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ABSTRACT

SYSTEM AND METHOD FOR MIXED MODE DELIVERY OF DYNAMIC CONTENT TO A MOBILE DEVICE

A method, system and apparatus for mixed mode delivery of content to a mobile device, the method having the steps of: receiving a subscription message including a filter; storing the filter; sending a subscription identifier; applying the filter to content available on the content provider, thereby producing a content subset; waiting for receipt of a content request; and forwarding the content subset upon receipt of the content request.

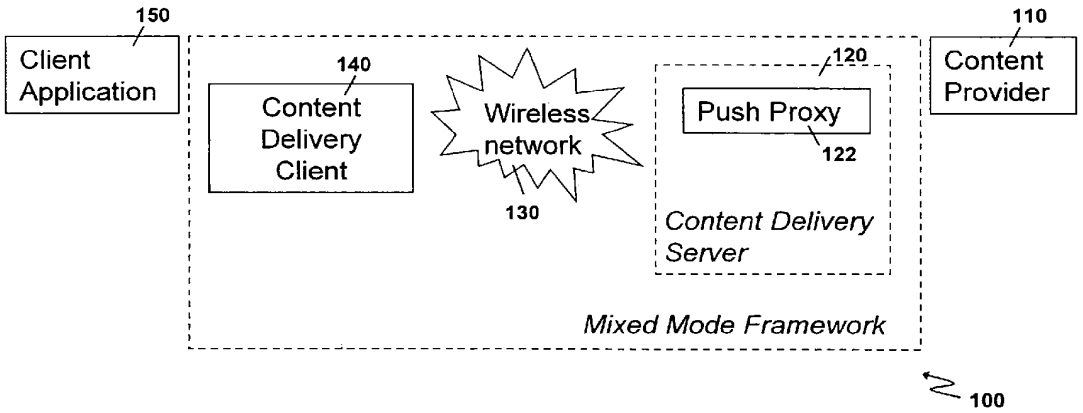
150
Client Application
140
Content Delivery Client
Wireless network
130
120
Push Proxy
122
Content Delivery Server
Mixed Mode Framework
110
Content Provider
100

FIG. 1

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

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Invention Title:	System and method for mixed mode delivery of dynamic content to a mobile device

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

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SYSTEM AND METHOD FOR MIXED MODE DELIVERY OF DYNAMIC CONTENT TO A MOBILE DEVICE

TECHNICAL FIELD

[0001] The present system and method relate to dynamic content delivery in a mobile environment and in particular to the mode of delivery of the dynamic content.

BACKGROUND

[0002] Users of mobile devices or mobile user equipment (UE) are increasingly becoming more sophisticated in terms of the functionality that they require from their mobile devices and the way that they access data from the mobile devices.

[0003] Dynamic content delivery allows users to have information or data pushed to them or allows users to pull the data from content providers. Examples of data could include stock quotes, weather updates, traffic updates, dynamic wallpaper, ads, applications or other data desirable to a user.

[0004] Content can be either pushed to a mobile device by a content provider or requested (pulled) from the content provider by the mobile device.

[0005] With pull-based delivery, the content is requested by a client application on the mobile device and delivered to the device in a response message. The problem with this approach is that the client application does not know about the availability of content from a content provider and needs to periodically pull content, thus wasting wireless bandwidth on unsuccessful attempts. This model does not provide a good user experience as frequent pull attempts affect network resources and ultimately the customer's monthly bill, while infrequent attempts result in outdated content.

[0006] With push mode delivery, the client application establishes a content subscription with a content provider. The application provides subscription filters that specify events of interest. The content provider applies the subscription filter to the available content, and if some content subset matches the filter, pushes this content to the mobile device using the available content delivery framework. This approach requires a complex content delivery infrastructure including subscription and content management on the push server and the content provider. The scalability for a large number of devices is a

major obstacle for implementation, due to the complexity of managing multiple timer events and filters.

[0007] The present system and method may overcome the limitations of the push-based and pull-based models of content delivery by providing for a mixed mode delivery model. The mixed mode delivery model may combine the benefits of subscription based delivery with the simplicity of client application driven pull models. The mixed mode paradigm may allow a client application to drive content delivery by either directly triggering the delivery of new content or registering interest in a new content with the delivery framework or content provider.

[0008] In the mixed mode delivery model, the event of content delivery is preferably triggered when content available to a client application on the mobile device is exhausted. This could be when the data is either consumed or expires.

[0009] The mixed mode delivery model can work over either push bearers or pull bearers. In the case of pull bearers, the content provider waits until a pull message is received to send data. However, a filter sent during subscription initiation is stored at the content provider and applied to available content, preferably prior to the receipt of the pull message.

[0010] In a push bearer solution, the content provider can be adapted to push content only upon receipt of a message that the client application is ready for content. If no content is available when the client application indicates it is ready, a flag can be set to push the next available content subset immediately. In the push bearer solution, the filter received from the client application upon subscription is stored by the content provider and needs only be sent once.

[0011] In both the push and pull bearer solutions, some of the processing can be transferred to a content delivery server. Specifically, the content delivery server can store a subscription identifier, and can cache content subsets, apply rules to the content subset, and wait to receive a request for more content before forwarding the content to the client application.

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SUMMARY

[0012] According to an aspect of the invention, there is disclosed a mixed mode dynamic content delivery method comprising the steps of receiving at a content provider a subscription message from a client application, the subscription message being associated with a filter; obtaining a subscription identifier; sending the subscription identifier downstream in response to the subscription message; associating the filter with the subscription identifier; applying the filter to content available on the content provider, thereby producing a content subset; receiving an indication of client application's readiness to receive content and forwarding the content subset downstream in response to the indication.

[0013] According to another aspect of the invention, there is disclosed a system for mixed mode delivery of dynamic content to a mobile device comprising a client application on the mobile device, the client application comprising messaging means configured to send a subscription message comprising a filter; content output means wherein content presented to a user of the mobile device is categorized as consumed content and notification means configured to send upstream an indication of readiness to receive content when all content for the client application is consumed and a content provider, the content provider comprising reception means configured to receive the subscription message and the filter; subscription identifier generation means configured to generate a subscription identifier and to associate the filter with the subscription identifier; transmission means configured to send the subscription identifier downstream in response to the subscription message; means configured to apply the filter to then available content, thereby producing a content subset; notification reception means configured to receive the indication of readiness to receive content and forwarding means configured to forward the content subset downstream in response to the indication.

