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(54) MOBILE DEVICE, AUXILIARY RENDERING DEVICE AND ARRANGEMENT

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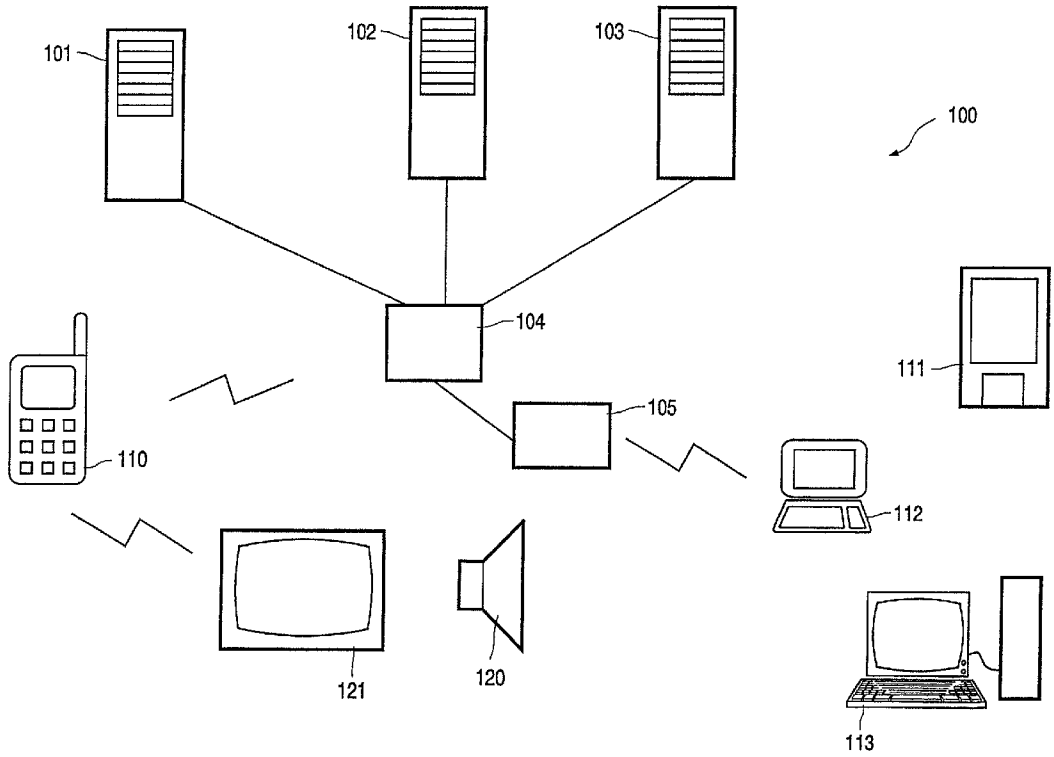
(57) **ABSTRACT**

The invention relates to an arrangement (**100**) comprising a mobile device (**110**) and an auxiliary rendering device (**120**). The mobile device (**110**) receives content from a content server (**101**) via a transcoding proxy (**104**) and can render it by itself, or relay it to the auxiliary rendering device (**120**). The mobile device (**110**) adapts the primary communication session to the capabilities of the auxiliary rendering device (**120**). Preferably the mobile device (**110**) receives an assistance message comprising information on the capabilities of the auxiliary rendering device (**120**), and relays this to the transcoding proxy (**104**) so that the content can be transcoded to a format suitable for the auxiliary rendering device (**120**). The mobile device (**110**) can perform a handover to a second auxiliary rendering device (**121**) if necessary.



