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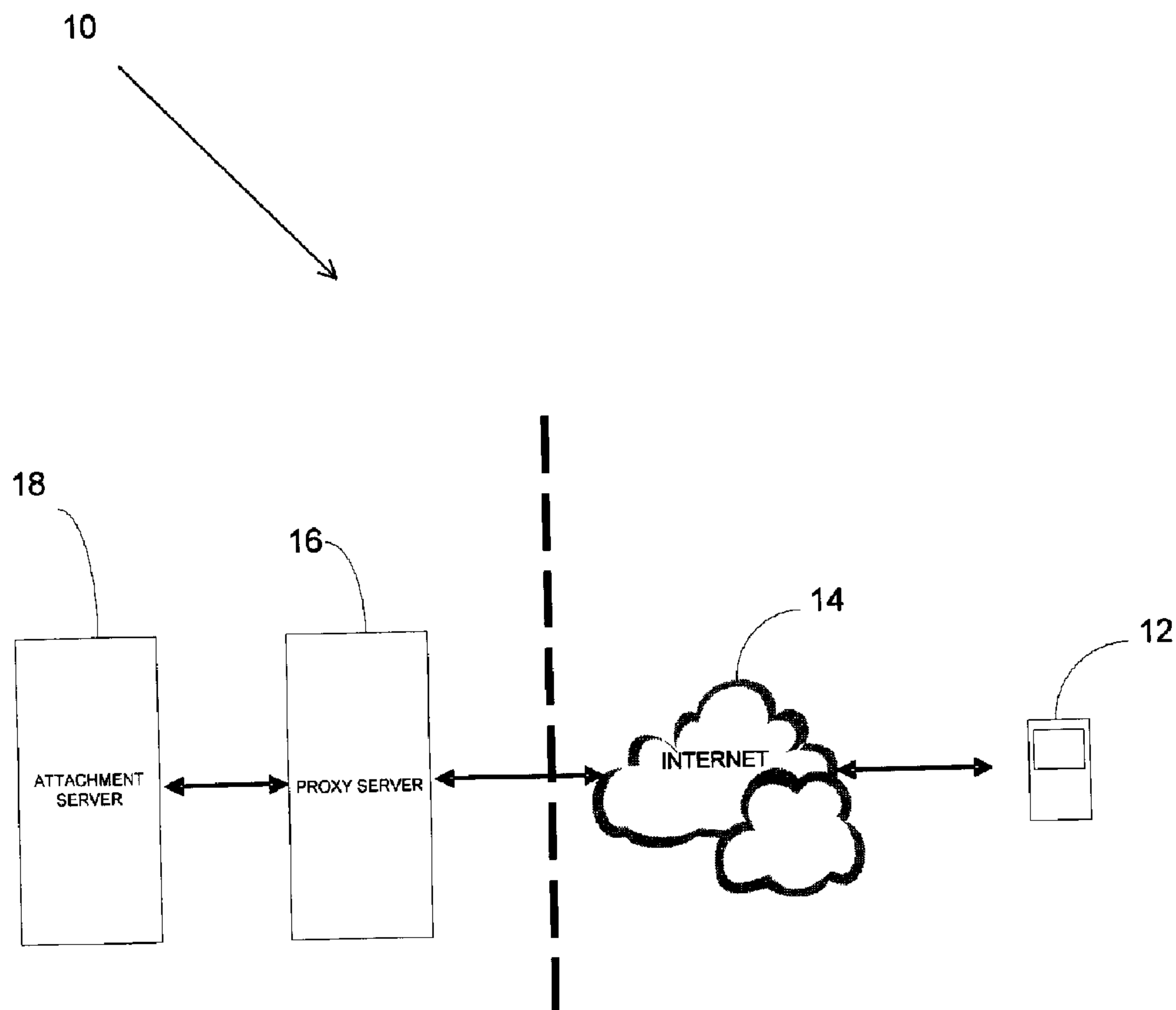
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SUR UN DISPOSITIF ELECTRONIQUE PORTATIF

(54) Title: METHOD FOR PRE-FETCHING DATA CHUNKS OF AN EMAIL ATTACHMENT ON A PORTABLE
ELECTRONIC DEVICE



(57) Abrégé/Abstract:

A method for downloading an attachment to an attachment viewer of a portable electronic device includes: sending an initial data request from said attachment viewer to a server in response to receipt of an email message including said attachment by said

(57) **Abrégé(suite)/Abstract(continued):**

portable electronic device; accessing a graph structure representing a map of said attachment from said server, said graph structure having been previously built on said server; reconstructing said graph structure in response to said initial request and encapsulating said graph structure in data having an attachment viewer readable format, said data being stored on said server; and i) downloading successive chunks of said data from said server to said attachment viewer responsive to successive user requests; ii) storing each of said successive chunks of said data on said portable electronic device prior to display thereof; iii) displaying said successive chunks of said data on said portable electronic device and automatically downloading respective next chunks of said data from said server; and iv) while said data chunks of said data remain to be downloaded from said server performing steps i) to iii).

ABSTRACT

A method for downloading an attachment to an attachment viewer of a portable electronic device includes: sending an initial data request from said attachment viewer to
5 a server in response to receipt of an email message including said attachment by said portable electronic device; accessing a graph structure representing a map of said attachment from said server, said graph structure having been previously built on said server; reconstructing said graph structure in response to said initial request and encapsulating said graph structure in data having an attachment viewer readable format,
10 said data being stored on said server; and i) downloading successive chunks of said data from said server to said attachment viewer responsive to successive user requests; ii) storing each of said successive chunks of said data on said portable electronic device prior to display thereof; iii) displaying said successive chunks of said data on said portable electronic device and automatically downloading respective next chunks of said
15 data from said server; and iv) while said data chunks of said data remain to be downloaded from said server performing steps i) to iii).