[0014] According to another aspect of the invention, there is disclosed a client application for use on a mobile device in a mixed mode dynamic content delivery system, the client application comprising messaging means configured to send a subscription message comprising a filter to a content provider; content reception means configured to receive content; content output means wherein content presented to a user of the mobile device is categorized as consumed content and transmission means configured to

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selectively send an indication of readiness to receive content when all content at the client application is consumed.

[0015] According to another aspect of the invention, there is disclosed a content provider for use in a mixed mode dynamic content delivery system, the content provider comprising reception means configured to receive a subscription message and a filter from a client application; subscription identifier generation means configured to generate a subscription identifier and to associate the filter with the subscription identifier; communication means configured to send the subscription identifier downstream in response to the subscription message; means configured to apply the filter to available content, thereby producing a content subset; notification reception means configured to receive from the client application an indication of readiness to receive content and forwarding means configured to forward the content subset downstream in response to the indication.

[0015a] According to another aspect of the invention, there is disclosed a method of controlling conveyance of dynamic content over a mixed mode delivery system to a mobile device, the method comprising sending a subscription message including a filter to a content provider; receiving a subset of dynamic content; categorizing content presented to a user of the mobile device as consumed content and selectively issuing an indication of readiness to receive content when all content received is consumed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The present application will be better understood with reference to the drawings in which:

Figure 1 is a block diagram of a basic architecture for a dynamic content delivery system;

Figure 2 is a flow diagram showing message and content passing between a client application and a content provider for a content delivery framework over pull bearer;

Figure 3 is a flow diagram showing message and content passing between a client application and a content provider for a content delivery framework over pull bearer with a content delivery server managing subscriptions and catching content;

Figure 4 is a flow diagram showing message and content passing between a client application and a content provider for a content delivery framework over push bearer;

Figure 5 is a flow diagram showing message and content passing between a client application and a content provider for a content delivery framework over push bearer with a content delivery server managing subscriptions and catching content; and

Figure 6 is a block diagram of an exemplary mobile device that could be used in association with the present method and system.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0017] Reference is now made to **Figure 1**. A generic hybrid system for delivering dynamic content to a client application is illustrated. A system of **Figure 1** is a simplified system and shows logical components that need to be in the dynamic content delivery architecture; however, one skilled in the art will appreciate that other components could exist or that various components could be grouped together.

[0018] Architecture **100** includes a content provider **110**. Content provider **110** is arranged to provide a dynamic content to users that are subscribed with content provider **110**. Examples can include, for example, a website selling books. A user may register with content provider **110** to obtain a list of newly released books within specified genres. Other examples could include news sites that might provide headlines to users on a periodic basis, traffic sites that might provide up-to-date traffic information to users during certain periods of the day. Stock market sites that could provide updated stock quotes or currency exchange rate to users, among others.

[0019] Depending on the bearers used, content provider **110** may register with a content delivery server **120** in order to allow clients of the content delivery server to receive content from content provider **110**. As will be appreciated, when using push bearers registration is required. When using pull bearers, registration is optional.

[0020] Content delivery server **120**, in one embodiment, includes a push proxy **122** that acts as a proxy for a client or a client application and provides a destination for content provider **110** to send content. The push proxy is used in push mode, but not in pull mode

[0021] Content delivery server **120** communicates over wireless network **130** with a content delivery client **140** that is located on a mobile device. Content delivery client **140** receives content that is being delivered from content provider **110** and can communicate the content with a client application **150**, which ultimately consumes the content.

[0022] Within the present specification, reference to content provider **110**, content delivery server **120**, push proxy **122**, wireless network **130**, content delivery client **140** or client application **150** is a reference back to the architecture of **Figure 1**.

[0023] Depending on the infrastructure, various forms of mixed mode deliveries exist. These depend on whether the infrastructure is a push-based or a pull-based infrastructure.

[0024] Referring to **Figure 2**, **Figure 2** illustrates a mixed mode delivery framework for delivery over pull bearers.

[0025] Client application **150**, upon subscription to a content provider **110**, sends a subscription message along with a filter in message **210**. As will be appreciated by those skilled in the art, the filter sent in message **210** describes the type and format of the data that the client application **150** is expecting. Examples of filters could include stock quotes for specific companies. Further, the filter could go into more detail including an indication that the stock quote should only be sent when the change in the price of the stock is greater than 1% of its previously sent market value, when trading reaches a certain volume, etc. A filter could also indicate a schedule for pushing content.

[0026] Message **210** is forwarded by content delivery client **140**, through content delivery server **120**, to content provider **110**.

[0027] When content provider **110** receives message **210**, it establishes a new subscription, extracts and applies the filter to available content in step **214**.

[0028] In message **216**, content provider **110** sends a subscription identifier along with any content that was available that met the filter criteria back to client application **150**.

[0029] As will be appreciated by those skilled in the art, mixed mode delivery over pull bearers is synchronous. Message **216** therefore can include both the content and the subscription ID as a response message and could be, for example, an HTTP response.

[0030] Client application **150** subsequently consumes the content that was delivered in message **216**. The client application 150 can either immediately display the content to the end user, such as with dynamic wallpaper, news marquees, etc., or store the content until a user request it. A user has consumed the content when all videos delivered are watched, audio delivered is listened to, tasks from the delivery list of tasks completed, etc.

[0031] Alternatively, content can expire. For example, weather forecasts, movie listings, stock quotes, etc. all have a time within which they are valid, after which the content has expired. If a client application has not consumed the content before it expires, the content can be ignored by client application **150** after it has expired.

[0032] Once client application **150** has consumed the content or the content has expired, the client application **150** sends message **220** to content provider **110**. Message **220** includes a request for any further content, if available. The message further includes the subscription identifier previously received by client application **150** and any rules that client application **150** wishes to apply to the content. As will be appreciated, no rule needs to be sent and the implementation and processing of rules is optional.

[0033] Rules are applied on top of the filter and are therefore applied to the content subset that has previously been filtered by content provider **110**. Rules can indicate how the content is delivered, including the ordering, the maximum size of the content that can be received and the priority affecting content ordering and/or selection, the timing of the receipt of the content or other rules that would be known to those skilled in the art.

[0034] In the example of **Figure 2**, content provider **110** receives message **220** and finds that no content is available in step **224**. The client application **150** receives an empty response or a response indicating that there is no content available.