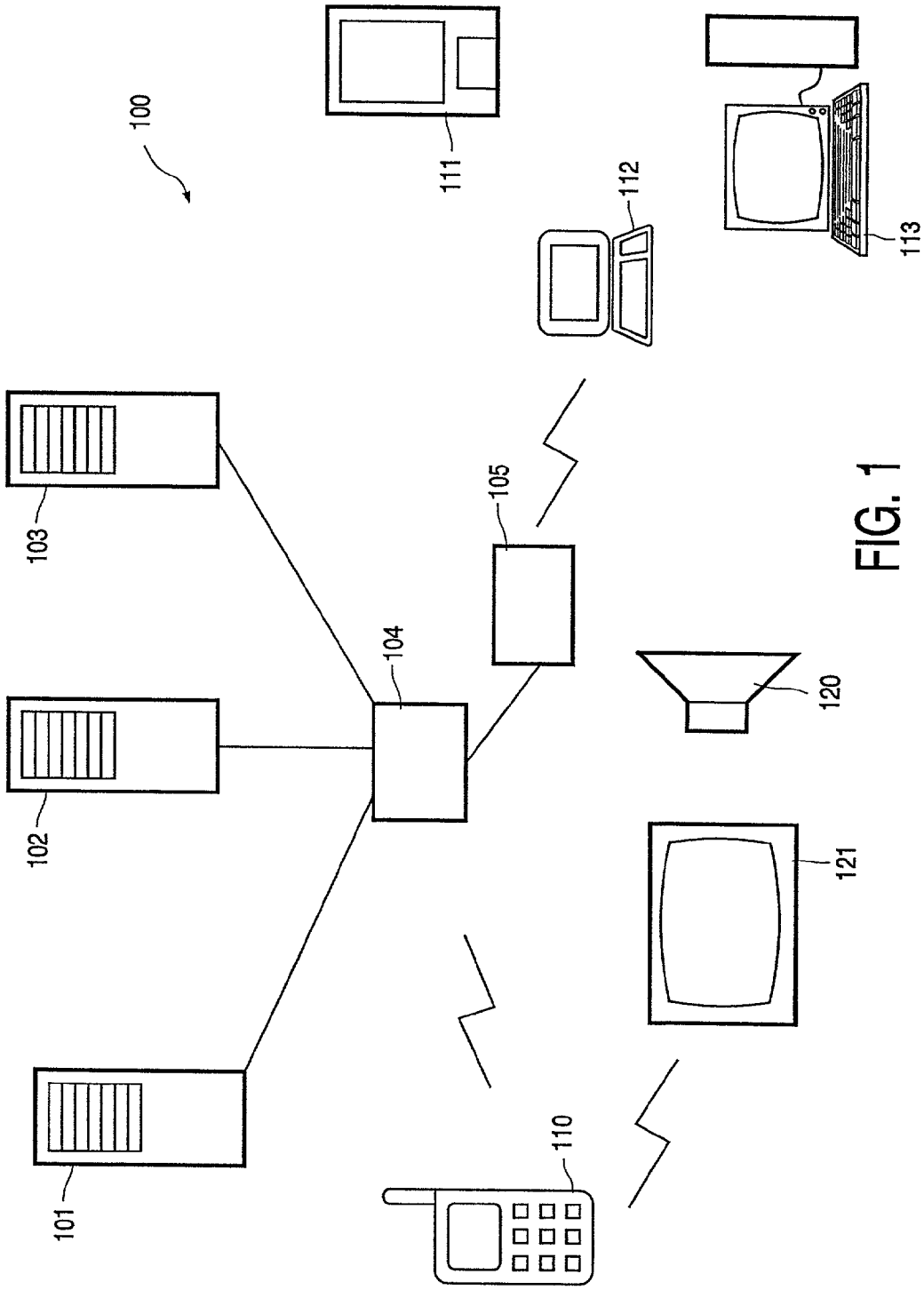


FIG. 1

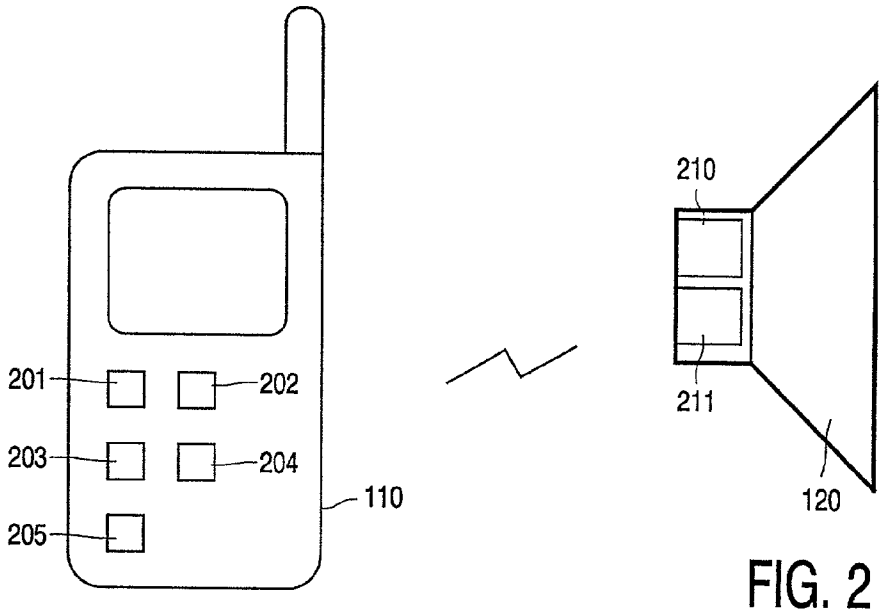

210
201
202
211
203
204
110
205
120

FIG. 2

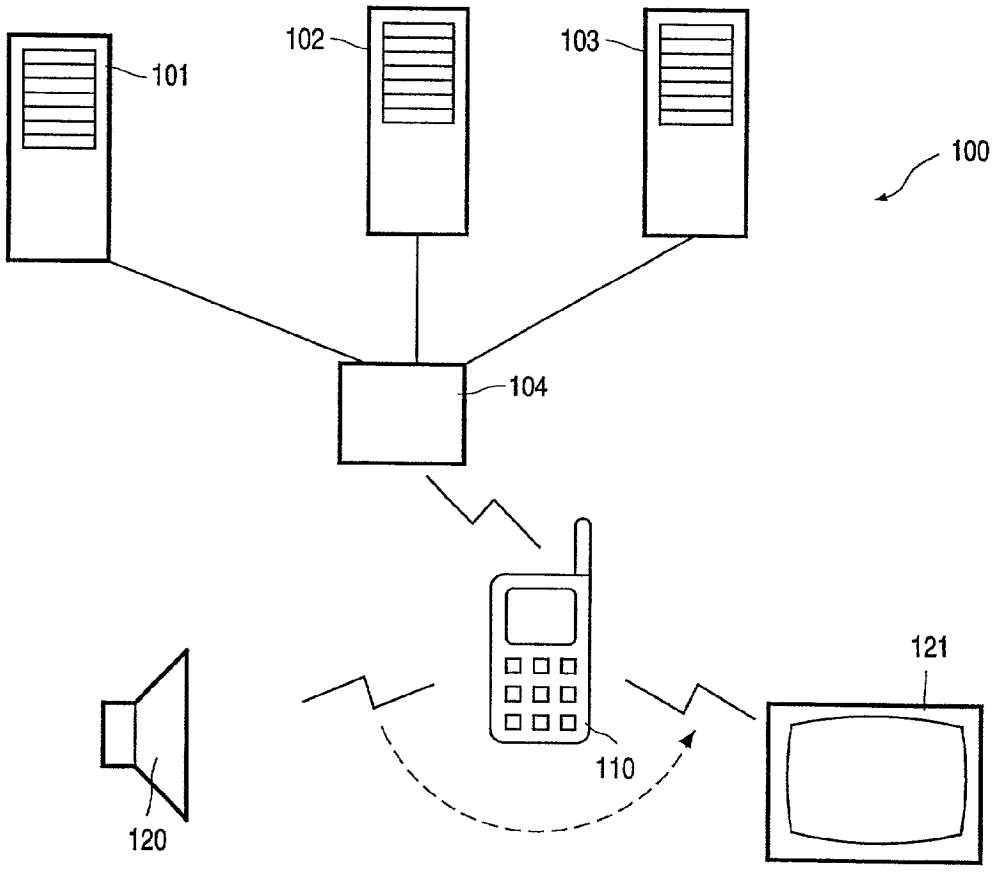

101
102
103
100
104
121
110
120

FIG. 3

MOBILE DEVICE, AUXILIARY RENDERING DEVICE AND ARRANGEMENT

[0001] The invention relates to a mobile device comprising primary communication means for establishing a primary communication session via a transcoding proxy with a content server, and auxiliary communication means for establishing an auxiliary communication session with an auxiliary rendering device.

[0002] The invention further relates to an auxiliary rendering device comprising mobile device communication means for establishing an auxiliary communication session with a mobile device, and rendering means for rendering content received in the auxiliary communication session.

[0003] The invention further relates to an arrangement comprising such a mobile device and such an auxiliary rendering device.