METHOD FOR PRE-FETCHING DATA CHUNKS OF AN EMAIL ATTACHMENT ON A PORTABLE ELECTRONIC DEVICE

[0001] The present disclosure relates generally to portable electronic devices operating
5 on wireless networks, in particular, to a method for receiving email attachments.

[0002] It is becoming increasingly popular to send photographs, scanned documents, slide shows, PDF documents and other types of attachments in email messages. Each attachment is provided with a filename and is linked to an email message in a manner that is well known in the art. Often, a single email message may contain multiple attachments.

10 **[0003]** On portable electronic devices, there is generally a delay between a request to view an attachment by a user and display of the attachment on the display screen of the device. The primary cause of the delay is server processing time; however, network speed is also a contributing factor. The delay can often exceed 20-30 seconds. A shorter waiting period between requesting and viewing an attachment on a portable electronic device is
15 therefore desirable.

[0004] One solution to the foregoing is to send an initial data request from the attachment viewer to a server in response to receipt of an email message including the attachment by the portable electronic device, accessing a graph structure representing a map of the attachment from the server, the graph structure having been previously built on
20 the server, reconstructing the graph structure in response to the initial request and encapsulating the graph structure in data having an attachment viewer readable format, the data being stored on the server and sending an initial chunk of the data to the attachment viewer, the initial chunk of the data being stored on the portable electronic device; wherein the initial chunk of the data is received prior to a request to view the attachment being sent to
25 the server.

[0005] Since the attachment data is divided into multiple chunks, whenever the user scrolls through the document and reaches a certain character count threshold (before the end of the latest downloaded data chunk), a request for the next available chunk is issued by the attachment viewer to the attachment server. However, the foregoing method pre-fetches
30 only the initial chunk of data and, due to the size of such data chunks and the complexity of processing the data chunks within the attachment server side, the user continues to wait several seconds before the next chunk data is available for viewing.

[0006] An example of the preparation of a DOM structure is shown in US-A-2006/0047743.

GENERAL

[0001] In one aspect there may be provided a method for downloading data onto a portable electronic device over a wireless network, wherein the data is an attachment of an email message received by the portable electronic device, said method comprising: a) downloading
5 an initial chunk of said data containing the start of said attachment from a server to said portable electronic device in response to a data request sent from said portable electronic device to said server; wherein the server comprises a graph structure representing a map of said attachment and wherein the graph structure is accessed to reconstruct said chunk of said data; wherein an initial data request to retrieve said attachment is sent in response to receipt of
10 the email message by said portable electronic device; b) storing the downloaded chunk of said data on said portable electronic device prior to display thereof; c) displaying said stored chunk of said data on said portable electronic device; d) while displaying said stored chunk of data automatically downloading or sending a next request to download a respective next chunk of said data from said server in accordance with said graph structure; and e) while data chunks of
15 said data remain to be downloaded from said server performing steps b) to d).

[0002] In another aspect there may be provided a portable electronic device, having: a user input; a local cache; a display; and an attachment viewer adapted for: a) sending a request to download a chunk of data from a server over a wireless network; wherein the data is an attachment of an email message received by the portable electronic device; wherein the server
20 comprises a graph structure representing a map of said attachment and wherein the graph structure is accessed to reconstruct said chunk of said data; wherein an initial data request to retrieve said attachment is sent in response to receipt of the email message by said portable electronic device; b) receiving and storing the downloaded chunk of said data in said local cache prior to display thereof; c) displaying said stored chunk of said data on said display; d)
25 while displaying said stored chunk of data automatically sending a next request to download a respective next chunk of said data from said server in accordance with said graph structure; and e) while data chunks of said data remain to be downloaded from said server performing steps b) to d).

[0003] In yet another aspect, there may be provided a method for downloading an
30 attachment to an attachment viewer of a portable electronic device, said method comprising: sending an initial request from said attachment viewer to a server in response to receipt of an email message identifying said attachment by said portable electronic device, said request including a display size and a type of said portable electronic device; accessing a graph

structure representing a map of said attachment from said server, said graph structure having been previously built on said server; reconstructing said graph structure in response to said initial request and encapsulating said graph structure in data having an attachment viewer readable format, said data being stored on said server; and i) downloading an initial chunk of said data from said server to said attachment viewer responsive to said initial request; ii) storing said downloaded chunk of said data on said portable electronic device prior to display thereof; iii) displaying said stored chunk of said data on said portable electronic device; iv) immediately upon displaying said stored chunk of said data and detecting scrolling input, automatically sending a request to download a respective next chunk of said data from said server; v) responsive to said request to download said respective next chunk of said data, downloading said respective next chunk of said data from said server; and vi) while data chunks of said data remain to be downloaded from said server, performing steps ii) to v).

[0004] In yet a further aspect, there may be provided a portable electronic device, including: at least one input device; a local cache; a display; and an attachment viewer for: i) sending a request to download an initial chunk of data from a server configured to access a graph structure representing a map of an attachment, said graph structure having been previously built on said server, to reconstruct said graph structure in response to said request, to encapsulate said graph structure in data having an attachment viewer readable format, and to store said data; ii) receiving and storing said downloaded chunk of said data in said local cache prior to display thereof; iii) displaying said stored chunk of said data on said display; iv) immediately upon displaying said stored chunk of said data and detecting scrolling input at said at least one input device, automatically sending a request to download a respective next chunk of said data from said server, said request including a size of said display and a type of said portable electronic device; and v) while said data chunks of said data remain to be downloaded from said server, performing steps ii) to iv).

