US 20070150617A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2007/0150617 A1

(43) Pub. Date: Jun. 28, 2007

Hariki

(54) RESOURCE APPLICATION PROGRAM INTERFACE UTILITY FOR CHANGING USER INTERFACE ELEMENTS ON WIRELESS DEVICES

(75) Inventor: **Keiji Hariki**, Sunnyvale, CA (US)

Correspondence Address:
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE, CA 95157

(73) Assignee: **Innopath Software, Inc.**

(21) Appl. No.: **11/493,709**

(22) Filed: **Jul. 25, 2006**

Related U.S. Application Data

(60) Provisional application No. 60/753,107, filed on Dec. 22, 2005.

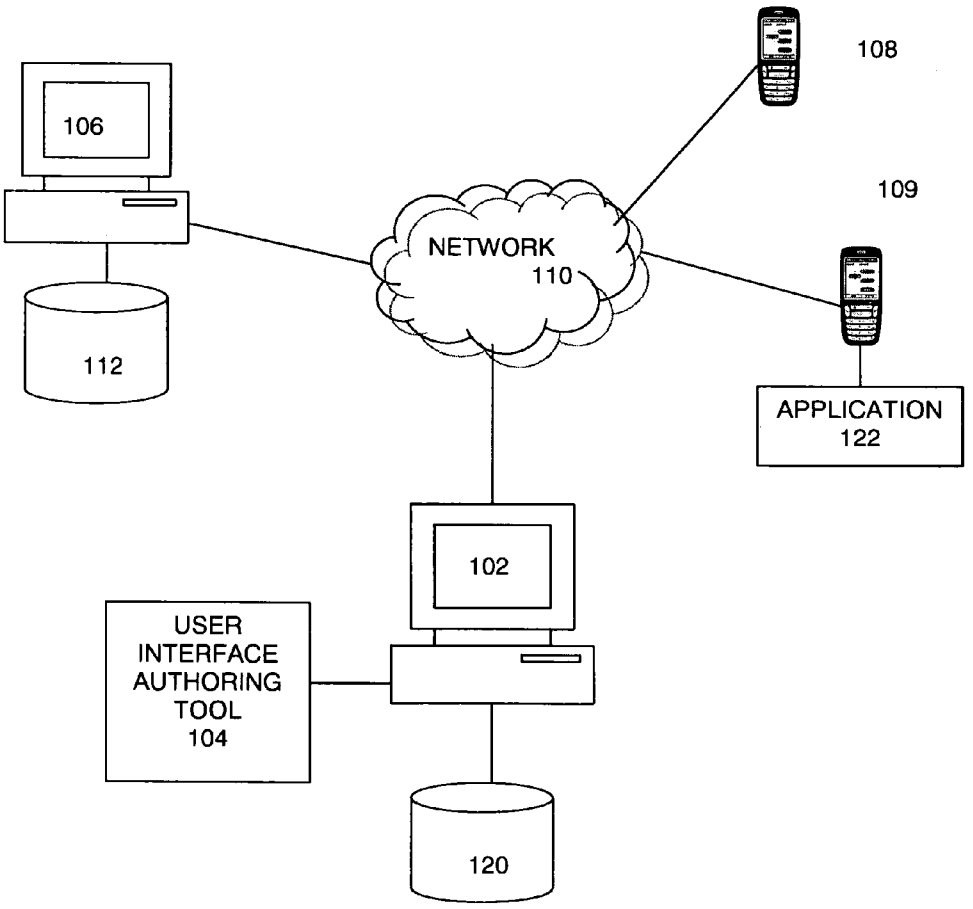
Publication Classification

(51) **Int. Cl.**
G06F 15/16 (2006.01)

(52) **U.S. Cl.** **709/246**

(57) **ABSTRACT**

Embodiments of a mobile device incorporating a resource application program interface for downloading user interface components for a resident application are described. Resource profiles are defined by device manufacturers for each model of mobile device. The resource profiles specify the composition, format, and appearance of one or more user interface elements displayed or executed by the mobile device. A content provider maintains a common database of resources for each mobile device model. The resources comprise files, links to files, and/or data or program objects associated with the configurable aspect of the user interface for each mobile device and are provided in the form of a downloadable UI content package consisting of the description file and resource files. The mobile device handset includes a resource API to download UI content package data from a UI content server or UI content that is locally stored. The resource API contains a number of different plug-in content engines and an engine selector component to allow an application program executed on the mobile handset to access the resources without requiring modification of the application.