[0004] A mobile device according to the preamble is known from U.S. Pat. No. 5,880,732. Mobile devices allow users to access information from a variety of sources at any time and at any place. Such devices, for example mobile phones using the Wireless Application Protocol, or palmtop computers, typically only have limited processing power and rendering capabilities. Due to portability considerations, the mobile device is typically made as thin as possible, i.e. low power consumption, compact, lightweight, and so on. Thus it is not possible to include many features in this thin device, e.g. high-resolution image, or requiring a specific plug-in program. To facilitate access to the rich content offered by various information services, a content transcoding process needs to be executed automatically on an intermediate transcoding proxy when the intended content contains something beyond the capability of the mobile device. The transcoding proxy server converts various types of contents into formats that are acceptable for a specific mobile device. This transcoding process typically involves actions such as adjusting the presentation so it will fit on the small screen on the mobile device, removing unnecessary elements such as audio for devices that have no sound capabilities, scaling graphics to an appropriate size, compressing data for transmission to the mobile device, converting from e.g. HTML to WML, and so on.

[0005] A benefit of using this architecture is the simplification of client devices and the ability of browsing universal content on the World-Wide Web. Most of the complicated tasks have been put on the transcoding proxy server or even further pushed to the content server. Meanwhile, another advantage of using this technology is the automatic content adaptation to various client devices and access network bandwidth.

[0006] However, the trend of developing mobile thin clients is to design smaller hand-held units. The small size of mobile thin client causes an associated display or speaker to be rather small. The small display or speaker make it difficult to adequately present the content to a user. To solve this problem, the above-mentioned U.S. patent discloses an arrangement that enables the usage of an external display monitor with a mobile telephone. The mobile telephone transmits numeric and textual data intended to be displayed on a display to a remote display monitor, where it can be presented on the large screen of the remote display monitor. However, a disadvantage of this mobile device is that it only copies the same data to a large display monitor. This makes this mobile device less than optimal for use in the presentation of data other than text. The data has been transcoded at the transcoding proxy to a format suitable for the mobile device, and this format is inherently limited to the capabilities of the mobile device. So, for instance, an image would be converted to black and white on a mobile device having only a black/white screen. This black and white image will then be transmitted by the mobile device for display on the remote display monitor. However, the remote display monitor will most likely have a color display. A similar problem exists with audio data, which is transcoded for presentation by the mobile device, yet presented by a device with more capabilities than the mobile device.

[0007] It is an object of the invention to provide a mobile device according to the preamble, which can facilitate a better presentation of content than the known device.

[0008] This object is achieved according to the invention in a mobile device which is characterized by means for adapting the primary communication session to the capabilities of the auxiliary rendering device. When the primary communication session is adapted in this fashion, the content received from the content server will be transcoded by the transcoding proxy for presentation on the auxiliary rendering device. The mobile device can to this end communicate information on the capabilities of the auxiliary rendering device to the transcoding proxy. Alternatively, the mobile device can comprise a number of profiles for auxiliary rendering devices, select the most appropriate one and transmit that to the transcoding proxy. The transcoding proxy could also contact the auxiliary rendering device itself to learn about its capabilities, either via the mobile device or via some other communication channel. In any case, once the transcoding proxy knows the capabilities of the auxiliary rendering device, it can transcode content for presentation on the auxiliary rendering device rather than for presentation on the mobile device. This allows a greater choice in devices on which to render the content and the formats in which this should be done.

[0009] An embodiment is characterized by rendering means for rendering content received in the primary communication session, and rendering control means for examining the content and redirecting the content to one of the rendering means and the auxiliary communication means in dependence on the examination, whereby the auxiliary communication means are arranged for transmitting the content via the auxiliary communication session for rendering by the auxiliary rendering device. The transcoding proxy can, in accordance with the information on the capabilities of the auxiliary rendering device, transcode the content in the most appropriate fashion. If an auxiliary communication session has been established with an auxiliary rendering device that comprises a color display, and the mobile device comprises a black and white display, the transcoding proxy may choose to transcode a source image to a color image rather than a black and white image, and then transmit the transcoded image to the mobile device. The rendering control means in the mobile device will examine the received image, determine that it is a color image and relay it to the auxiliary rendering device. This facilitates an optimal presentation of the image.

[0010] A further embodiment is characterized in that the auxiliary communication means are arranged for receiving

an assistance message from the auxiliary rendering device, the assistance message comprising information on the capabilities of the auxiliary rendering device, and for establishing the auxiliary communication session in response to the assistance message, and the primary communication means are arranged for transmitting said information on the capabilities to the transcoding proxy. The mobile device locates an auxiliary rendering device by means of the assistance message. This message comprises information on its capabilities, such as the presence of a display screen with resolution data, the capabilities of a speaker, and so on. The mobile device relays this information to the transcoding proxy, which can then transcode the information into a format suitable for rendering on the auxiliary rendering device or into a format suitable for rendering on the mobile device.