[0004a] In a still further aspect, there may be provided a method for downloading data onto a portable electronic device comprising: i) sending a request to download an initial chunk of data from a server configured to access a graph structure representing a map of an attachment, said graph structure having been previously built on said server, to reconstruct said graph structure in response to said request, to encapsulate said graph structure in data having an attachment viewer readable format, and to store said data; said request including a display size and a type of said portable electronic device; ii) receiving and storing said downloaded chunk of said data in said local cache prior to display thereof; iii) displaying said stored chunk

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of said data on said display; iv) immediately upon displaying said stored chunk of said data and detecting scrolling input, automatically sending a request to download a respective next chunk of said data from said server; and v) while said data chunks of said data remain to be downloaded from said server, performing steps ii) to iv).

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BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The embodiments will be better understood with reference to the following Figures in which like numerals denote like parts and in which:

[0006] Figure 1 is a schematic diagram of a wireless communication system;

10 **[0007]** Figure 2 is a block diagram of components of a portable electronic device according to an embodiment; and

[0008] Figure 3 is a flowchart showing device-side operation of a method for downloading data to an Attachment Viewer of the portable electronic device of Figure 2; and

15 **[0009]** Figure 4 is a flowchart showing server-side operation of a method for downloading data to an Attachment Viewer of the portable electronic device of Figure 2.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0010] Referring now to Figure 1, a communication system 10 for a portable electronic device 12 is generally shown. The portable electronic device 12 is operable to effect
20 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.

[0011] 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

5 GSM/GPRS, CDPD, TDMA, iDEN, Mobitex, DataTAC networks, EDGE, EVDO or UMTS and broadband networks such as Bluetooth and variants of 802.11.

[0012] 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
10 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.

[0013] Referring now to Figure 2, a block diagram of certain components within the
15 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.

20 **[0014]** 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, including an Attachment Viewer application for
25 viewing attachments to emails, such as word processing documents, spreadsheets, images, etc.. 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
30 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.

[0015] Request/view functionality for an attachment of an email message received by the portable electronic device 12 is provided by the Attachment Viewer and the Attachment
5 Server 18.

[0016] Referring to Figure 3, device-side operation of a method for downloading an attachment to an Attachment Viewer of the portable electronic device 12 is generally shown. When an email message is received by the portable electronic device 12 at step 42, the Attachment Viewer first determines whether or not the email message contains an
10 attachment, as indicated at step 44. The Attachment Viewer is able to determine if an attachment is present by checking the email payload and searching for email components that have been marked as supported attachments. The email components are marked by an enterprise server, which communicates with Attachment Server 18.

[0017] If the email message does not include an attachment, the logic terminates. If the
15 email message does include an attachment, the Attachment Viewer sends an initial request to the Attachment Server 18 to retrieve the attachment, as indicated at step 46. In response to the initial request, an initial chunk of data is returned to the portable electronic device 12 and is stored in the content store 40, as indicated at steps 48 and 50, respectively. Each chunk of data downloaded from the Attachment Server 18 is of a size (e.g. 16Kbyte) suitable
20 for internal caching within the device 12 and may be provided in Universal Content Stream (UCS) format, which is an Attachment Viewer readable format.

[0018] At step 52, the user opens the attachment and selects "Full Content" from a menu in order to view the attachment in the Attachment Viewer of the portable electronic device 12. If the user does not choose to view the attachment, the logic terminates and the initial chunk
25 of UCS data remains in the content store 40 of the portable electronic device 12 until the email message is deleted.

[0019] In response to the "Full Content" selection by the user, the initial chunk of UCS data is retrieved from the content store 40 and displayed by the Attachment Viewer, as indicated at steps 54 and 56, respectively. Upon the initial document display of the first data
30 chunk, a background request for the second chunk is immediately issued (step 58) and data is cached (step 60). When the user action requests this data (i.e. by scrolling to the end of the first chunk), the next chunk is immediately retrieved from the persistent store 40 and presented to the user at step 66. Provided that additional attachment data remains to be

downloaded from the server 18 (step 64), the background request for the subsequent next data chunk is re-issued (step 58).

[0020] It will be understood from the foregoing that each next data chunk is automatically downloaded from the server 18 and cached on the device 12 immediately upon user action (scroll) requesting the current data chunk. It will also be understood that if the user jumps in the document text such as by using a text hyperlink (a "NO" at step 62), then the chunk requested at step 58 will not necessarily be the subsequent chunk of data to be displayed. Since such a "jump" is not an implied action that can be predicted, the method terminates and the user has to wait for the target data chunk to be downloaded from the server 18. However, once displayed, the method starts again at step 58 by pre-fetching the next chunk after the target chunk being displayed.

[0021] Referring to Figure 4, server-side operation of the method for downloading an attachment to an Attachment Viewer of the portable electronic device 12 is generally shown. When an email message having an attachment is received by the portable electronic device 12, as indicated at step 42 of Figure 3, the Attachment Server 18 first builds a Document Object Model (DOM) by parsing the attachment document, as indicated at step 62 of Figure 4. In this manner, a graph structure representing a map of the original attachment file is built within the Attachment Server 18. The DOM contains textual content, font, style and formatting attributes as well as layout attributes, such as page/slide size, positioning information (i.e. x, y and z coordinates on the page), embedded graphics and tables, for example. DOM structure is well known and is disclosed in United States Patent Application Nos. 2002/0161796 and 2006/0055693, which are herein incorporated by reference.