Netflix v. GoTV
IPR2023-00757
Netflix Ex. 1006

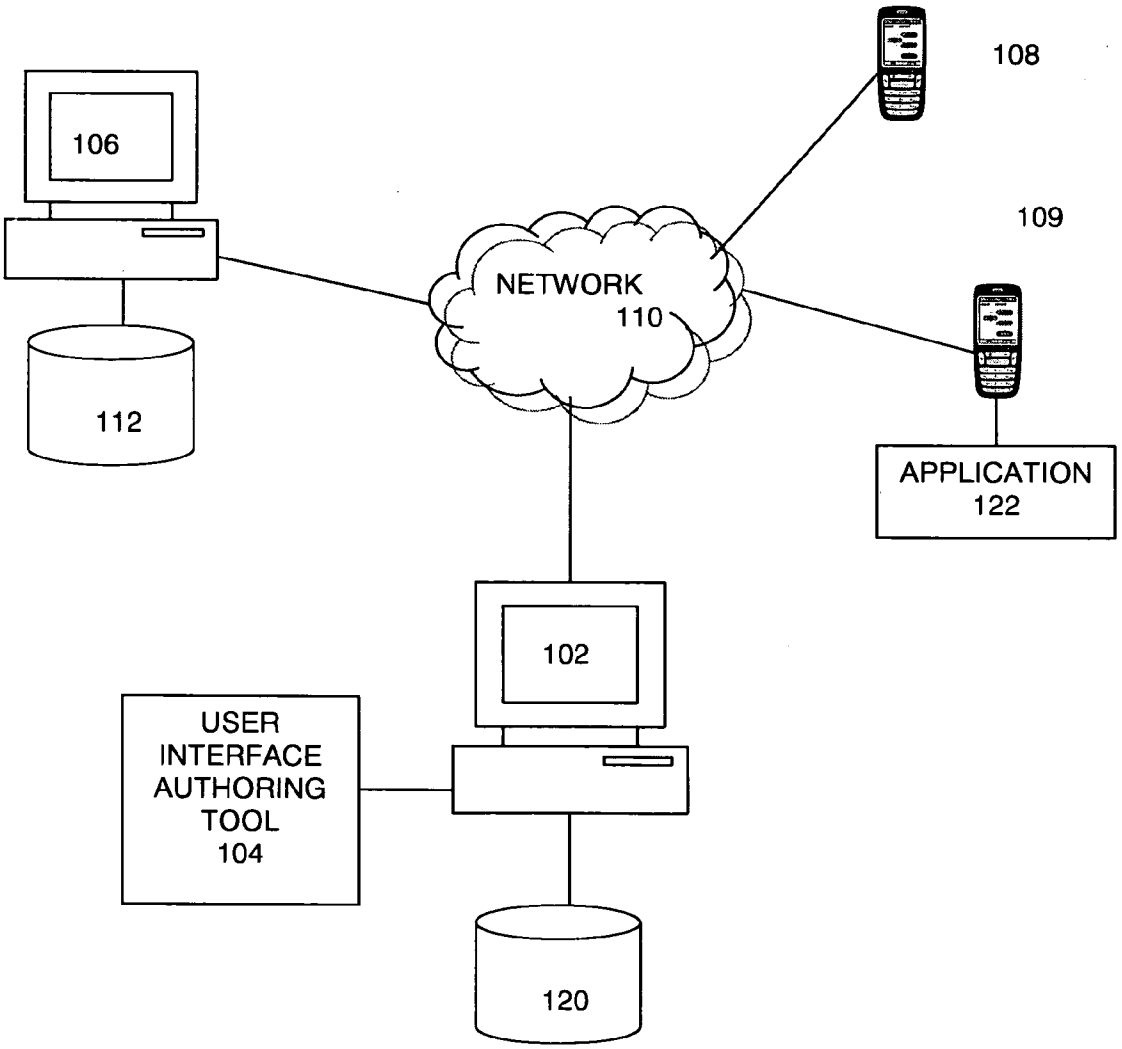

108
106
109
NETWORK
110
112
APPLICATION
122
102
USER
INTERFACE
AUTHORING
TOOL
104
120

FIGURE 1

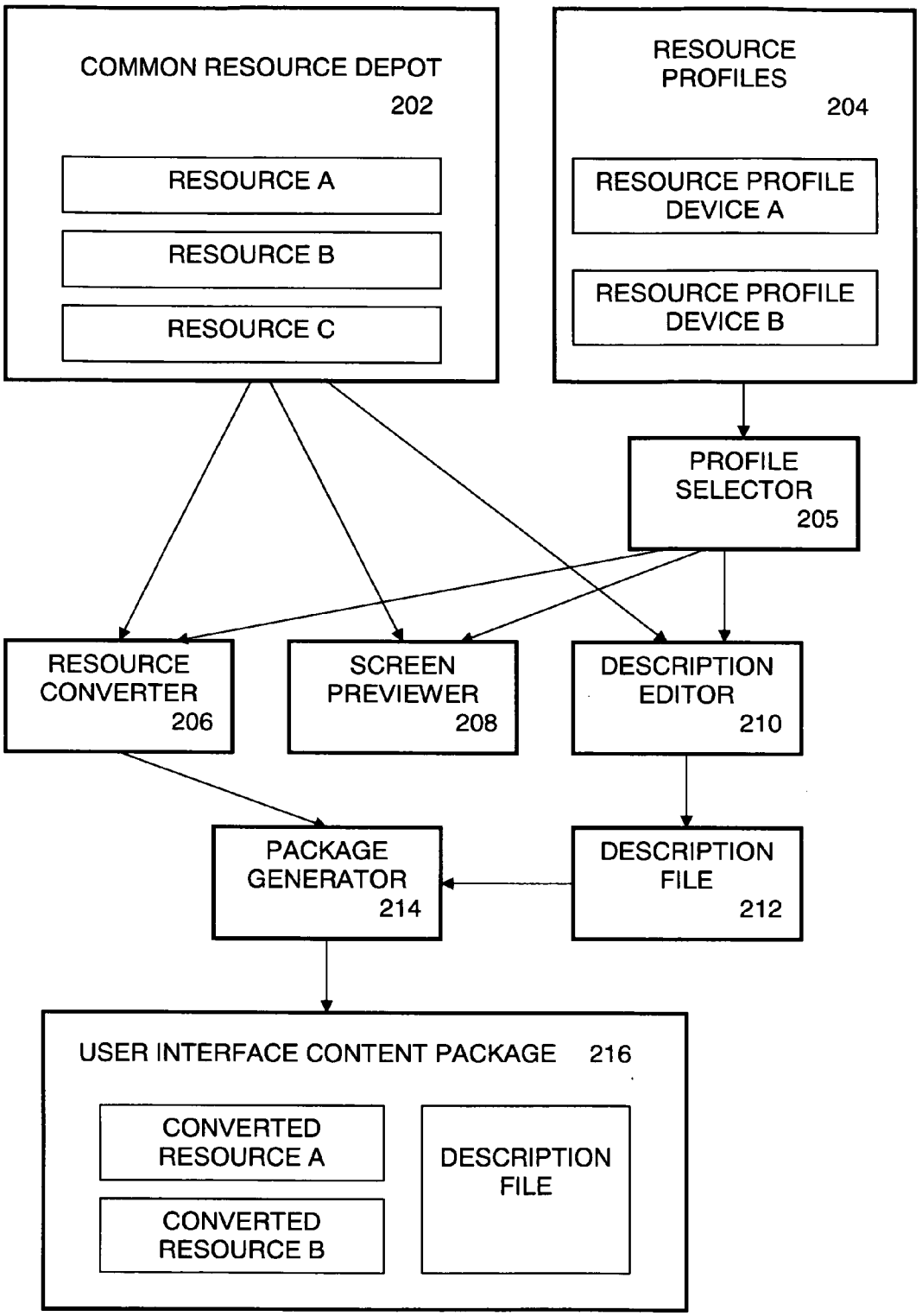

COMMON RESOURCE DEPOT
202
RESOURCE A
RESOURCE B
RESOURCE C
RESOURCE PROFILES
204
RESOURCE PROFILE DEVICE A
RESOURCE PROFILE DEVICE B
PROFILE SELECTOR
205
RESOURCE CONVERTER
206
SCREEN PREVIEWER
208
DESCRIPTION EDITOR
210
PACKAGE GENERATOR
214
DESCRIPTION FILE
212
USER INTERFACE CONTENT PACKAGE 216
CONVERTED RESOURCE A
CONVERTED RESOURCE B
DESCRIPTION FILE

FIGURE 2

RESOURCE PROFILES

RESOURCE PROFILE DEVICE A

```
<item id= "ID_1" type= "Flash"  size="240,240" position="0,10" screenID="2"/>