[**0011**] A further embodiment is characterized in that the auxiliary communication means are arranged for transmitting an assistance request to at least one auxiliary rendering device. An advantage of this embodiment is that this allows the mobile device to actively locate an auxiliary rendering device. Auxiliary rendering devices can respond to the assistance request with their respective assistance messages, allowing the mobile device to select the most appropriate one. The assistance request is preferably broadcast in a wireless fashion so that all auxiliary rendering devices in the vicinity can receive it.

[**0012**] A variant of this embodiment is characterized in that the primary communication means are arranged for receiving a communication request for establishing the primary communication session, and the auxiliary communication means are arranged for transmitting the assistance request in response to receiving the communication request. An advantage of this variant is that it facilitates server-initiated communication sessions. The content server can send a communication request, typically via the transcoding proxy, to the mobile device to establish a communication session. The mobile device can then locate an auxiliary rendering device for use in that communication session.

[**0013**] A further variant of this embodiment is characterized in that the auxiliary communication means are arranged for transmitting the assistance request when a level for the quality of a previously established auxiliary communication session drops below a predetermined value. The mobile device can also use the assistance request to locate a new auxiliary rendering device. This allows it to establish an auxiliary communication session with the new auxiliary rendering device, for instance if the auxiliary rendering device that was previously in use has gone out of range.

[**0014**] A further embodiment is characterized in that the auxiliary communication means are arranged for ending the auxiliary communication session and establishing a further auxiliary communication session in response to receiving a further assistance message from a further auxiliary rendering device, said further assistance message comprising information on the capabilities of the further auxiliary rendering device, and in that the primary communication means are arranged for transmitting said information on the capabilities to the transcoding proxy in response to receiving the further assistance message. When the mobile device receives such a further assistance message, for instance in response to transmitting an assistance request when the level of the previously established auxiliary communication session drops below a predetermined value, it can start using the new auxiliary rendering device instead. This makes it possible for a user to walk around between multiple auxiliary rendering devices, for example display screens in a building, without having to wait until the primary communication session has ended. The effect will be that the rendering of the content simply continues on the auxiliary rendering device he is closest to.

[**0015**] It is a further object of the invention to provide an auxiliary rendering device according to the preamble, which can a better presentation of content than the known device.

[**0016**] This object is achieved according to the invention in an auxiliary rendering device which is characterized in that mobile device communication means are arranged for transmitting an assistance message comprising information on the capabilities of the auxiliary rendering device to the mobile device. By transmitting the assistance message, the auxiliary rendering device allows the mobile device to determine whether it can make use of the offered facilities, such as a larger display or better loudspeakers. The mobile device can then pass on this information to a transcoding proxy, which can then transcode content according to the capabilities of the auxiliary rendering device, rather than according to the capabilities of the mobile device.

[**0017**] An embodiment is characterized in that the mobile device communication means are arranged for transmitting the assistance message in response to receiving an assistance request from the mobile device. An advantage of this embodiment is that this allows the mobile device to actively locate an auxiliary rendering device. Auxiliary rendering devices can respond to the assistance request with their respective assistance messages, allowing the mobile device to select the most appropriate one. The assistance request is preferably received from a broadcast in a wireless fashion.

[**0018**] The invention further relates to an arrangement comprising a mobile device and an auxiliary rendering device according to the invention.

[**0019**] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments shown in the drawings, in which:

[**0020**] **FIG. 1** schematically shows a communication network arranged for a communication session between a mobile device and a content server;

[**0021**] **FIG. 2** schematically shows the mobile device in more detail; and

[**0022**] **FIG. 3** schematically shows a handover process.

[**0023**] Throughout the figures, same reference numerals indicate similar or corresponding features. Some of the features indicated in the drawings are typically implemented in software, and as such represent software entities, such as software modules or objects.

[**0024**] **FIG. 1** schematically shows a communication network **100** arranged for a communication session between a mobile device **110** and a content server **101**. The content servers **101**, **102**, **103** can establish communication sessions with mobile devices **110**, **111**, **112**, **113** via a transcoding proxy **104**. Also present are auxiliary rendering devices **120**, **121**, comprising auxiliary loudspeaker and display, respec-

tively. Other auxiliary rendering devices can of course easily be substituted. To illustrate the working of the invention, it is assumed that a communication session is to be established between the mobile device **110** and the content server **101**.