[0022] At step 64, which corresponds to step 46 of Figure 3, the initial request from the Attachment Viewer is received by the Attachment Server 18. Based on the request content, the DOM is accessed and components of the DOM are reconstructed in order to fulfill the request. The request typically includes: a screen size of the portable electronic device 12, the type of portable electronic device 12 and the requested UCS chunk size in Kilobytes. At step 66, the reconstructed DOM is encapsulated in UCS data and stored on the Attachment Server 18. An initial chunk of UCS data is then sent to the Attachment Viewer, as indicated at step 68, which corresponds to step 48 of Figure 3. The initial chunk of data contains the start of the attachment. For example, the first chunk may contain the first page or multiple pages of a document depending on how many pages can fit in the requested UCS chunk size. When the user opens the attachment and selects "Full Content", as indicated at step

70, the second chunk of UCS data is sent to the portable electronic device 12, as indicated at step 72. Then, when the user scrolls to the end of the first chunk, the next chunk is already available in content store 40. As soon as the next chunk is displayed (corresponding to step 66 in Figure 3), the attachment viewer sends a request for the next chunk (step 58 in Figure 3), resulting in the Attachment Server 18 downloading the next data chunk (step 74).

5 [0023] In summary, by automatically pre-fetching and storing each next (subsequent) chunk of attachment data locally on the portable electronic device 12, the Attachment Viewer is able to display attachment content immediately upon user scrolling to the end of a current chunk of data. By the time the user has viewed each portion of the attachment defined by a chunk of data, which is contained in the initial chunk of data, the second chunk of data will
10 have arrived at the device 12. Thus, the user is able to view the attachment document without experiencing a significant delay following the view request.

[0024] The method for downloading data to a portable electronic device 12 is not limited to downloading attachment data from an Attachment Server. Native attachment downloads, which send attachment binary data from an Enterprise Server rather than UCS data from the Attachment Server, may also be performed. Native attachment download is useful for
15 portable electronic devices having Microsoft Office™-type programs available. Such programs are capable of displaying .doc and .ppt files, for example, using the appropriate Office-type program on the portable electronic device. Other types of data may also be
20 downloaded using the method disclosed herein.

A specific embodiment has been shown and described herein. However, modifications and variations may occur to those skilled in the art. All such modifications and variations are believed to be within the sphere and scope of the present embodiment.

Claims:

1. A method for downloading data onto a portable electronic device over a wireless network, wherein the data is an attachment of an email message received by the portable electronic device, said method comprising:
- 5 a) downloading an initial chunk of said data containing the start of said attachment from a server to said portable electronic device in response to a data request sent from said portable electronic device to said server; wherein the server comprises a graph structure representing a map of said attachment and wherein the graph structure is accessed to
- 10 reconstruct said chunk of said data; wherein an initial data request to retrieve said attachment is sent in response to receipt of the email message by said portable electronic device;
- b) storing the downloaded chunk of said data on said portable electronic device prior to display thereof;
- 15 c) displaying said stored chunk of said data on said portable electronic device;
- d) while displaying said stored chunk of data automatically downloading or sending a next request to download a respective next chunk of said data from said server in accordance with said graph structure; and
- e) while data chunks of said data remain to be downloaded from said server
- 20 performing steps b) to d).
2. A method as claimed in claim 1, wherein said method comprises downloading the attachment to an attachment viewer of said portable electronic device, said method comprising, prior to said downloading, the step of:
- 25 sending said initial data request from said attachment viewer to said server.
3. A method as claimed in claim 2 wherein said graph structure has been previously built on said server; and the method further comprising:
- reconstructing said graph structure in response to said initial request and
- 30 encapsulating said graph structure in data having an attachment viewer readable format, said data being stored on said server.

4. A method as claimed in claim 2 or 3, wherein said graph structure is a Document Object Model.
- 5 5. A method as claimed in claim 2, 3 or 4, wherein said attachment viewer readable format is Universal Content Stream format.
6. A method as claimed in any one of claims 2 to 5, wherein the method comprises downloading successive chunks of said data from said server to said attachment viewer
10 responsive to successive user requests sent from the portable electronic device.
7. A portable electronic device, having:
a user input;
a local cache;
15 a display; and
an attachment viewer adapted for:
a) sending a request to download a chunk of data from a server over a wireless network; wherein the data is an attachment of an email message received by the portable electronic device; wherein the server comprises a graph structure
20 representing a map of said attachment and wherein the graph structure is accessed to reconstruct said chunk of said data; wherein an initial data request to retrieve said attachment is sent in response to receipt of the email message by said portable electronic device;
b) receiving and storing the downloaded chunk of said data in said local
25 cache prior to display thereof;
c) displaying said stored chunk of said data on said display;
d) while displaying said stored chunk of data automatically sending a next request to download a respective next chunk of said data from said server in accordance with said graph structure; and
30 e) while data chunks of said data remain to be downloaded from said server performing steps b) to d).

8. A computer readable medium storing computer readable instructions executable by a processor of a computing device to cause said device to implement the steps of the method of any one of claims 1 to 6.

5 9. A method for downloading an attachment to an attachment viewer of a portable electronic device, said method comprising:

sending an initial request from said attachment viewer to a server in response to receipt of an email message identifying said attachment by said portable electronic device, said request including a display size and a type of said portable electronic device;

10 accessing a graph structure representing a map of said attachment from said server, said graph structure having been previously built on said server;

reconstructing said graph structure in response to said initial request and encapsulating said graph structure in data having an attachment viewer readable format, said data being stored on said server; and

15 i) downloading an initial chunk of said data from said server to said attachment viewer responsive to said initial request;

ii) storing said downloaded chunk of said data on said portable electronic device prior to display thereof;

iii) displaying said stored chunk of said data on said portable electronic device;

20 iv) immediately upon displaying said stored chunk of said data and detecting scrolling input, automatically sending a request to download a respective next chunk of said data from said server;

v) responsive to said request to download said respective next chunk of said data, downloading said respective next chunk of said data from said server; and

25 vi) while data chunks of said data remain to be downloaded from said server, performing steps ii) to v).