<item id= "ID_2" type= "PNG"  size="24,24" position="5, 0" screenID="1"/>
<item id= "ID_3" type= "JPEG"  size="240,320" position="0,0" screenID="1"/>
```

302

RESOURCE PROFILE DEVICE B

```
<item id= "ID_1" type= "Flash"  size="240,240" position="0,10" screenID="2"/>
<item id= "ID_2" type= "GIF"  size="24,24" position="5, 0" screenID="1"/>
<item id= "ID_4" type= "JPEG"  size="240,320" position="0,0" screenID="1"/>
```

304

204

FIGURE 3

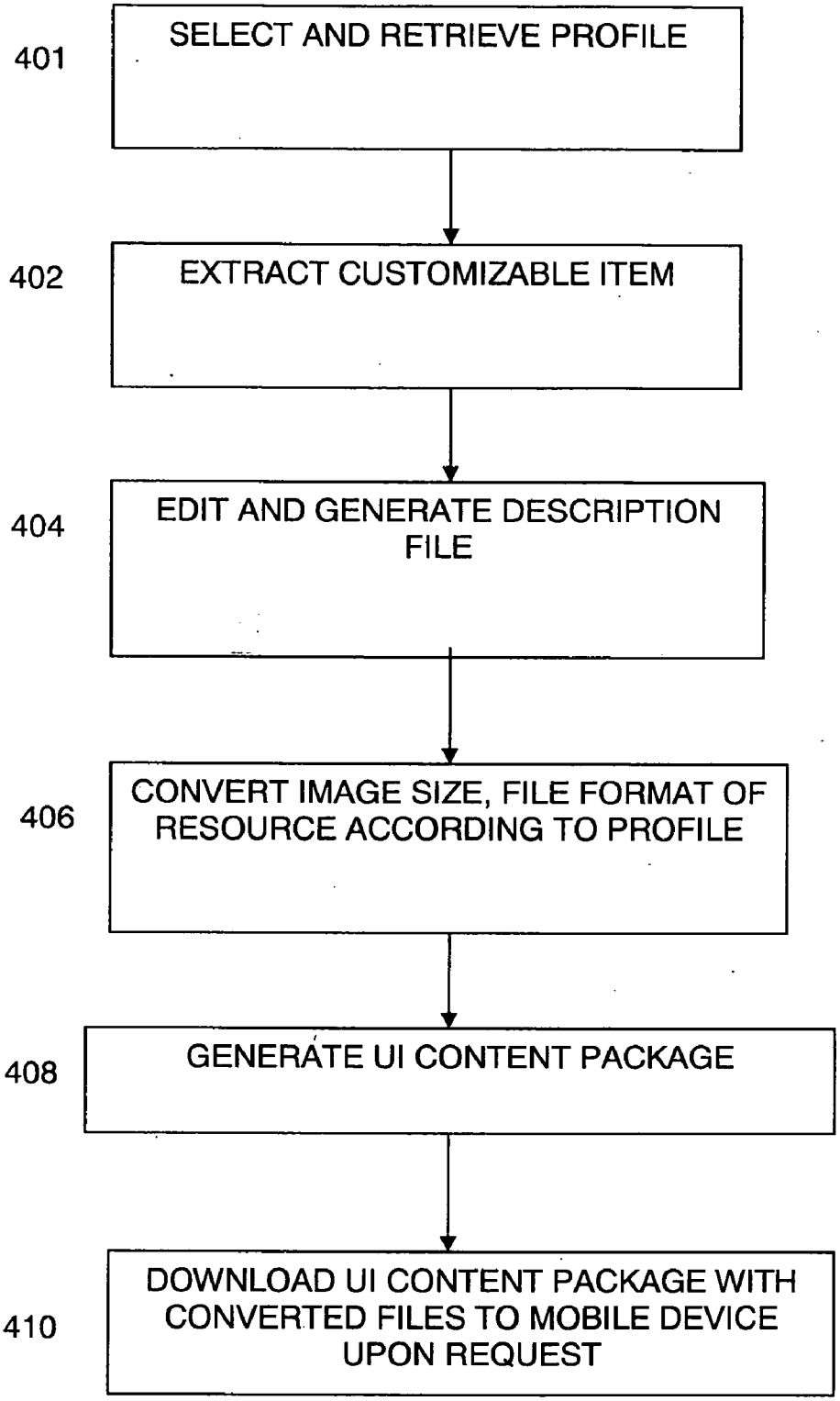

401
SELECT AND RETRIEVE PROFILE
402
EXTRACT CUSTOMIZABLE ITEM
404
EDIT AND GENERATE DESCRIPTION FILE
406
CONVERT IMAGE SIZE, FILE FORMAT OF RESOURCE ACCORDING TO PROFILE
408
GENERATE UI CONTENT PACKAGE
410
DOWNLOAD UI CONTENT PACKAGE WITH CONVERTED FILES TO MOBILE DEVICE UPON REQUEST