[**0025**] The communication session is typically an end-to-end communication session that may involve the exchange of Internet data packets. They can be divided into two types as follows:

[**0026**] 1. Client-initiated access, which may trigger the execution of some application programs on the transcoding proxy, such as image transcoding, audio/video re-encoding, JAVA or WML script execution, and so on.

[**0027**] 2. Network-initiated services, such as e-mail notification, Internet telephony, instant messaging, and so on.

[**0028**] The transcoding proxy **104** transcodes communication sessions established between the content server **101** and the mobile device **110** to and from a format suitable for the mobile device **110**, to facilitate access to the content offered by the content server **101**. The transcoding proxy **104** converts various types of contents into formats that are acceptable for the mobile device **104**. This conversion typically involves actions such as adjusting the presentation so it will fit on the small screen on the mobile device **110**, removing unnecessary elements such as audio for devices that have no sound capabilities, scaling graphics to an appropriate size, compressing data for transmission to the mobile device **104**, converting from e.g. HTML to WML, and so on. Methods of transcoding communication sessions are known from e.g. U.S. Pat. No. 6,049,821 or U.S. Pat. No. 5,918,013. The transcoding proxy **104** may directly relay the transcoded content to the mobile device **110**, or may need a gateway **105** to do so.

[**0029**] **FIG. 2** schematically shows the mobile device **110** in more detail. It comprises a primary communication module **201** for establishing a primary communication session via a transcoding proxy with a content server, and an auxiliary communication module **202** for establishing an auxiliary communication session with an auxiliary rendering device such as auxiliary rendering device **120**.

[**0030**] The auxiliary communication module **202** receives an assistance message from the auxiliary rendering device **120**. This assistance message comprises information on the capabilities of the auxiliary rendering device **120**, such as the presence of a display screen with resolution data, the capabilities of a speaker, and so on.

[**0031**] The assistance message may be sent by the auxiliary rendering device **120** of its own accord, but preferably is sent in response to the transmission of an assistance request by the auxiliary communication module **202** to at least one auxiliary rendering device **120**, **121**. Auxiliary rendering devices **120**, **121** can respond to the assistance request with their respective assistance messages, allowing the mobile device **110** to select the most appropriate one. The assistance request is preferably sent as a broadcast in a wireless fashion. The mobile device **110** may employ a timer which is set when the assistance request is transmitted. If the timer reaches a particular timeout value, and no assistance message has been received yet, the mobile device **110** can conclude no auxiliary rendering device **120** is available.

[**0032**] In response to receiving the assistance message, the auxiliary communication module **202** establishes an auxiliary communication session with the auxiliary rendering device **120**. This auxiliary communication session allows the mobile device **110** to relay the content via the auxiliary communication session to the auxiliary rendering device **120** for rendering by the auxiliary rendering device **120**.

[**0033**] After the assistance message has been received, the primary communication module **201** transmits the information on the capabilities to the transcoding proxy **104**, which can then transcode the information into a format suitable for rendering on the auxiliary rendering device **120** or into a format suitable for rendering on the mobile device **110**.

[**0034**] The primary communication module **201** can now establish a primary communication session with the content server **101**. The auxiliary rendering device **120** can render content received in this session. The primary communication session can also be established in a server-initiated fashion. In that case, the primary communication module **201** receives a communication request for establishing the primary communication session from the content server **101**. In response to that, the auxiliary communication module **202** transmits the assistance request to locate an appropriate auxiliary rendering device, if no auxiliary communication session has yet been established. Once the auxiliary communication session has been established, the primary communication module **201** relays the information on the capabilities of the auxiliary rendering device **120** to the transcoding proxy **104**, and the primary communication session is established as above. The use of the timer as described above is particularly useful in this case, since the content server **101** may employ its own timer in waiting for the primary communication session to be established. If the mobile device **110** does not establish this session soon enough, the content server **101** will most likely give up. The attempt to establish an auxiliary communication session should therefore not

[**0035**] The mobile device **110** further comprises a rendering module **203** which renders content received in the primary communication session. Rendering the content can be done in a variety of ways, for example by presenting it on a display, producing a sound using a loudspeaker, and so on. The rendering module **203** may employ a decoding module **204**, which decodes the received content before it can be rendered. This could be, for instance, an MP3 decoder, or a conditional access module.