[0035] At a subsequent time, client application **150** can again attempt to pull content through message **230** asking if further content is available, while sending a subscription identifier and rules for the content to content provider **110**. In step **234**, content provider **110** applies the filter and finds that content is available, at which point it generates a message **240** in which content is delivered back to client application **150**. As will be appreciated by those skilled in the art, content provider **110** can also apply the rules that were passed to it in message **230**. As will also be appreciated, message **240** does not need to return a subscription identifier since client application **150** already knows its subscription identifier.

[0036] In one embodiment of the present application, content provider **110** could apply a filter to content as the content becomes available. As will be appreciated, matching content with the subscription filter could be time consuming, and the benefit of the mixed mode delivery model is that a content subset based on the subscription filter could be prepared prior to a request from client application **150**, thereby eliminating delay and user latency.

[0037] The mixed mode delivery of **Figure 2** is friendlier for mobile devices than a simple pull-based model since there is no need to pass a subscription filter over the air each time. Further, as indicated above, the use of the filter prior to a pull message being received could eliminate delays in user latency.

[0038] As will be further appreciated by those skilled in the art, the content delivery client **140** and content delivery server **120** are redundant in the model of **Figure 2** and client application **150** could communicate directly with content provider **110**.

[0039] A further alternative embodiment is presented in **Figure 3**. **Figure 3** again illustrates a mixed mode delivery over pull bearers. However, in the example of **Figure 3**, the content delivery server provides subscription management and content catching services, thereby removing these functions from the client application **150** and the content provider **110**.

[0040] Referring to **Figure 3**, a client application **150** sends a subscription message **310** to content provider **110**. The subscription message **310** includes a filter to indicate what content should be received from content provider **110**. This message is passed through the content delivery client **140**, the content delivery server **120** to content provider **110**.

[0041] Upon receipt of the subscription message **310** by content provider **110**, content provider **110** provides a subscription identifier to content delivery server **120**.

[0042] Content provider **110** further applies a filter received in message **310** to content stored by content provider **110** and finds available content for delivery to client application **150**. This is performed in step **314**.

[0043] Alternatively, upon subscription, the response message is processed by the content delivery server **120** and the subscription information (for example, a match between the device identifier and the subscription identifier) is extracted and stored for future use. As will be appreciated, the subscription identifier is used by the content delivery server **120** to indicate to content provider **110** that content should be sent. The above could be implemented by providing subscription identifiers in the header of the HTTP request or as a separate part of a multi-part message. The response stripped of the subscription identifier is returned to the client application **150**.

[0044] Content provider **110** generates a message **316** to deliver the content found in step **314**. The content delivery message **316** is forwarded through content delivery server **120** to client application **150**.

[0045] As will be further appreciated, content provider **110** could continue to apply the filter to various content and rather than, or in addition to, delivering content in step **316**, when further content is discovered for delivery to client application **150**, it can be sent in a message **318**.

[0046] Content delivery server **120** receives message **318** and caches the message until the content is requested by client application **150**.

[0047] Once client application **150** has consumed the content provided by message **316**, or the data in message **316** has expired, client application **150** can generate a new message **320** asking for more content and also providing rules for the content. Message **320** is passed to content delivery server **120**.

[0048] Content delivery server **120** receives message **320**, and applies the rules that were passed in message **320** if any rules are provided. Further, content delivery server

120 passes message **322**, which contains the content that was delivered in message **318** to client application **150**.

[0049] As will further be appreciated, content delivery message **322** does not necessarily contain all of the cached content from the content delivery server **120**. The rules may specify a certain size of cache content, or content delivery server **120** may have certain rules as to the amount of data that is passed to client application **150**, and only a portion of the data may be passed while the remainder is kept in the cache of content delivery server **120** until a subsequent request is received from client application **150**.

[0050] Once all of the content is delivered from the cache of content delivery server **120**, content delivery server **120** can further generate a message **330** that includes the subscription identifier that was previously passed to it. Content provider **110** receives message **330** and message **330** is used to trigger the application of the filter to available content to see whether there is more content available for delivery. Content provider **110** can thereafter generate messages **332** and **334** as illustrated in **Figure 3**.

[0051] Message **330** simplifies the procedure for content provider **110**. Content provider **110** does not have to constantly apply a filter content as it is generated or received, allowing the process to be more scalable for a larger number of subscribers and simplifying the process that needs to be performed by content provider **110**. Specifically, the filter does not need to be applied until message **330** is received from content delivery server **120**.

[0052] Content delivery server **120** caches content delivery messages **332** and **334** until a message is received from client application **150** asking for more content.

[0053] The embodiment of **Figure 3** thereby provides for some of the processing and caching to be performed by content delivery server **120**, removing some of the burden from content provider **110**. The mixed mode model of **Figure 3** provides for a reduction in the network resources required by only sending a subscription message with a filter once to content server **120** and content provider **110**. Further, content is filtered prior to be passed back to client application **150** and it is only delivered when client application **150** requests the content to be delivered. In the example of **Figure 3**, this is only when previous content has either been consumed or has expired.

[0054] Reference is now made to **Figure 4**. **Figure 4** provides the framework for a mixed mode delivery system over a push bearer.

[0055] Client application **150** sends a subscription message **410**, which includes a filter, to content provider **110**. The content provider upon receipt of the message **410**, registers the subscription and returns a subscription ID in message **412**.

[0056] In step **414**, the filter is applied to available content and content provider **110** pushes a matching content subset to client application **150** in message **420**.

[0057] Client application **150** consumes content or the content expires as described above, and once the content is consumed or expired, client application **150** generates a message **430** requesting further content from content provider **110**. Message **430** includes the subscription identifier along with any rules that the client application may wish to be applied to a content subset.

[0058] In the example of **Figure 4**, content provider **110** receives message **430** and applies the filter, finding that no content is available. However, when the message is received, a flag is added to content provider **110** indicating client application **150** desires more content. Thereafter, when further content does become available, it should be pushed to client application **150**.

[0059] As further illustrated in **Figure 4**, when new content arrives at content provider **110**, a filter is applied and content is found to be available. Subsequently, content provider **110** generates message **440**, which is pushed to client application **150**.

[0060] As compared with traditional push based models, the mixed mode delivery model illustrated in **Figure 4** is more efficient. Information is delivered to client application **150** only when the client application **150** and the mobile device are ready to consume the information. The delivery event is directly triggered by the application, and there is therefore no need for complex event or timer management frameworks. Further, the client application could optionally also specify a push schedule in the delivery rules found in message **430**. This could therefore result in a combination of mixed mode and push mode behaviors.

[0061] In an alternative embodiment as illustrated in **Figure 5**, content delivery server **120** provides subscription management and content caching functionality.