FIGURE 4

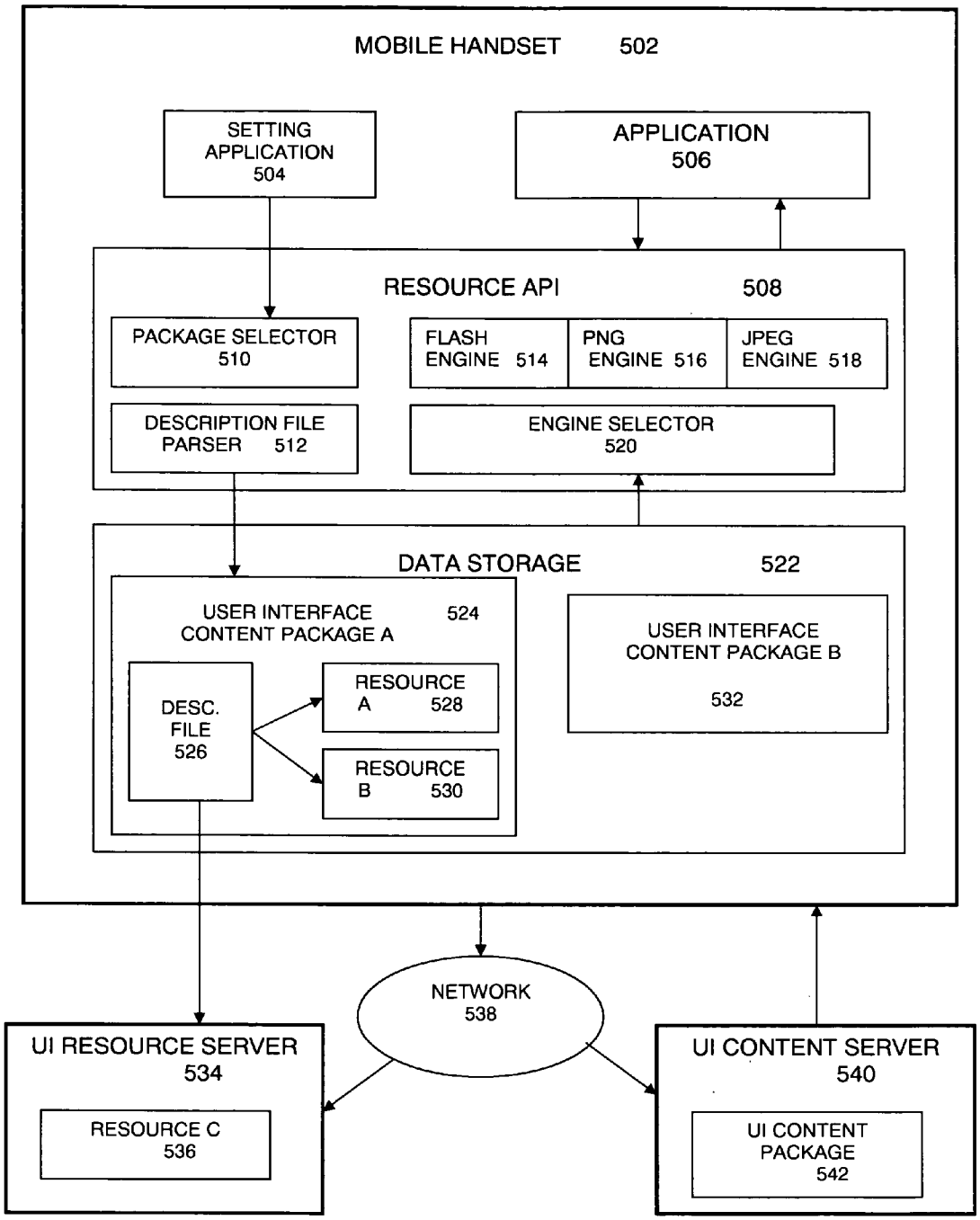

MOBILE HANDSET 502
SETTING APPLICATION 504
APPLICATION 506
RESOURCE API 508
PACKAGE SELECTOR 510
FLASH ENGINE 514
PNG ENGINE 516
JPEG ENGINE 518
DESCRIPTION FILE PARSER 512
ENGINE SELECTOR 520
DATA STORAGE 522
USER INTERFACE CONTENT PACKAGE A 524
DESC. FILE 526
RESOURCE A 528
RESOURCE B 530
USER INTERFACE CONTENT PACKAGE B 532
NETWORK 538
UI RESOURCE SERVER 534
RESOURCE C 536
UI CONTENT SERVER 540
UI CONTENT PACKAGE 542