10. A method as claimed in claim 9, wherein said graph structure is a Document Object Model.

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11. A method as claimed in claim 9, wherein said attachment viewer readable format is Universal Content Stream format.

12. A method as claimed in claim 9, wherein said sending and said downloading are conducted over a wireless network.
13. A method as claimed in claim 9, wherein said sending and said downloading are
5 conducted over a broadband network.
14. A method as claimed in claim 12, wherein said wireless network is selected from the group consisting of GSM/GPRS, CDPD, TDMA, iDEN, Mobitex, and DataTAC.
- 10 15. A method as claimed in claim 13, wherein said broadband network is selected from the group consisting of, EDGE, EVDO or UMTS and such as Bluetooth and variants of 802.11.
- 15 16. A portable electronic device, including:
at least one input device;
a local cache;
a display; and
an attachment viewer for:
i) sending a request to download an initial chunk of data from a server
20 configured to access a graph structure representing a map of an attachment, said graph structure having been previously built on said server, to reconstruct said graph structure in response to said request, to encapsulate said graph structure in data having an attachment viewer readable format, and to store said data;
ii) receiving and storing said downloaded chunk of said data in said local
25 cache prior to display thereof;
iii) displaying said stored chunk of said data on said display;
iv) immediately upon displaying said stored chunk of said data and detecting scrolling input at said at least one input device, automatically sending a request to download a respective next chunk of said data from said server, said request
30 including a size of said display and a type of said portable electronic device; and
v) while said data chunks of said data remain to be downloaded from said server, performing steps ii) to iv).

17. A method for downloading data onto a portable electronic device comprising:
- i) sending a request to download an initial chunk of data from a server configured to access a graph structure representing a map of an attachment, said graph structure having been previously built on said server, to reconstruct said graph structure in response to said request, to encapsulate said graph structure in data having an attachment viewer readable format, and to store said data; said request including a display size and a type of said portable electronic device;
 - ii) receiving and storing said downloaded chunk of said data in said local cache prior to display thereof;
 - 10 iii) displaying said stored chunk of said data on said display;
 - iv) immediately upon displaying said stored chunk of said data and detecting scrolling input, automatically sending a request to download a respective next chunk of said data from said server; and
 - v) while said data chunks of said data remain to be downloaded from said server,
 - 15 performing steps ii) to iv).
18. A method as claimed in claim 17, wherein said data is an attachment that is received in an email message.
- 20 19. A method as claimed in claim 17, wherein said sending and said receiving are conducted over a wireless network.
20. A method as claimed in claim 17, wherein said sending and said receiving are conducted over a broadband network.
- 25 21. A method as claimed in claim 19, wherein said wireless network is selected from the group consisting of GSM/GPRS, CDPD, TDMA, iDEN, Mobitex, and DataTAC.
22. A method as claimed in claim 20, wherein said broadband network is selected from the group consisting of, EDGE, EVDO or UMTS and such as Bluetooth and variants of 802.11.
- 30