[0062] Referring to **Figure 5**, client application **150** sends subscription message **410** including a filter to content provider **110** through content delivery server **120**.

[0063] Content provider **110** generates a subscription identifier and sends this to content delivery server **120**. Further, the filter that was received in message **510** is applied to available content and a content delivery message **520** is generated by content provider **110** and sent to client application **150**.

[0064] Client application **150** consumes the content delivered through a message **520** and once the content is consumed or expired, client application **150** generates a message **530** asking for further available content and optionally passing rules. Message **530** is sent to content delivery server **120**, which receives the content and registers that client application **150** wishes to receive more information.

[0065] In the example of **Figure 5**, no content is stored in the cache on content delivery server **120** at the time it receives message **530** and therefore nothing is sent back to client application **150**.

[0066] When content provider **110** receives further content and applies the filter to this content, once applicable content is found this applicable content is pushed to content delivery server **120** using message **540**. Content delivery server **120** caches this content, and in the case of **Figure 5** when client application **150** has previously registered demand for new content, the rules are applied in step **542** and the content is delivered in message **544**. Conversely, if no demand has been registered, then content delivery server **120** will cache content, as illustrated by content received from messages **550** and **552**. As will be appreciated from the above, an additional benefit of mixed mode over push bearer involves saving the delivery of expired content, or replacing not yet delivered content. If content that is cached on content delivery server **120** and waiting for client application **150** to trigger a push expires or is replaced with more up-to date content, the content delivery server **120** can drop the expired content. This saves network resources and user payments for wireless delivery of content that user did not or could not consume.

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[0067] A similar benefit also exists for the model of **Figure 4**, where content waiting on the content provider **110** but yet pushed can be replaced before it is pushed if the content has expired or been replaced. Again, the trigger by the client application 150 saves the sending of content that the user cannot consume.

[0068] In the example of Figure 5, client application consumes content from content delivery message **544** and once the content has either been consumed or has expired a new message **560** is generated which is sent to content delivery server **120**.

[0069] Content delivery server **120** applies rules to any content that is stored in its cache and subsequently delivers the content in message **570** to client application **150**.

[0070] The above mixed delivery mode over push bearers thereby provides certain advantages. Functionality is moved from content provider **110** to content delivery server **120**. Further, data is only passed to client application **150** when client application **150** is ready for this data.

[0071] As will be appreciated by those skilled in the art, the mixed mode delivery model requires that content provider **110** be adapted to store filters for client applications **150** and to apply those filters to available content. However, filtering can be done periodically rather than only when a message with filters is received from client application **150**.

[0072] Content provider **110** is further required to implement a flag for the embodiment of **Figure 4** in which the content is cached on content provider **110** until client application **150** is ready for it. This functionality is moved to the content delivery server **120** in the embodiment of **Figure 5**.

[0073] As will be appreciated by those skilled in the art, the above can be implemented on any mobile data device and reference is now made to **Figure 6** in which an exemplary mobile device is illustrated. This is not meant to limit the present application and any mobile data device could be used.

[0074] **Figure 6** is a block diagram illustrating a mobile device apt to be used with preferred embodiments of the apparatus and method of the present application. Mobile device **2200** is preferably a two-way wireless communication device having at least voice

and data communication capabilities. Mobile device **2200** preferably has the capability to communicate with other computer systems on the Internet. Depending on the exact functionality provided, the mobile device may be referred to as a data messaging device, a two-way pager, a wireless e-mail device, a cellular telephone with data messaging capabilities, a wireless Internet appliance, or a data communication device, as examples.

[0075] Where mobile device **2200** is enabled for two-way communication, it will incorporate a communication subsystem **2211**, including both a receiver **2212** and a transmitter **2214**, as well as associated components such as one or more, preferably embedded or internal, antenna elements **2216** and **2218**, local oscillators (LOs) **2213**, and a processing module such as a digital signal processor (DSP) **2220**. As will be apparent to those skilled in the field of communications, the particular design of the communication subsystem **2211** will be dependent upon the communication network in which the device is intended to operate.

[0076] Network access requirements will also vary depending upon the type of network **2219**. In some CDMA networks network access is associated with a subscriber or user of mobile device **2200**. A CDMA mobile device may require a removable user identity module (RUIM) or a subscriber identity module (SIM) card in order to operate on a CDMA network. The SIM/RUIM interface **2244** is normally similar to a card-slot into which a SIM/RUIM card can be inserted and ejected like a diskette or PCMCIA card. The SIM/RUIM card can have approximately 64K of memory and hold many key configuration **2251**, and other information **2253** such as identification, and subscriber related information.

[0077] When required network registration or activation procedures have been completed, mobile device **2200** may send and receive communication signals over the network **2219**. As illustrated in **Figure 6**, network **2219** can consist of multiple base stations communicating with the mobile device. For example, in a hybrid CDMA 1x EVDO system, a CDMA base station and an EVDO base station communicate with the mobile device and the mobile device is connected to both simultaneously. The EVDO and CDMA 1x base stations use different paging slots to communicate with the mobile device.

[0078] Signals received by antenna **2216** through communication network **2219** are input to receiver **2212**, which may perform such common receiver functions as signal

amplification, frequency down conversion, filtering, channel selection and the like, and in the example system shown in **Figure 6**, analog to digital (A/D) conversion. A/D conversion of a received signal allows more complex communication functions such as demodulation and decoding to be performed in the DSP **2220**. In a similar manner, signals to be transmitted are processed, including modulation and encoding for example, by DSP **2220** and input to transmitter **2214** for digital to analog conversion, frequency up conversion, filtering, amplification and transmission over the communication network **2219** via antenna **2218**. DSP **2220** not only processes communication signals, but also provides for receiver and transmitter control. For example, the gains applied to communication signals in receiver **2212** and transmitter **2214** may be adaptively controlled through automatic gain control algorithms implemented in DSP **2220**.

[0079] Mobile device **2200** preferably includes a microprocessor **2238** which controls the overall operation of the device. Communication functions, including at least data and voice communications, are performed through communication subsystem **2211**. Microprocessor **2238** also interacts with further device subsystems such as the display **2222**, flash memory **2224**, random access memory (RAM) **2226**, auxiliary input/output (I/O) subsystems **2228**, serial port **2230**, two or more keyboards or keypads **2232**, speaker **2234**, microphone **2236**, other communication subsystem **2240** such as a short-range communications subsystem and any other device subsystems generally designated as **2242**. Serial port **2230** could include a USB port or other port known to those in the art.

