

lines indicates the content format (e.g. XHTML). It will be appreciated from this diagram that a message originating on an SMS bearer with GSM text content is processed by the server 1 using an output from an AP of XHTML content on an HTTP bearer to provide a final message to the mobile station of SMIL content on an MMS bearer. This is called “convergence”. In this specification, the ability to take control data and/or content in various independent formats from multiple network bearers or services and by internal processing or rendering ‘converge’ these to provide a single independent message or message stream.

[0087] A more complex example is shown in FIG. 9. This use case highlights three aspects of convergence:

[0088] From the mobile user perspective—sending an SMS in and obtaining an MMS out to the same phone—namely convergent transmission and delivery.

[0089] From the application perspective—two applications combining to offer increased information—namely a location system being used to feed data to the application to support location-dependent processing without the application developer having to access a location register.

[0090] From the content perspective—retrieving XHTML from the application and supplying SMIL to the mobile phone.

[0091] The following describes the messages.

[0092] (1) Mobile phone user sends an SMS containing a keyword to the SMSC. Unknown to the mobile phone user, the keyword actually identifies a convergent service or a virtual service (which does not actually exist, but Hydra allows it to appear to do so, by combining the web-based application with the location details). The terms “convergent service” and “virtual service” means a service as viewed by the user, not an internal part of the gateway 1 such as the services 21-33 of FIG. 2.

[0093] (2) The SMSC sends the SMS to an SMPP service within Hydra.

[0094] (3) The SMPP service ensures that the message will not be lost by storing it in a transaction manager service, and then acknowledges the message receipt to the SMSC. Hydra is now responsible for the message.

[0095] (4) The SMPP service sends the MAMP message out to the default message channel—which will be picked up by the workflow manager.

[0096] (5) The workflow manager, using its rules, assigns workflow elements to the MAMP message. In this case, it assigns the following workflow steps: session manager, entity resolver, and content processor. It cannot determine any further steps, since it does not know what form of output the content processor will generate.

[0097] (6) The session manager creates a new session. This allows the content processor to cache rendered information, and billing to generate CDRs against the session usage.

[0098] (7) The entity resolver service places additional data into the MAMP message based on the resolution of various addresses mapping to internal UIDs.

[0099] (8) The content processor uses the application definition for the resolved entity to determine it is actually a convergent service, and thus needs to obtain location information before making the request to the actual application.

[0100] (9) The location service places additional data into the MAMP message related to the mobile phone users’ current location.

[0101] (10) The content processor uses HTTP to obtain XHTML from the application. The request to the application includes location information—thus abstracting the application from the operator’s location register, and allowing the application and location register to converge. For example, the application may be a movies information application—and with the addition of location information from the location register and conditional processing based on the service definition from the XML configuration, can specify city-specific cinema listings.

[0102] (11) The content processor renders the XHTML from the application into a form suitable for display on the mobile phone.

[0103] (12) The workflow manager service receives the updated MAMP message. Different rules will not match the MAMP message, allowing new workflow to be assigned to take the MAMP message to: billing, SMTP.

[0104] (13) The billing service calculates the cost based on the current session information. A check is made against the pre-paid credit (assuming the mobile user is pre-paid). This is done after the content processing since it cannot pre-determine the rendering format (SMS or MMS), nor the number of messages required to resolve the application’s XHTML (e.g. may require several MMS to send a large number of images).

[0105] (14) The SMTP service sends the contents of the MAMP message (i.e. the rendered content from the application) to the MMSC via SMTP protocol.

[0106] (15) The MMSC acknowledges receipt of the message, allowing the transaction manager service to commit the transaction.

[0107] (16) The MMS is sent to the mobile phone user.

[0108] (17) After a period of no further activity within the current session, the session manager expires the session, triggering a new MAMP message to the workflow manager service.

[0109] (18) The workflow manager service applies rules to the MAMP message, and determines that it should visit the following services so they may clean up their session-related processing: content processor, billing.