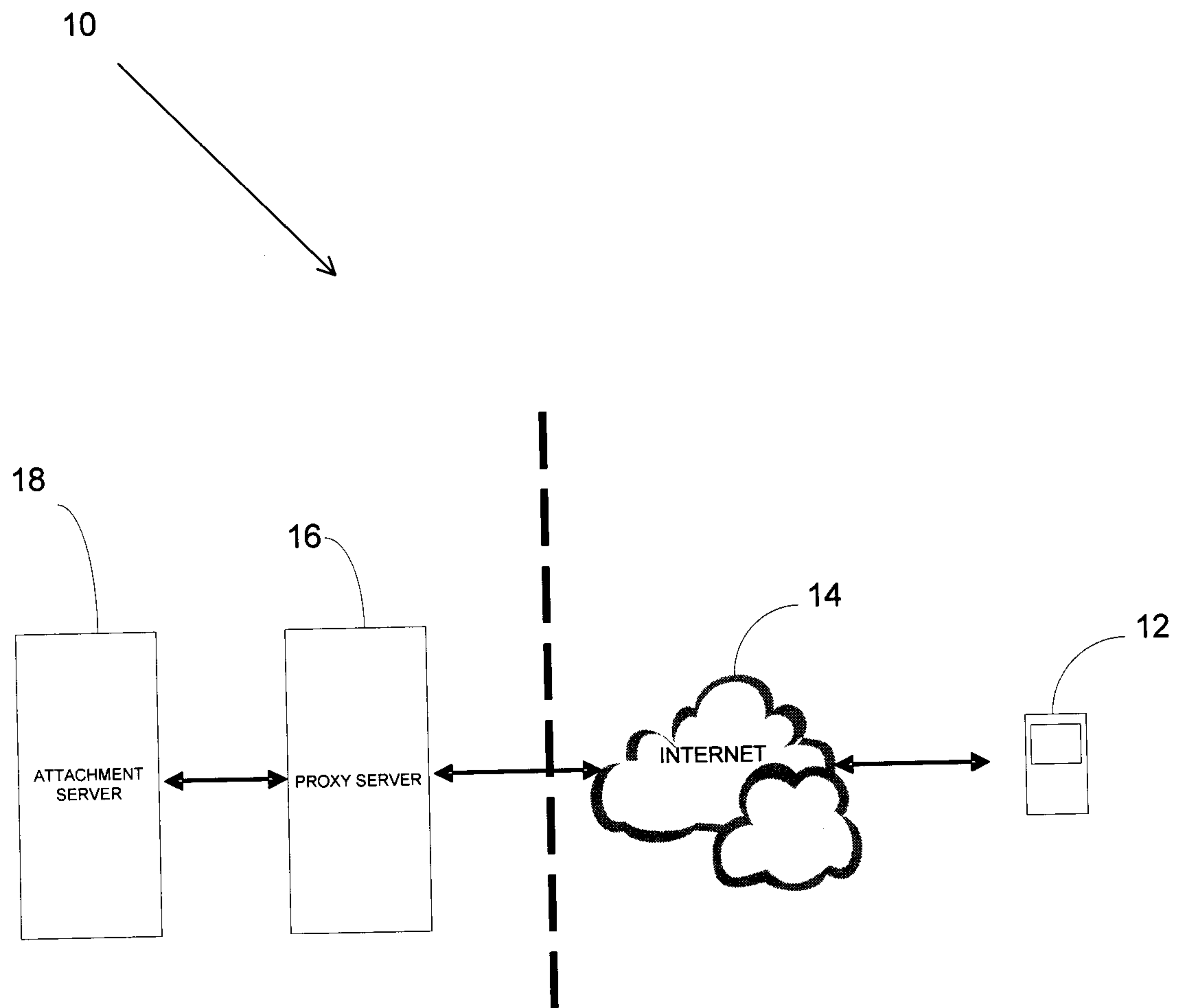


Fig. 1

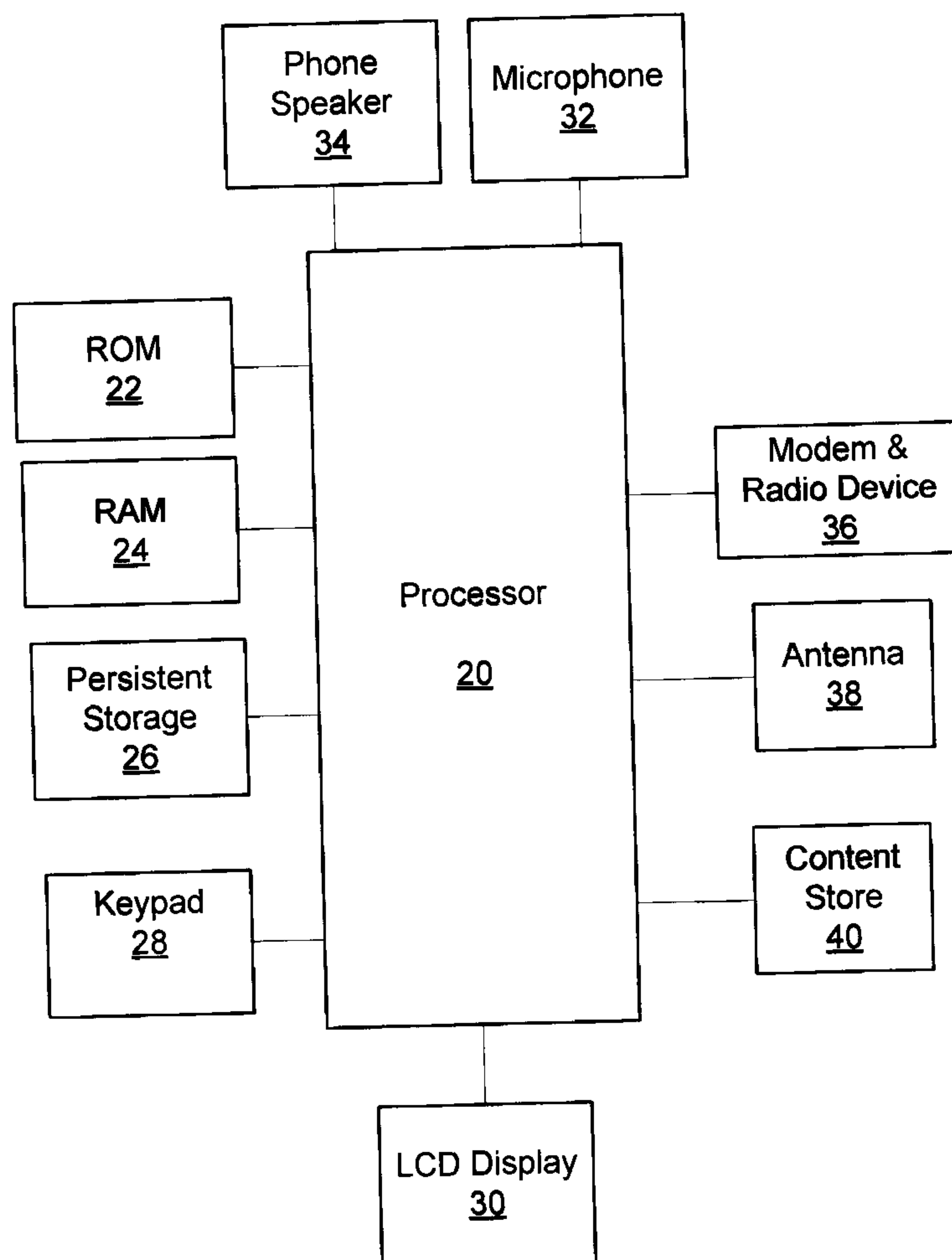


Fig. 2

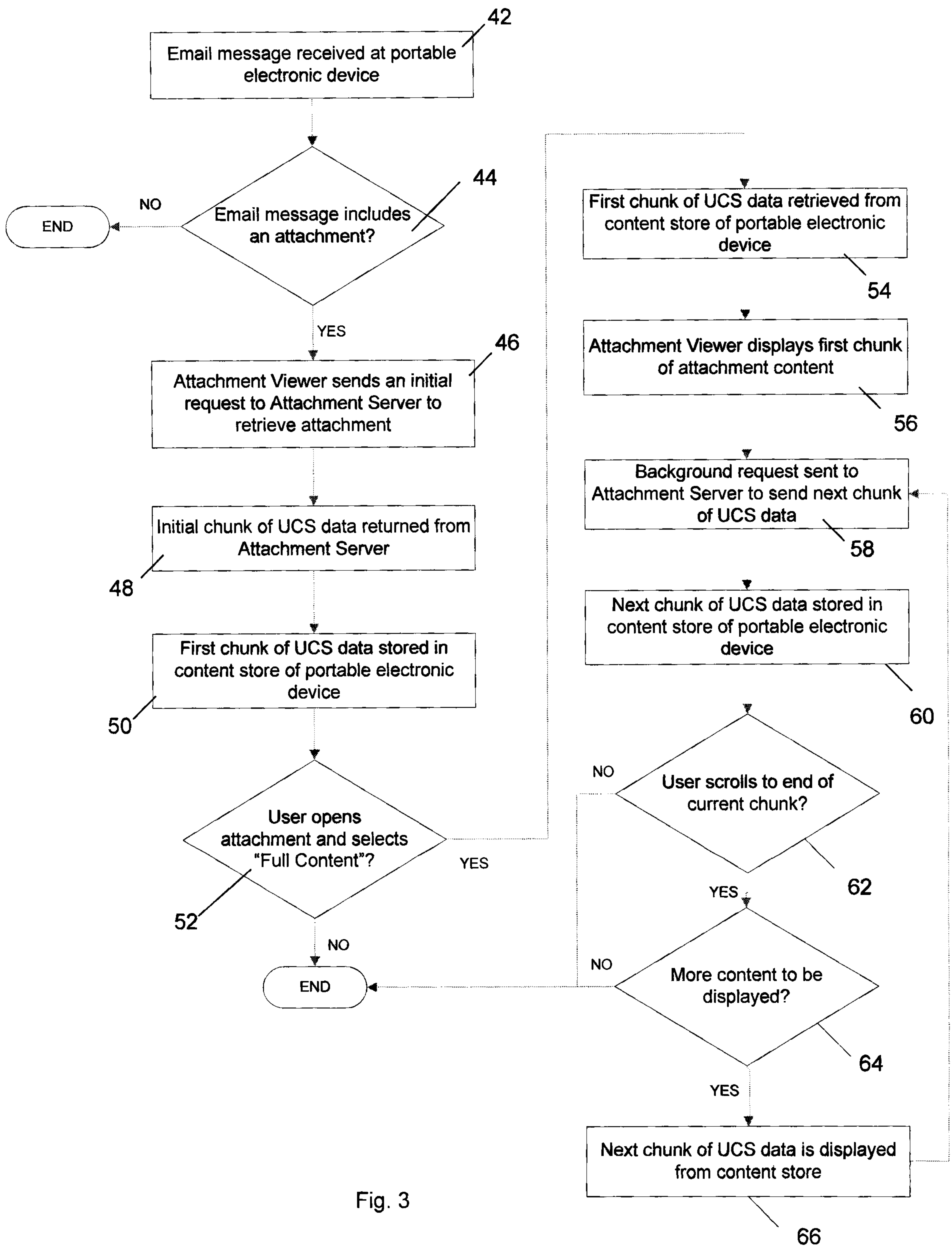


Fig. 3

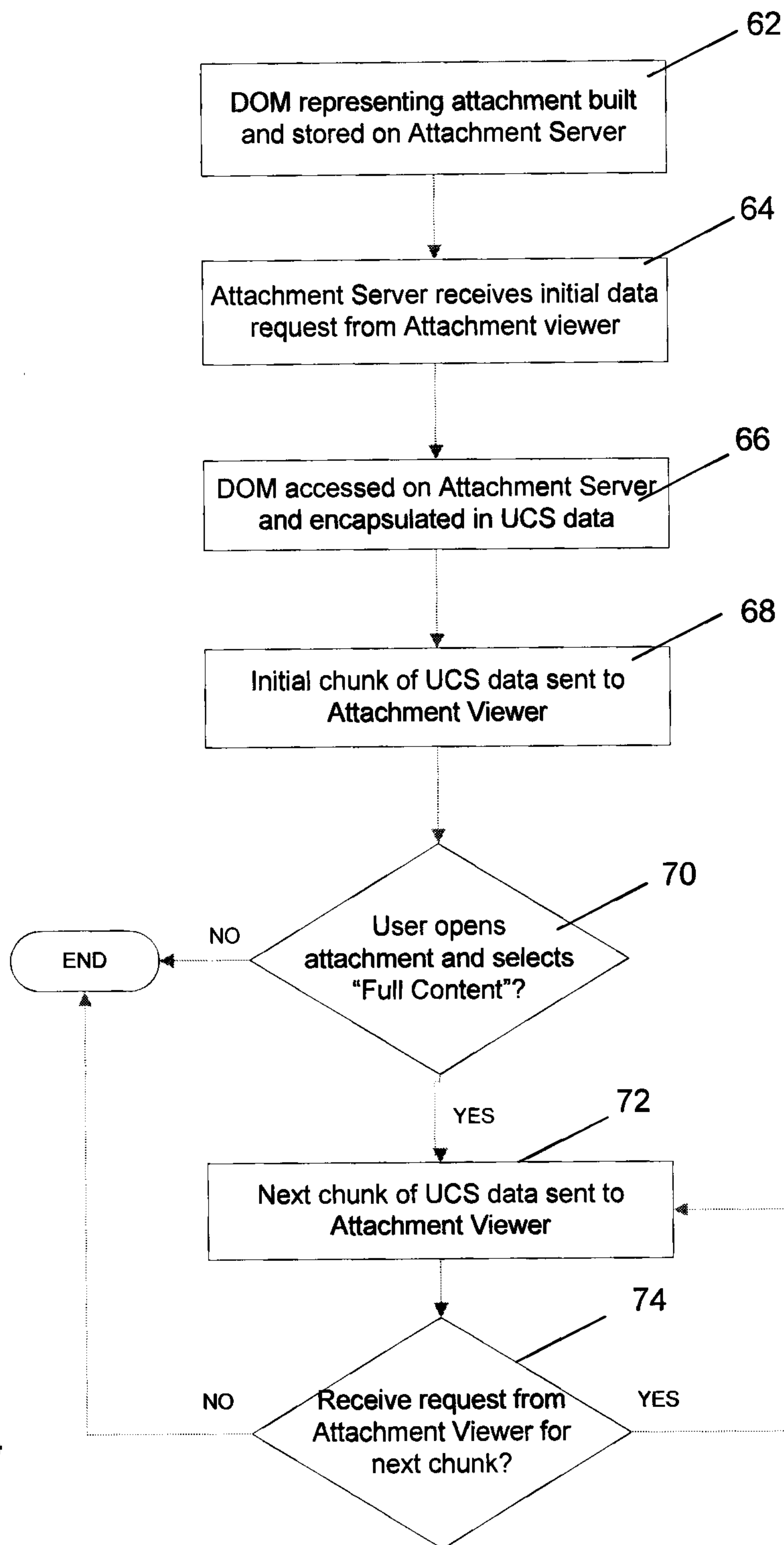