[0080] Some of the subsystems shown in **Figure 6** perform communication-related functions, whereas other subsystems may provide "resident" or on-device functions. Notably, some subsystems, such as keyboard **2232** and display **2222**, for example, may be used for both communication-related functions, such as entering a text message for transmission over a communication network, and device-resident functions such as a calculator or task list.

[0081] Operating system software used by the microprocessor **2238** is preferably stored in a persistent store such as flash memory **2224**, which may instead be a read-only memory (ROM) or similar storage element (not shown). Those skilled in the art will appreciate that the operating system, specific device applications, or parts thereof, may be temporarily loaded into a volatile memory such as RAM **2226**. Received communication signals may also be stored in RAM **2226**.

[0082] As shown, flash memory **2224** can be segregated into different areas for both computer programs **2258** and program data storage **2250**, **2252**, **2254** and **2256**. These different storage types indicate that each program can allocate a portion of flash memory **2224** for their own data storage requirements. Microprocessor **2238**, in addition to its operating system functions, preferably enables execution of software applications on the mobile device. A predetermined set of applications that control basic operations, including at least data and voice communication applications for example, will normally be installed on mobile device **2200** during manufacturing. Other applications could be installed subsequently or dynamically.

[0083] A preferred software application may be a personal information manager (PIM) application having the ability to organize and manage data items relating to the user of the mobile device such as, but not limited to, e-mail, calendar events, voice mails, appointments, and task items. Naturally, one or more memory stores would be available on the mobile device to facilitate storage of PIM data items. Such PIM application would preferably have the ability to send and receive data items, via the wireless network **2219**. In a preferred embodiment, the PIM data items are seamlessly integrated, synchronized and updated, via the wireless network **2219**, with the mobile device user's corresponding data items stored or associated with a host computer system. Further applications may also be loaded onto the mobile device **2200** through the network **2219**, an auxiliary I/O subsystem **2228**, serial port **2230**, short-range communications subsystem **2240** or any other suitable subsystem **2242**, and installed by a user in the RAM **2226** or preferably a non-volatile store (not shown) for execution by the microprocessor **2238**. Such flexibility in application installation increases the functionality of the device and may provide enhanced on-device functions, communication-related functions, or both. For example, secure communication applications may enable electronic commerce functions and other such financial transactions to be performed using the mobile device **2200**.

[0084] In a data communication mode, a received signal such as a text message or web page download will be processed by the communication subsystem **2211** and input to the microprocessor **2238**, which preferably further processes the received signal for output to the display **2222**, or alternatively to an auxiliary I/O device **2228**. A push client **2260**, which could be equivalent to push clients **140** and **510**, could also process the input.

[0085] A user of mobile device **2200** may also compose data items such as email messages for example, using the keyboard **2232**, which is preferably a complete alphanumeric keyboard or telephone-type keypad, in conjunction with the display **2222** and possibly an auxiliary I/O device **2228**. Such composed items may then be transmitted over a communication network through the communication subsystem **2211**.

[0086] For voice communications, overall operation of mobile device **2200** is similar, except that received signals would preferably be output to a speaker **2234** and signals for transmission would be generated by a microphone **2236**. Alternative voice or audio I/O subsystems, such as a voice message recording subsystem, may also be implemented on mobile device **2200**. Although voice or audio signal output is preferably accomplished primarily through the speaker **2234**, display22**422** may also be used to provide an indication of the identity of a calling party, the duration of a voice call, or other voice call related information for example.

[0087] Serial port **2230** in **Figure 6**, would normally be implemented in a personal digital assistant (PDA)-type mobile device for which synchronization with a user's desktop computer (not shown) may be desirable, but is an optional device component. Such a port **2230** would enable a user to set preferences through an external device or software application and would extend the capabilities of mobile device **2200** by providing for information or software downloads to mobile device **2200** other than through a wireless communication network. The alternate download path may for example be used to load an encryption key onto the device through a direct and thus reliable and trusted connection to thereby enable secure device communication. As will be appreciated by those skilled in the art, serial port **2230** can further be used to connect the mobile device to a computer to act as a modem.

[0088] Other communications subsystems **2240**, such as a short-range communications subsystem, is a further optional component which may provide for communication between mobile device **2200** and different systems or devices, which need not necessarily be similar devices. For example, the subsystem **2240** may include an infrared device and associated circuits and components or a Bluetooth™ communication module to provide for communication with similarly enabled systems and devices.

[0089] The embodiments described herein are examples of structures, systems or methods having elements corresponding to elements of the techniques of this application.

This written description may enable those skilled in the art to make and use embodiments having alternative elements that likewise correspond to the elements of the techniques of this application. The intended scope of the techniques of this application thus includes other structures, systems or methods that do not differ from the techniques of this application as described herein, and further includes other structures, systems or methods with insubstantial differences from the techniques of this application as described herein.

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The claims defining the invention are as follows:

1. A mixed mode dynamic content delivery method comprising the steps of:

receiving at a content provider a subscription message from a client application, the subscription message being associated with a filter;

obtaining a subscription identifier;

sending the subscription identifier downstream in response to the subscription message;

associating the filter with the subscription identifier;

applying the filter to content available on the content provider, thereby producing a content subset;

receiving an indication of client application's readiness to receive content; and

forwarding the content subset downstream in response to the indication.

2. The method of claim 1, wherein the step of applying the filter is performed in response to the receipt of the indication of readiness.

3. The method of claim 1, wherein associating the filter with the subscription identifier includes retrievably storing the filter.

4. The method of claim 1, wherein obtaining the subscription identifier includes generating the subscription identifier.

5. The method of claim 1, wherein said indication of readiness comprises rules to be applied to the content subset, said method further comprising applying said rules to said content subset.

6. The method of claim 1 or claim 2, wherein said subscription identifier is sent to the client application.

7. The method of claim 1 or claim 2, wherein said subscription identifier is sent to a content delivery server.

8. The method of claim 7, wherein said content subset is forwarded to said content delivery server.

9. The method of claim 8, wherein said content delivery server caches said content subset.

10. The method of any one of the preceding claims, wherein said subscription message is an initial indication of readiness to receive content.

11. The method of any one of the preceding claims, wherein said mixed mode delivery method is performed over pull bearers.

12. The method of any one of claims 1 to 10 wherein said mixed mode delivery method is performed over push bearers.

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13. The method of claim 12, wherein absent content to be forwarded, the method further comprising the step of asserting a flag at at least one of said content provider and content delivery server to indicate said client application's readiness to receive content.