FIGURE 5

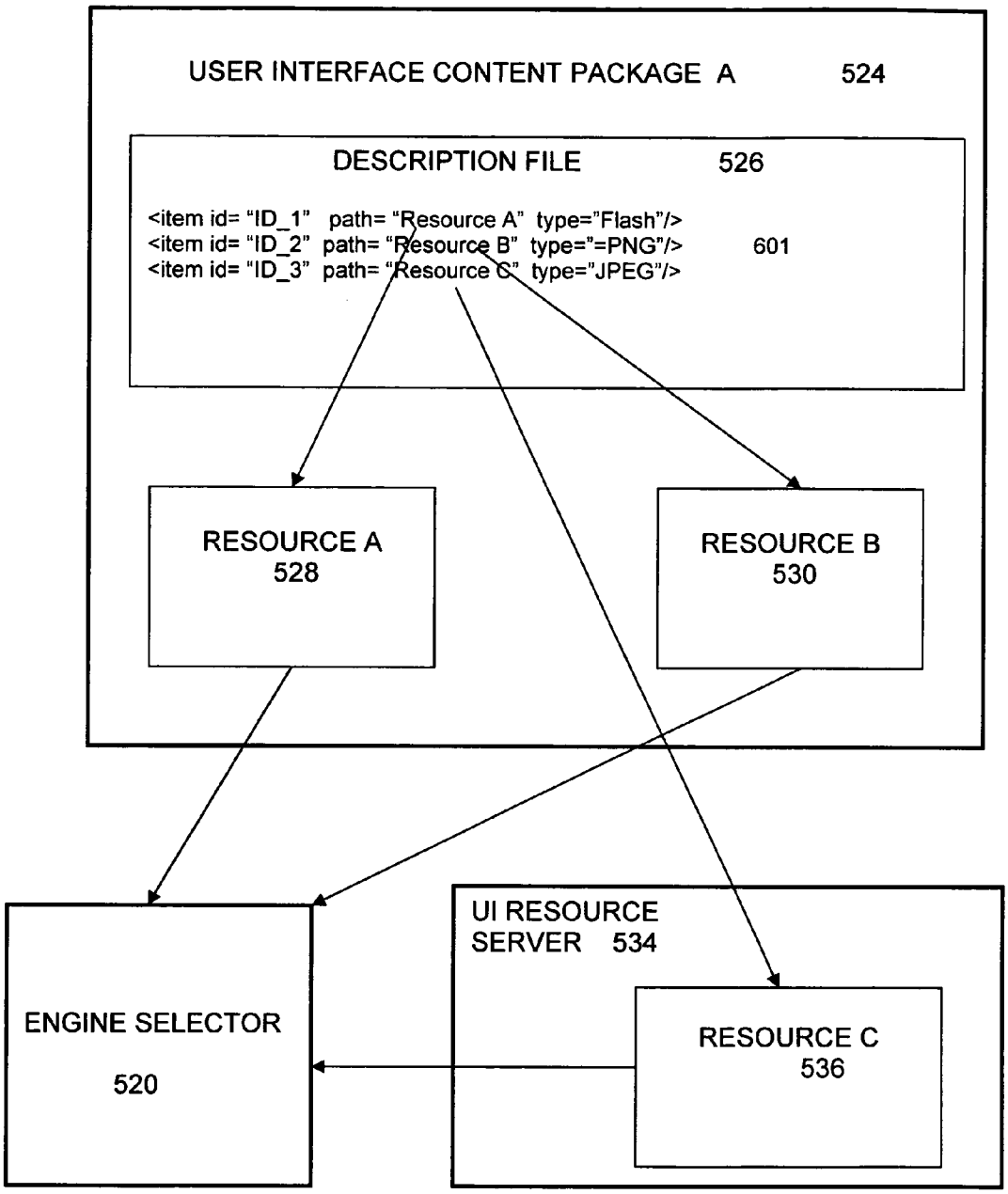

USER INTERFACE CONTENT PACKAGE A 524
DESCRIPTION FILE 526
<item id= "ID_1" path= "Resource A" type="Flash"/>
<item id= "ID_2" path= "Resource B" type="=PNG"/>
<item id= "ID_3" path= "Resource C" type="JPEG"/>
601
RESOURCE A
528
RESOURCE B
530
ENGINE SELECTOR
520
UI RESOURCE
SERVER 534
RESOURCE C
536