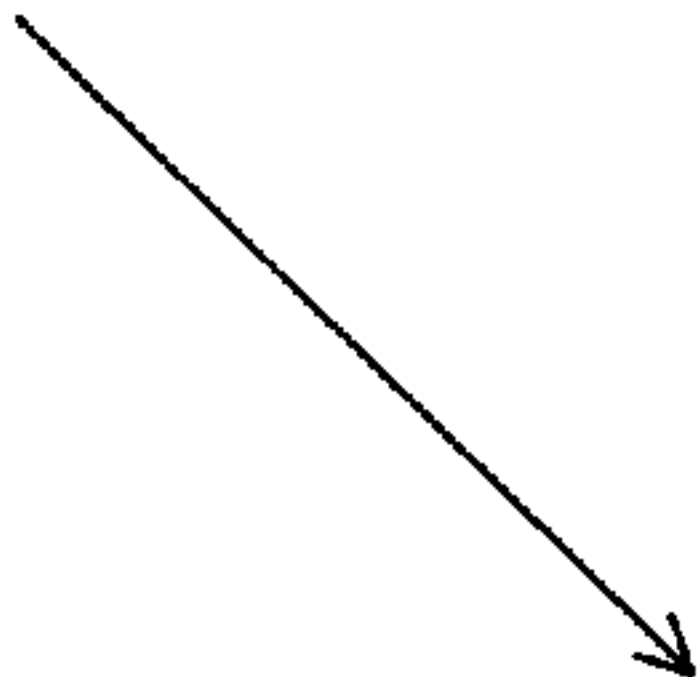
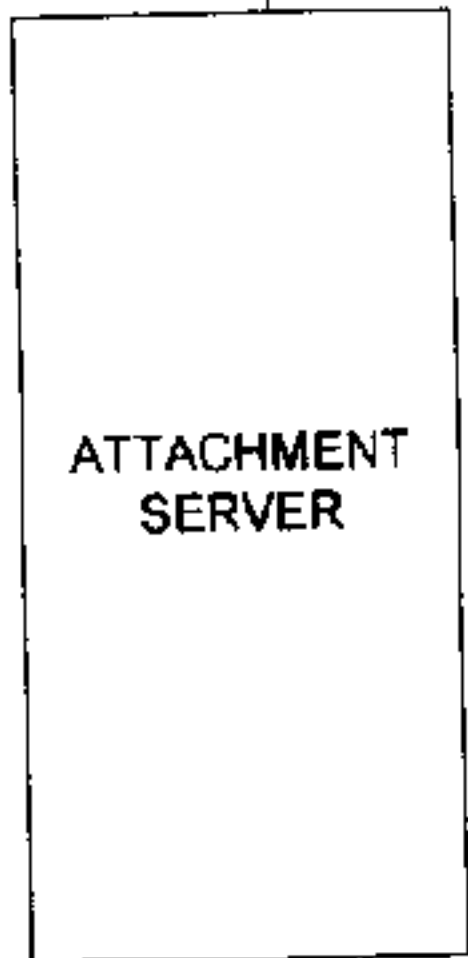


Fig. 4

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18



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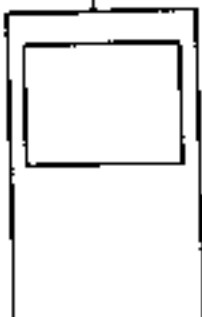


PROXY SERVER



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INTERNET



12