[**0036**] In accordance with the invention, the mobile device **110** further comprises a rendering control module **205** which examines the received content to determine if it can be rendered by the rendering module **203**. If this is the case, it redirects the content to the rendering module **203**. If not, it redirects the content to the auxiliary communication module **202**. The auxiliary communication module **202** then transmits the content via the auxiliary communication session to the auxiliary rendering device **120** for rendering by the auxiliary rendering device **120**.

[**0037**] The auxiliary rendering device **120** comprises a mobile device communication module **210** for establishing an auxiliary communication session with the mobile device **110**. The mobile device communication module **210** transmits an assistance message comprising information on the capabilities of the auxiliary rendering device **120** to the

mobile device **110**, preferably in response to receiving an assistance request from the mobile device **110**. It may also be transmitted periodically or because of some other factor. The mobile device **110** responds to receiving an assistance message by establishing the auxiliary communication session, if it judges the capabilities of the auxiliary rendering device **120** sufficient. If not, it needs not do anything. The auxiliary rendering device **120** should therefore not take any action if no results are forthcoming from the assistance message.

[**0038**] If the mobile device **104** receives multiple assistance messages, it can pick one depending on various factors. For instance, it may choose the assistance message from the geographically closest auxiliary rendering device, or the one that was received the soonest after transmitting the assistance request.

[**0039**] The auxiliary rendering device **120** further comprises a rendering module **211** for rendering content received in the auxiliary communication session. This rendering module **211** will typically have better rendering capabilities than the rendering module **203** in the mobile device **110**. Once the mobile device **110** has established a primary communication session with the content server **101**, it can relay content received therethrough via the auxiliary communication session to the auxiliary rendering device **120** for rendering by the auxiliary rendering device **120**. The auxiliary rendering device **120** in **FIG. 2** is equipped with a loudspeaker, and so allows rendering of audio content, such as music or speech. This way, the mobile device **110** does not need to render this audio content on its own loudspeaker, which in the case of a mobile telephone gives a much lower rendering quality compared to a dedicated loudspeaker system. The mobile device **110** could similarly have used auxiliary rendering device **121**, which comprises an auxiliary display that is bigger and has better resolution and color capabilities than the display on the mobile device **110**. The mobile device **110** can now let the auxiliary rendering device **121** render visual content, such as images, text or movies, rather than render it itself on its own tiny display. Once the primary communication session has been ended, the mobile device **104** can similarly end the auxiliary communication session, since it no longer needs to use the auxiliary rendering device **120**.

[**0040**] **FIG. 3** schematically shows a handover process involving the mobile device **110** and first and second auxiliary rendering devices **120**, **121**. It is assumed that a primary communication session has been established between content server **101** and mobile device **110** via transcoding proxy **104**, and that an auxiliary communication session has been established between mobile device **104** and first auxiliary rendering device **120**. As has become clear above, the mobile device **104** receives content from the content server **101** and either renders this itself, using rendering module **203**, or forwards the content to auxiliary device **120** via the auxiliary communication session.

[**0041**] It may become necessary or desirable to stop using first auxiliary device **120** and to start using second auxiliary device **121** instead. For instance, the second auxiliary device **121** may have better rendering capabilities than the first auxiliary device **120**, so switching to second auxiliary device **121** would be preferable for the user. Alternatively, a level for the quality of the established auxiliary communication session drops below a predetermined value, i.e., the auxiliary device **120** goes out of range or stops responding to transmissions for some reason. The mobile device **110** can detect this, for instance, by performing an RF level scan.

[**0042**] To switch to second auxiliary device **121**, the mobile device **110** transmits an assistance request, as described above. Second auxiliary rendering device **121** will receive the assistance request, and will respond with an assistance message, comprising information on its capabilities. The mobile device **110** can use this message to determine if switching to the second auxiliary rendering device **121** is desirable. If so, the auxiliary communication module **202** ends the auxiliary communication session with the first auxiliary rendering device **120** and establishes a new auxiliary communication session with the second auxiliary rendering device **121**. The primary communication module **201** then transmits said information on the capabilities to the transcoding proxy **104**, so that the transcoding proxy **104** can start transcoding to a format suitable for the second auxiliary rendering device **121**.

[**0043**] It may be useful to temporarily suspend the primary communication session before ending the auxiliary communication session, and to resume the primary communication session once the new auxiliary communication session has been established. This ensures that no content is transmitted while no suitable auxiliary rendering device is available.