FIGURE 6

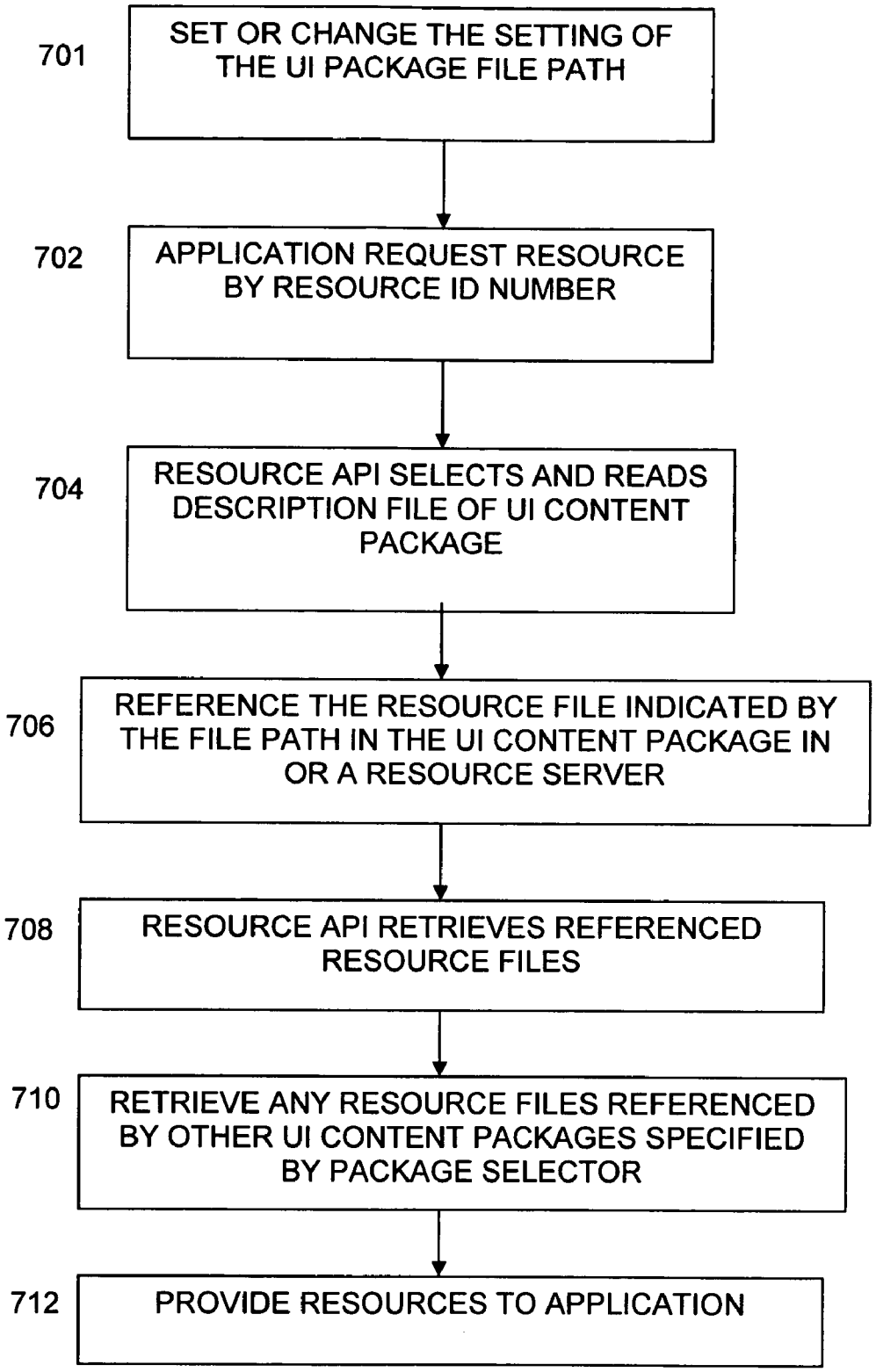

701
SET OR CHANGE THE SETTING OF THE UI PACKAGE FILE PATH
702
APPLICATION REQUEST RESOURCE BY RESOURCE ID NUMBER
704
RESOURCE API SELECTS AND READS DESCRIPTION FILE OF UI CONTENT PACKAGE
706
REFERENCE THE RESOURCE FILE INDICATED BY THE FILE PATH IN THE UI CONTENT PACKAGE IN OR A RESOURCE SERVER
708
RESOURCE API RETRIEVES REFERENCED RESOURCE FILES
710
RETRIEVE ANY RESOURCE FILES REFERENCED BY OTHER UI CONTENT PACKAGES SPECIFIED BY PACKAGE SELECTOR
712
PROVIDE RESOURCES TO APPLICATION

FIGURE 7

RESOURCE APPLICATION PROGRAM INTERFACE UTILITY FOR CHANGING USER INTERFACE ELEMENTS ON WIRELESS DEVICES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to U.S. Provisional Application No. 60/753,107, and filed on Dec. 22, 2005.

[0002] The present application is related to U.S. patent application entitled "User Interface Authoring Utility for Changing User Interface Elements on Wireless Devices," filed on Jul. 25, 2006, and assigned to the assignee of the present application.

FIELD

[0003] Embodiments of the invention relate generally to communication networks and more specifically, to a user interface generation system for mobile communication devices.

BACKGROUND

[0004] The development of wireless mobile technology beyond simple point-to-point cell phones has led to the proliferation of mobile devices that are increasingly able to access data from various different sources and process many different types of content data. Mobile services have been developed that allow users to download various types of data and programs, such as games, music, video clips, and so on, for use on their mobile devices. This has led to the expansion of mobile phones beyond mere communication devices, but as processing platforms for a variety of different tasks, and has resulted in the development of various different types of mobile devices to take advantage of these different applications and services. For example, a user may access communication and/or Internet services using a cellular phone, web-enabled mobile phone, home PC, notebook computer, Personal Digital Assistant (PDA), portable game console, electronic mail (e-mail) device, media playback device, and any other type of network enabled computing device. Not only are new types of device being developed, but present known devices, such as the mobile phone, are increasingly becoming integrated devices that are packed with greater capabilities to integrate functions beyond their simple core functions, such as combination phone/camera/MP3 player devices.

[0005] The proliferation of different services and devices on wireless networks has led to a great expansion in the different access protocols and user interfaces available on phone and similar devices. In order to help users manage their mobile and network devices, various types of customization capabilities have been provided with wireless devices and communication services. For example, certain mobile phone service and equipment providers provide user interface (UI) customization capabilities that allow users to personalize their phones or mobile devices with custom ringtones, background displays (wallpaper), menu configurations, and the like. The ability to change or customize the colors, fonts, sounds, and functions of the device UI, generally referred to as the "UI skin" can greatly enhance the marketability of a device.

[0006] Present UI customization schemes have certain disadvantages, however. For example, many customization features may be buried deep in the native UI or mobile device browser, thus presenting difficult or time consuming operations for the user, and preventing many users from taking full advantage of the possible customization features. Furthermore, present UI customization solutions are typically limited to the basic user interface of a particular device, and are restricted to allowing customization of only a few parameters of the device. Many mobile devices, however, are now capable of performing many different tasks, and even downloading and executing application programs. The customization features of present devices typically do not allow the user to customize features related to the execution of downloadable application programs or utilities, or provide comprehensive customization over all of the functions that may be integrated in the device.

[0007] Most device manufacturers provide a single default user interface for each model of device. Customization features, referred to as "UI skin packages," are often developed and provided by third party vendors. With regard to these third party content providers, providing customization features can involve many labor intensive or high overhead tasks. Each device model on the market may have a unique UI format and specification. With the constant and rapid development and release of new hardware, new resource files must be written and maintained for each new specification of mobile device. At present, the UI skin content providers must typically obtain descriptors or profile parameters for each UI of device from the device manufacturers individually, and compile these into resource files. This can be an often time-consuming process that can also be quite error-prone since it deals with a lot of detailed information.

[0008] What is needed, therefore, is a mobile device UI configuration system that allows a UI skin package content provider to easily generate a new UI resource file for new or different mobile devices, and make these UI skin packages available for download and installation on user mobile devices.

[0009] What is further needed is a mobile device configuration system that allows modification of mobile device user interfaces or application programs without modification of the application programs themselves.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Embodiments of a user interface modification system in a wireless network are illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

[0011] FIG. **1** is a block diagram of a communications network system that implements embodiments of a user interface authoring tool, under an embodiment.

[0012] FIG. **2** is a functional diagram of a user interface authoring tool, under an embodiment.

[0013] FIG. **3** is an example of a resource profiles for mobile devices, according to an embodiment.

[0014] FIG. **4** is a flowchart that illustrates a method providing a user interface authoring tool, according to an embodiment.

[0015] FIG. **5** is a block diagram of a mobile device including a resource application program interface for downloading resources for a UI content package, under an embodiment.

[0016] FIG. **6** is a more detailed illustration of the resource references for the mobile device of FIG. **5**.

[0017] FIG. **7** is a flowchart that illustrates a method downloading resources to a mobile device through a resource application program interface on the mobile device, according to an embodiment.