14. The method of claim 13, wherein the step of applying the filter is performed subsequent to new content becoming available.

15. The method of any one of the preceding claims, further comprising the steps of:

identifying expired content, and

excluding the expired content from the content subset prior to said forwarding step.

16. The method of claim 15, further comprising the steps of replacing old content prior to said forwarding step.

17. A system for mixed mode delivery of dynamic content to a mobile device comprising:

a client application on the mobile device, the client application comprising:

messaging means configured to send a subscription message comprising a filter;

content output means wherein content presented to a user of the mobile device is categorized as consumed content; and

notification means configured to send upstream an indication of readiness to receive content when all content for the client application is consumed; and

a content provider, said content provider comprising:

reception means configured to receive the subscription message and the filter;

subscription identifier generation means configured to generate a subscription identifier and to associate the filter with the subscription identifier;

transmission means configured to send the subscription identifier downstream in response to the subscription message;

means configured to apply the filter to then available content, thereby producing a content subset;

notification reception means configured to receive the indication of readiness to receive content; and

forwarding means configured to forward the content subset downstream in response to the indication.

18. The system of claim 17, the client application further comprising means configured to identify expired content.

19. The system of claim 17, the content provider further comprising storage configured to retrievably store the filter.

20. The system of claim 17, wherein said indication of readiness comprises rules to be applied to the content subset, said content provider further comprising means to apply said rules to the content subset.

21. The system of claim 17, further comprising a content delivery server, the content delivery server comprising:

reception means configured to receive the subscription identifier from the content provider, the content subset from the content provider, and the indication of readiness;

a cache configured to cache the content subset; and

forwarding means configured to forward the content subset to the client application.

22. The system of claim 21, wherein said indication of readiness comprises rules to be applied to the content subset, said content delivery server further comprising means to apply said rules to the content subset.

23. The system of any of claims 17 to 22, wherein said subscription message includes the indication of readiness.

24. The system of any one of claims 17 to 22, wherein said system utilizes pull bearers.

25. The system of any one of claims 17 to 22, wherein said system utilizes push bearers.

26. The system of claim 25, wherein said content provider is configured to assert a flag to indicate said client application's readiness to receive content.

27. The system of claims 24 to 26, wherein at least one of said content provider and content delivery server is further configured to exclude expired content from the content subset.

28. The system of claim 27, wherein at least one of said content provider and content delivery server is further configured to replace old content.

29. A client application for use on a mobile device in a mixed mode dynamic content delivery system, the client application comprising:

messaging means configured to send a subscription message comprising a filter to a content provider;

content reception means configured to receive content;

content output means wherein content presented to a user of the mobile device is categorized as consumed content; and

transmission means configured to selectively send an indication of readiness to receive content when all content at the client application is consumed.

30. The client application of claim 29, further comprising means configured to identify expired content, the transmission means being further configured to selectively send the indication of readiness to receive content when all content at the client application has expired.

31. A content provider for use in a mixed mode dynamic content delivery system, the content provider comprising:

reception means configured to receive a subscription message and a filter from a client application;

subscription identifier generation means configured to generate a subscription identifier and to associate the filter with the subscription identifier;

communication means configured to send the subscription identifier downstream in response to the subscription message;

means configured to apply the filter to available content, thereby producing a content subset;

notification reception means configured to receive from the client application an indication of readiness to receive content ; and

forwarding means configured to forward the content subset downstream in response to the indication .

32. The content provider of claim 31, wherein said indication of readiness comprises rules to be applied to the content subset, said content provider further having means configured to apply said rules to the content subset.

33. The content provider of claim 31 or claim 32, further comprising means configured to assert a flag on the content provider to indicate said client application's readiness to receive content.

34. The content provider of any one of claims 31 to 33, further having means for excluding expired content from the content subset.

35. The content provider of any one of claims 31 to 34, further having means for replacing old content.

36. A method of controlling conveyance of dynamic content over a mixed mode delivery system to a mobile device, the method comprising:

sending a subscription message including a filter to a content provider;

receiving a subset of dynamic content;

categorizing content presented to a user of the mobile device as consumed content; and

selectively issuing an indication of readiness to receive content when all content received is consumed.

37. The method of claim 36, further comprising:

identifying expired content; and

selectively issuing the indication of readiness to receive content when all content received has expired.

38. A computer-readable medium having computer-readable code embodied therein, the computer-readable code being executable by a processor of a computing device or system for implementing the method according to any one of claims 1 to 17, 36 or 37.

DATED this Tenth Day of November, 2009

Research In Motion Limited

Patent Attorneys for the Applicant

SPRUSON & FERGUSON

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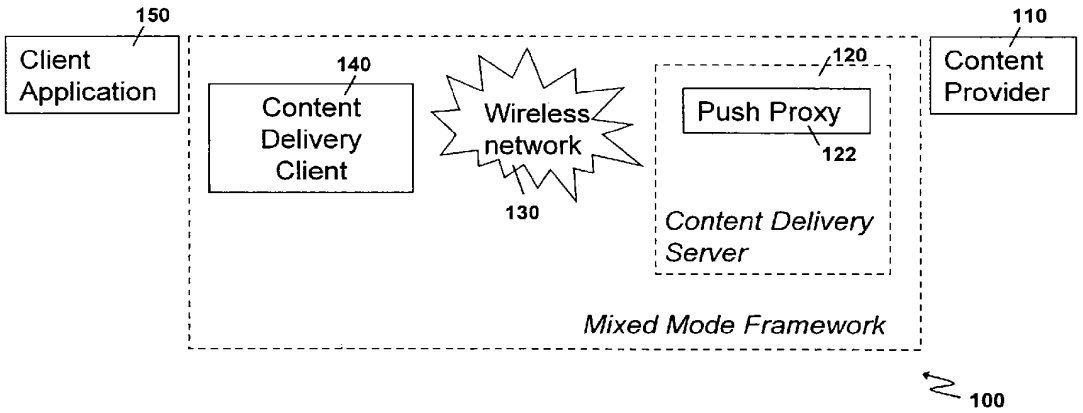
150
Client Application
140
Content Delivery Client
Wireless network
130
120
Push Proxy
122
Content Delivery Server
110
Content Provider
Mixed Mode Framework
100