[**0044**] The mobile device **110** will move around in the network. It may happen that it reaches the boundary of a so-called service area covering a particular geographical area or portion of the network. In that case, the mobile device **110** needs to perform a handover to an adjacent service area. European patent application 00203656.4 (attorney docket PHTW00006) describes a method of transferring the primary communication session from one service area to another, and is incorporated herein by reference. Each service area is associated with a transcoding proxy for transcoding communication sessions established in said service area to and from a format suitable for the mobile device **110**. When the mobile device **110** moves to the second service area, the associated second transcoding proxy is contacted and session handling and session information is transferred thereto. The transfer operation is transparent to the content server **101**, so the session between mobile device **110** and content server **101** stays intact.

[**0045**] When the mobile device **110** detects a boundary of the service area, but there is no need to start using the second auxiliary rendering device **121**, the above-mentioned method can be used without modification. It may be necessary for the mobile device **110** to send the information on the capabilities of the first auxiliary rendering device **120** to the second transcoding proxy associated with the second service area, if the session information that is transferred does not include this information on the capabilities.

[**0046**] It can be advantageous to simultaneously switch from one service area to another and from one auxiliary rendering device to another. In that case, the mobile device **104** should send the information on the capabilities of the second auxiliary rendering device **120** to the second service area during the handover process.

1. A mobile device (**110**) comprising primary communication means (**201**) for establishing a primary communication session via a transcoding proxy (**104**) with a content server (**101**), and auxiliary communication means (**202**) for establishing an auxiliary communication session with an auxiliary rendering device (**120**), characterized by means for adapting the primary communication session to the capabilities of the auxiliary rendering device (**120**).

2. A mobile device (**110**) as claimed in claim 1, characterized by rendering means (**203**) for rendering content received in the primary communication session, and rendering control means (**205**) for examining the content and redirecting the content to one of the rendering means (**203**) and the auxiliary communication means (**202**) in dependence on the examination, whereby the auxiliary communication means (**202**) are arranged for transmitting the content via the auxiliary communication session for rendering by the auxiliary rendering device (**120**).

3. A mobile device (**110**) as claimed in claim 1, characterized in that the auxiliary communication means (**202**) are arranged for receiving an assistance message from the auxiliary rendering device (**120**), the assistance message comprising information on the capabilities of the auxiliary rendering device (**120**), and for establishing the auxiliary communication session in response to the assistance message, and the primary communication means (**201**) are arranged for transmitting said information on the capabilities to the transcoding proxy (**104**).

4. A mobile device (**110**) as claimed in claim 3, characterized in that the auxiliary communication means (**202**) are arranged for transmitting an assistance request to at least one auxiliary rendering device (**120**).

5. A mobile device (**110**) as claimed in claim 4, characterized in that the primary communication means (**201**) are arranged for receiving a communication request for establishing the primary communication session, and the auxiliary communication means (**202**) are arranged for transmitting the assistance request in response to receiving the communication request.

6. A mobile device (**110**) as claimed in claim 4, characterized in that the auxiliary communication means (**202**) are arranged for transmitting the assistance request when a level for the quality of a previously established auxiliary communication session drops below a predetermined value.

7. A mobile device (**110**) as claimed in claim 3, characterized in that the auxiliary communication means (**202**) are arranged for ending the auxiliary communication session and establishing a further auxiliary communication session in response to receiving a further assistance message from a further auxiliary rendering device (**121**), said further assistance message comprising information on the capabilities of the further auxiliary rendering device (**121**), and in that the primary communication means (**201**) are arranged for transmitting said information on the capabilities to the transcoding proxy (**104**) in response to receiving the further assistance message.

8. An auxiliary rendering device (**120**) comprising mobile device communication means (**210**) for establishing an auxiliary communication session with a mobile device (**110**), and rendering means (**211**) for rendering content received in the auxiliary communication session, characterized in that mobile device communication means (**210**) are arranged for transmitting an assistance message comprising information on the capabilities of the auxiliary rendering device (**120**) to the mobile device (**110**).

9. An auxiliary rendering device (**120**) as claimed in claim 8, characterized in that the mobile device communication means (**201**) are arranged for transmitting the assistance message in response to receiving an assistance request from the mobile device (**110**).

10. An arrangement (**100**) comprising a mobile device (**110**) as claimed in any of the claims **1-7**, and an auxiliary rendering device (**120**) as claimed in claim 8 or **9**.

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