DETAILED DESCRIPTION

[0018] Embodiments of a mobile device incorporating a user interface modification resource application programming interface (API) are described. Aspects of the one or more embodiments described herein may be implemented on one or more computers or computing devices executing software instructions. The computers may be networked in a client-server arrangement or similar distributed computer network. Embodiments are directed to network systems that incorporate a telecommunications or similar wireless network system.

[0019] Resource profiles are defined by device manufacturers for each model of mobile device. The resource profiles specify the composition, format, and appearance of one or more user interface elements displayed or executed by the mobile device. A user interface authoring process executed by a content provider maintains a common database of resources for each mobile device model. The resources comprise files, links to files, and/or data or program objects associated with the configurable aspect of the user interface for each mobile device. The customizable aspects or items of a user interface are extracted from selected resource profiles and description files for these aspects are generated using the appropriate common resources. The resources provided by the common resource database are converted to the formats dictated by the resource profiles and a UI package generator produces a downloadable UI content package consisting of the description file and the converted resource files. The mobile device handset includes a resource API to download UI content package data from a UI content server or UI content that is locally stored. The resource API contains a number of different plug-in content engines and an engine selector component to allow an application program executed on the mobile handset to access the resources without requiring modification of the application.

[0020] FIG. **1** illustrates a communications network system **100** that implements one or more embodiments of a mobile device UI authoring tool. In system **100**, a service provider server computer provides network access to one or more mobile devices, such as mobile phones **108** and **109**. In one embodiment, the mobile devices **108** and **109** are cellular phones and network **110** is a comprehensive telecommunications network that includes both a cellular phone network and the Internet. Network **110** may also include one or more Wide Area Networks (WAN), Local Area Networks (LAN), or any combination thereof. The server computer can be a wireless service provider or Internet Service Provider or combination of both. The mobile devices **108** and **109** communicate with each other and other mobile devices over the wireless portion of network **110**, over the cellular network. The mobile devices can also be configured to communicate with one or more client and/or server computers that are directly or indirectly coupled to network **110**. The mobile devices **108** and **109** can represent devices made by different manufacturers, different models of devices made by the same manufacturer or any type of devices that have different user interface elements from one another.

[0021] As shown in system **100**, a server computer **102** operated by the service provider or a third party vendor is a content provider server computer that provides content data, application programs, diagnostic tools, program components, or any other content or executable objects to the mobile device **108**. The content provider computer can be a World-Wide Web (WWW) server that stores data in the form of web pages and transmits these pages as Hypertext Markup Language (HTML) files over the Internet **110** to the mobile devices **108** and **109**, or other client computer on the network. For example, server **102** can executes a web server process to serve web pages over network **110**. For this embodiment, one or more of the mobile devices runs a web browser program to access the web pages served by server computer **102** and any other available content provider or supplemental server, such as computer **106**.

[0022] Any or all of the client computers in system **100** may be a workstation computer or they may be a computing device such as a notebook computer, personal digital assistant, or the like. The client computers may also be embodied within a mobile communication device, game console, or similar computing device that provides access to the Internet network **110** and a sufficient degree of user input and processing capability to execute or access the application programs. The mobile devices **108** and **109** may be coupled to the network **110** over a wired connection, a wireless connection or any combination thereof.

[0023] In a typical implementation, a great number of mobile devices of various types and makes can be interconnected through network **110**. Because no strict industry standards have been written to dictate a uniform user interface among the possible different mobile devices, each mobile device can feature a different user interface. In general, each manufacturer of a mobile device may have a certain style of user interface, but even devices provided by the same manufacturer can feature very different user interfaces to one another. The ability of users to customize their user interfaces increases the variation of user interface styles even more.

[0024] In one embodiment, server computer **102** is operated by a content provider that can generate a customized user interface for a plurality of different makes and types of mobile devices, such as cell phones **108** and **109**. For purposes of discussion, the customized user interface is referred to as a "UI skin." In general, UI skins allow a user to customize the "look and feel" or application program environment of a device by altering display and/or sound output aspects of the device, such as backgrounds, title bars, buttons, alert sounds, and so on. Some programs make automatic skin changes for a user when the user starts the program or uses certain parts of the program; alternatively UI skins can be downloaded by the user and installed on the mobile device to alter the default UI or permanently change the UI of the device. UI skins may be developed by third party vendors, device manufacturers, application writers, and so on. In general, different categories of UI skins can be developed for different types of mobile devices and different makes of mobile devices.

[0025] As shown in FIG. **1**, server computer **102** is operated by a content provider, and executes a user interface authoring tool **104** that generates a content package for each mobile device and downloads the user interface to the appropriate mobile device upon request of the mobile device user. Various resource profiles and resource files for the

different mobile devices can be stored in a database or data store **120** coupled to the server computer **102**. Alternatively, the resource profiles and other associated data files can be stored in a remote data store, such as data store **112** maintained by workstation **106**.

[0026] In one embodiment, the mobile devices **108** and **109** are delivered to the users with a default user interface that presents a set UI skin consisting of a particular screen configuration, size, color scheme, font, menu scheme, keypad button assignment, ringtone selection, and so on. Many different aspects of a mobile device may be customizable however, such as the format and display of menus, commands, subwindows, and so on. The content provider **102** can provide a customized UI that allows the user to change certain aspects of the UI skin. The resource files dictating the parameters that can be changed are stored in data store **120** or data store **112**.

[0027] In system **100**, User interface descriptor information comprising the customizable UI elements are downloaded to a mobile device, such as **108** or **109**. In one embodiment, the UI descriptor information can comprise screen parameter definitions (e.g., size, aspect ratio, icon definitions, and so on), images, video clips, music or other sound clips, ringtones, games, small applications (applets), utilities, diagnostic tools, or any other similar data or applications, all of which are referred to as "UI content objects." UI Content objects can be provided by a number of different content providers, such as content provider **102** or **106**. Typically customized UI content is downloaded upon demand, such as when the user requests a UI upgrade or modification from a particular content provider. Alternatively, UI skin content can be pushed to the user from a content provider based on a periodic subscription arrangement, trial use, or similar mechanism. In one embodiment, the UI content objects are generated and made available for download through the user interface authoring tool **104** executed by server computer **102**. The user interface authoring tool **104** can represent a program or suite of programs, or even hardware circuits, or any combination thereof embodying instructions executed by one or more processing units in server **102**.