FIG. 1

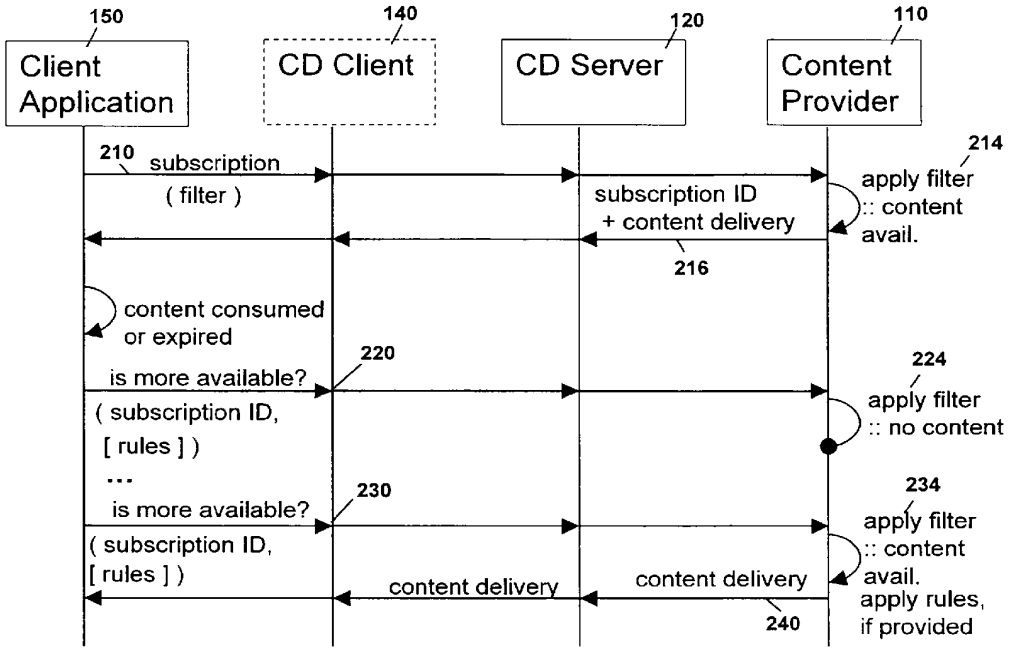
150
Client Application
140
CD Client
120
CD Server
110
Content Provider
210
subscription
(filter)
214
apply filter :: content avail.
subscription ID + content delivery
216
content consumed or expired
220
is more available?
(subscription ID, [rules])
...
224
apply filter :: no content
230
is more available?
(subscription ID, [rules])
234
apply filter :: content avail.
apply rules, if provided
content delivery
content delivery
240

FIG. 2

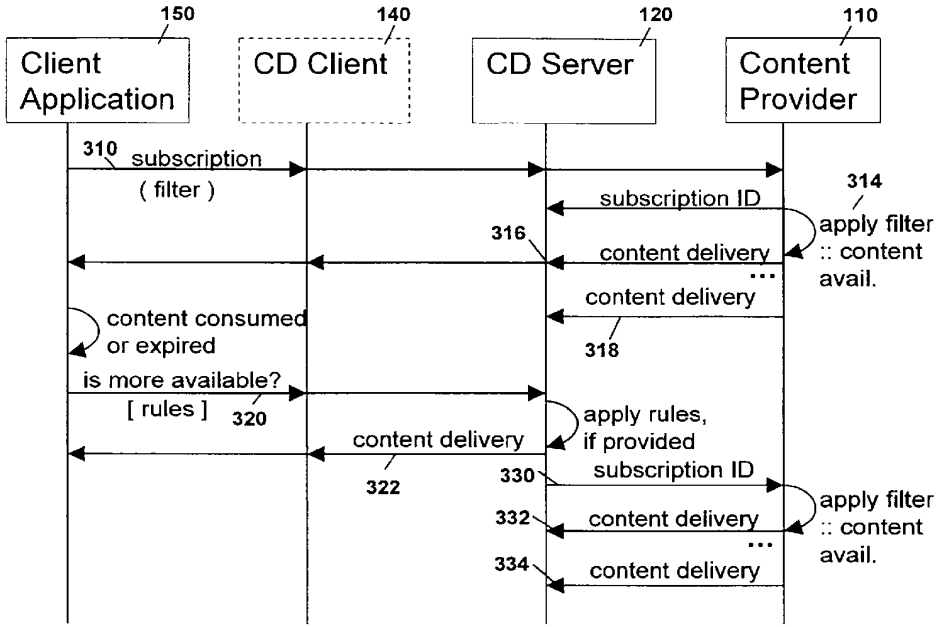
150
140
120
110
Client Application
CD Client
CD Server
Content Provider
310
subscription
(filter)
314
subscription ID
apply filter :: content avail.
316
content delivery
...
content delivery
318
content consumed or expired
is more available?
[rules]
320
apply rules, if provided
content delivery
322
330
subscription ID
apply filter :: content avail.
332
content delivery
...
334
content delivery

FIG. 3

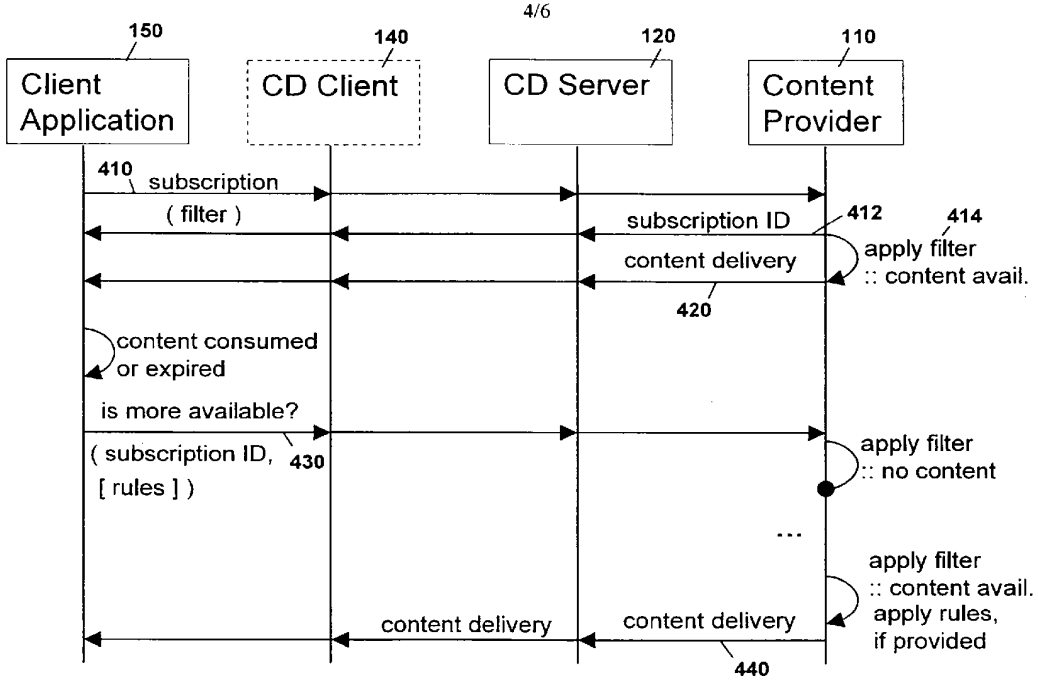
150
Client Application
140
CD Client
120
CD Server
110
Content Provider
410
subscription
(filter)
subscription ID
412
414
apply filter
:: content avail.
content delivery
420
content consumed
or expired
is more available?
(subscription ID,
[rules])
430
apply filter
:: no content
...
apply filter
:: content avail.
apply rules,
if provided
content delivery
content delivery
440

