returned to the attachment viewer of the portable electronic device **12**, as indicated at step **84**.

[0028] In operation, the user of the portable electronic device **12** receives an email message having an attachment and opens the attachment in the attachment viewer. The attachment appears as shown in FIG. **4** with details that are difficult for the user to distinguish. If the original attachment image is larger than the display **30** of the portable electronic device **12**, the "full image" option is available in the attachment viewer menu **62**. The user then selects the "full image" option and if the "full image" option has not been previously requested for this particular image, the attachment viewer sends a request to the attachment server to provide a full image. The image is divided into four quadrants and the attachment viewer request includes width and height parameters for each of the four quadrants that are calculated by the attachment viewer. The attachment server, upon receiving the attachment viewer request, constructs four new enlarged quadrants of the original image and returns the four quadrants to the attachment viewer. The quadrants are then assembled together and the full image is presented on display **30** and saved in the content store **40** of the portable electronic device **12**.

[0029] A specific embodiment of the present embodiment has been shown and described herein. However, modifications and variations may occur to those skilled in the art. For example, although the portable electronic device **12** has been described having cellular telephone capabilities, the described embodiment is not limited to portable electronic devices having both cellular telephone and email capabilities. A portable electronic device having email capabilities but not cellular telephone capabilities may also be used. All such modifications and variations are believed to be within the sphere and scope of the present embodiment.

What is claimed is:

1. A server-side method for viewing a full image of a server stored original attachment on a portable electronic device comprising:

building a graph structure within said server representing a map of said original image;

transmitting a re-sized image from said server to said portable electronic device for display, said original image exceeding an image size limit of said portable electronic device, said image size limit indicative of screen size of said portable electronic device, wherein said portable electronic device divides said original image into four individual quadrants and calculates width and height parameters of said four individual quadrants;

receiving a request from said portable electronic device to enlarge the re-sized image displayed on said device based on said width and height parameters, said request including said image size limit;

retrieving and traversing said graph structure within the server to locate any corresponding image component for said original image and, upon locating said corresponding image component iterating through attributes of the image component to determine if a separate image component has been constructed for said image size limit;

in the event that said separate image component has not been constructed then collecting image binary data from said original image within said server, constructing a new image component from said binary data and caching said new image component as an attribute of the original image in said graph structure;

collecting further image binary data from one of either said new image component or said separate image component and modifying said further binary data based on said width and height parameters to provide four resized quadrants of said original image;

transmitting each of said four resized quadrants to said portable electronic device for assembly and display of said full image of said original image.

2. The method of claim **1**, wherein an original image width exceeds a width of said image size limit and an original image height exceeds a height of said image size limit.

3. The method of claim **1**, wherein said graph structure is a Document Object Model (DOM).

4. A server for implementing a server-side operation for viewing a full image of a server stored original attachment on a portable electronic device, said server comprising:

an attachment server enabled to:

build a graph structure representing a map of said original image;

transmit a re-sized image to said portable electronic device for display, said original image exceeding an image size limit of said portable electronic device, said image size limit indicative of a screen size of said

portable electronic device, wherein said portable electronic device divides said original image into four individual quadrants and calculates width and height parameters of said four individual quadrants;

receive a request from said portable electronic device to enlarge the image displayed on said portable electronic device based on said width and height parameters, said request including said image size limit;

retrieve and traverse said graph structure to locate any corresponding image component for said original image and, upon locating said corresponding image component iterate through attributes of the image component to determine if a separate image component has been constructed for said image size limit;

in the event that said separate image component has not been constructed then collect image binary data from said original image, construct a new image component from said binary data and cache said new image component as an attribute of the original image in said graph structure;

collect further image binary data from one of either said new image component or said separate image component and modify said further binary data based on said width and height parameters to provide four resized quadrants of said original image; and,

transmit each of said four resized quadrants to said portable electronic device for assembly and display of said full image of said original image.

5. The server of claim **4**, wherein an original image width exceeds a width of said image size limit and an original image height exceeds a height of said image size limit.

6. The server of claim **4**, wherein said graph structure is a Document Object Model (DOM).

7. A server-side method for viewing a full image of a server stored original attachment on a portable electronic device comprising:

building a graph structure within said server representing a map of said original image;

transmitting a re-sized image from said server to said portable electronic device, said original image exceeding an image size limit of said portable electronic device, said image size limit indicative of screen size of said portable electronic device, wherein said portable electronic device divides said original image into four individual quadrants and calculates width and height parameters of said four individual quadrants;

receiving a request from the portable electronic device to enlarge the re-sized image displayed on said device based on said width and height parameters, said request including said image size limit;

retrieving and traversing said graph structure within the server to locate a separate image component constructed for said image size limit;

collecting image binary data from said separate image component and modifying said image binary data based on said width and height parameters to create four resized quadrants of said original image;

transmitting each of said four resized quadrants to said attachment viewer for assembly such that such that said full image of said original image can be displayed.

8. The method of claim **7**, wherein an original image width exceeds a width of said image size limit and an original image height exceeds a height of said image size limit.

9. The method of claim **1**, wherein said graph structure is a Document Object Model (DOM).

10. A server for implementing a server-side operation for viewing a full image of a server stored original attachment on a portable electronic device, said server comprising:

an attachment server enabled to:

build a graph structure within said server representing a map of said original image;

transmit a re-sized image from said server to said portable electronic device, said original image exceeding an image size limit of said portable electronic device, said image size limit indicative of screen size of said portable electronic device, wherein said portable electronic device divides said original image into four individual quadrants and calculates width and height parameters of said four individual quadrants;

receive a request from the portable electronic device to enlarge the re-sized image displayed on said device based on said width and height parameters, said request including said image size limit;

retrieve and traverse said graph structure within the server to locate a separate image component constructed for said image size limit;

collect image binary data from said separate image component and modify said image binary data based on said width and height parameters to create four resized quadrants of said original image;

transmit each of said four resized quadrants to said attachment viewer for assembly such that such that said full image of said original image can be displayed.

11. The server of claim **10**, wherein an original image width exceeds a width of said image size limit and an original image height exceeds a height of said image size limit.

12. The server of claim **10**, wherein said graph structure is a Document Object Model (DOM).

13. A client-side method for viewing a full image of a server stored original attachment on a portable electronic device comprising:

dividing an original image attachment into four quadrants; and

requesting resized quadrants for assembly, wherein said resized quadrants, when assembled, appear as a single seamless image on a display of said portable electronic device, and wherein said attachment viewer is enabled for communication with an attachment server enabled for:

building a graph structure representing a map of said original image attachment; and

and sending said resized quadrants to said attachment viewer.

14. The method of claim **13**, further comprising storing said full image in memory of said portable electronic device.

15. The method of claim **13**, further comprising generating a menu selection at said portable electronic device for user enabling of said full image, said menu selection being generated if said original image exceeds an image size limit.

16. A portable electronic device comprising:

an attachment viewer stored on said portable electronic device, said attachment viewer for:

dividing an original image attachment into four quadrants; and

requesting resized quadrants for assembly, wherein said resized quadrants, when assembled, appear as a single

seamless image on a display of said portable electronic device, and wherein said attachment viewer is enabled for communication with an attachment server enabled for:

building a graph structure representing a map of said original image attachment; and

and sending said resized quadrants to said attachment viewer.

17. The portable electronic device of claim **13**, further comprising a memory for storing said full image.

18. The portable electronic device of claim **13**, further comprising an input device for receiving a menu selection for user enabling of said full image, said menu selection being generated if said original image exceeds an image size limit.

* * * * *