FIG. 4

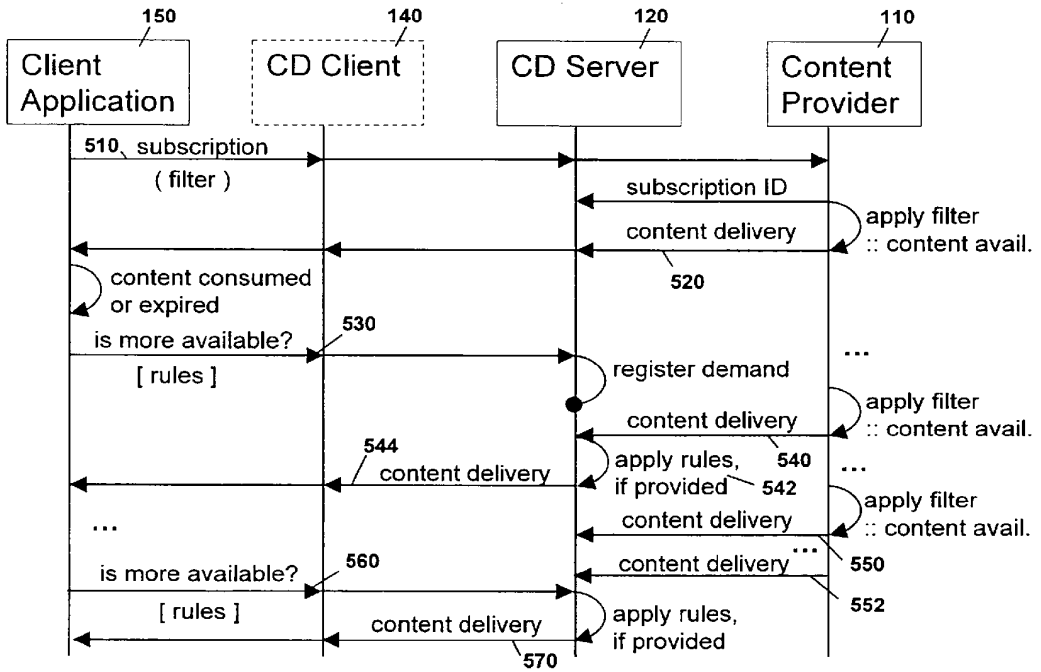
150
140
120
110
Client Application
CD Client
CD Server
Content Provider
510 subscription
(filter)
subscription ID
apply filter
:: content avail.
content delivery
520
content consumed
or expired
is more available?
530
[rules]
register demand
apply filter
:: content avail.
content delivery
544
content delivery
apply rules,
if provided
540
542
apply filter
:: content avail.
content delivery
content delivery
550
552
is more available?
560
[rules]
content delivery
apply rules,
if provided
570

FIG. 5

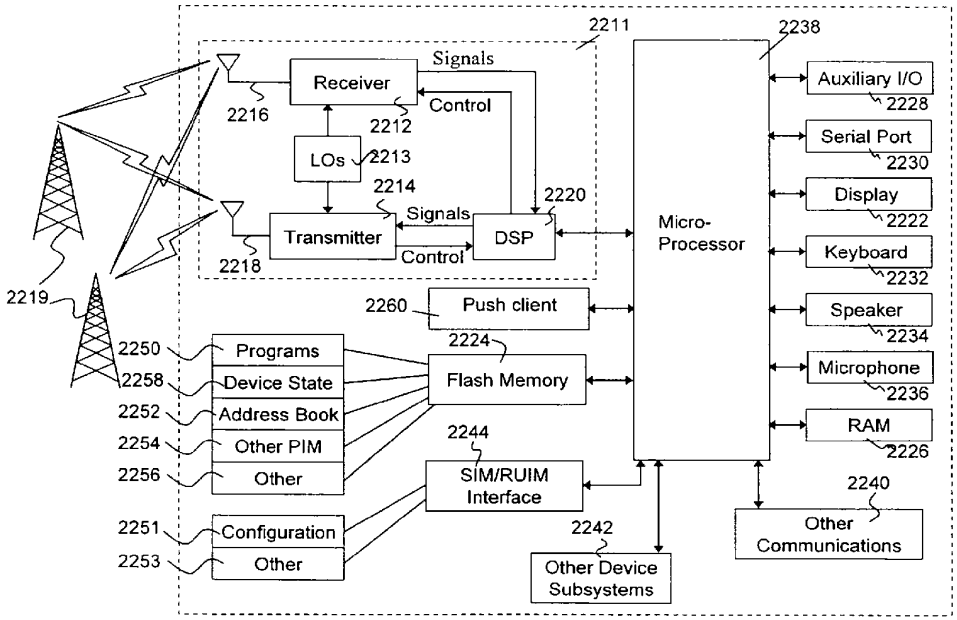
2211
2238
Signals
Receiver
Control
2216
2212
LOs
2213
2214
2220
Signals
Transmitter
DSP
Control
2218
2219
Micro-
Processor
Auxiliary I/O
2228
Serial Port
2230
Display
2222
Keyboard
2232
Speaker
2234
Microphone
2236
RAM
2226
2260
Push client
2224
Flash Memory
2250
Programs
2258
Device State
2252
Address Book
2254
Other PIM
2256
Other
2244
SIM/RUIM
Interface
2240
Other
Communications
2251
Configuration
2253
Other
2242
Other Device
Subsystems

FIG. 6