Server-Based UI Authoring Tool

[0028] FIG. **2** is a functional block diagram of a user interface authoring system, under an embodiment. The UI authoring system allows content providers to create content packages embodying UI skins for distribution and downloading to mobile devices on the network. The content package for each UI skin contains information specific to the type of device, manufacturer of the device, operating system, application programs, and other relevant information regarding the mobile device.

[0029] For the system illustrated in FIG. **2**, UI skin package data specific to each mobile device is generated from common resource data using resource profile information for each mobile device model. The model of a device generally refers to the make (manufacturer) of a device and the specific model, type, or version of the device, as specified by the manufacturer. Through the use of the UI authoring tool, a content creator can create UI skin content packages for each possible model of mobile device used on the network without preparing separate resource files for each model.

[0030] The user interface specifications for each mobile device are provided by the device manufacturers and are stored in a resource profiles database **204**. The user interface specifications generally describe all relevant aspects of a UI element with regard to the device and any application programs that may be used on the device. Each type or model of mobile device has an associated resource profile. Thus, as shown in FIG. **2**, a resource profile is provided for device A, and a resource profile is provided for device B. With reference to FIG. **1**, these can correspond to resource profiles for mobile devices **108** and **109**, respectively. The composition and format of the resource profiles are described later and in greater detail with respect to FIG. **3**.

[0031] A common resource depot **202** contains resources, such as those denoted resource A, resource B, and resource C. The resources comprise files, links to files, and/or data or program objects associated with the configurable aspect of the user interface for each mobile device. Thus each resource (also referred to as a "resource file") in resource depot **202** represents a file, location, directory, link, document, or similar object that contains or references information or data elements pertaining to the aspects of the mobile device that can be configured or customized. All of the pertinent information relating to a mobile device is stored in a resource file, and all of the resource files for the possible different mobile device types are stored in a common resource depot **202**. The resource files can contain various types of data objects relating to the user interface elements of the mobile devices, such as image files, sound files, screen layouts, icons, movies, and so on. The common resource depot **202** can be implemented as a database stored in a data store **120** maintained by the content provider **102** or a data store **112** maintained by a separate server **106**.

[0032] The profile selector **205** selects a resource profile **204** depending upon the device model selected by the content provider. The corresponding resource **202** for that model is then converted by resource converter **206**. The resource converter **206** can be configured to perform various different types of conversion operations, such as converting file formats (e.g., PNG to JPEG), changing color formats (e.g., monochrome to 8-bit color), and so on. The resource converter **206** converts each resource into a format corresponding to the resource profile. A screen previewer component **208** provides a utility to preview the user interface for the device based on the resource files.

[0033] A description editor component **210** produces description files **212** based on the selected resource profile **204** and resource file **202**. A description file **212** specifies the resources and the file type, and file path name. The description file **212** and the converted resource output from resource converter **206** are processed by a package generator component **214**. The package generator **214** takes the resource and description and creates a UI content package **216**. The UI content package contains the UI skin for the target mobile device and contains images or data for the various UI elements, such as image files, movie files, and/or sound files. The UI content package comprises the appropriate converted resources and the description file.

[0034] The package generator can be configured to produce the UI content package in variety of different formats, such as an archived file, an encrypted file, or a file that contains supplemental information, such as that provided by a supplemental content provider.

[0035] In one embodiment, the resource profiles **204** are files or data objects that are provided by device manufacturers for each mobile device. FIG. **3** is an example of the format of possible resource profiles for mobile devices,

according to an embodiment. The resource profiles specify the type, format, size, placement, and various other parameters for each user interface element for the device. For the example shown in FIG. **3**, the resource profile for device A includes a number of items, each referenced by a unique item ID. Thus, for example, item **1** is a Flash file, that is displayed on a 240×240 pixel space at position 0, 10 on screen **2** of the device. Likewise, item **2** is a PNG file of size 24 by 24 displayed at position 5.0, and so on. Similarly, device B has a number of UI elements specified by a number of items, as shown. FIG. **3** illustrates one exemplary format for the device resource profiles, and many other types of resource file formats are possible depending upon the device types and manufacturer specifications. The resources **202** are converted into a format that corresponds to the appropriate resource profile **204**. Thus, if the resource is an image, it is converted to the appropriate size and file format according to the resource profile.

[0036] FIG. **4** is a flowchart that illustrates a method of generating and downloading UI skins, according to an embodiment. The method begins in step **401** with selection and retrieval of the appropriate resource profile for the device from the resource profiles **204**. In step **402**, the profile selector extracts the customizable items within the UI elements. Not all elements of a UI may be customizable, and the process only handles elements of the UI that are customizable. The description file is then generated by the description editor, step **404**. At this time, the resource converter converts the image sizes, and file formats of the resources according to the profile, step **406**. The package generator then creates the UI content package, step **408**. The UI content package can then be downloaded to the target mobile device, step **410**.

[0037] Through the system and process illustrated in FIGS. **2** through **4**, the UI authoring tool allows the content creator to create a UI skin content package for each possible mobile device type without requiring the preparation of separate resource files for each device. Through the use of the pre-defined resource profiles, and the appropriate editing and conversion components, a common resource file database can be used to generate different UI content packages for each mobile device in a network.

[0038] In one embodiment, the mobile device executes an application **122** that utilizes the resources provided by the content provider. This application might be an object displayed on the screen of the mobile device or a played through a playback circuit (sound or video) of the mobile device, or it may be an executable module (applet) executed by the mobile device. The resources comprising the UI content package to be downloaded to the mobile device for use by the application may be provided by an external content provider, as shown in FIG. **1**. Alternatively, the UI content package may be pre-installed on the mobile device itself.

[0039] In general, regardless of the source of the UI content package, the resources referenced by the descriptor file and utilized by the application must be referenced in some way by the application and then retrieved and converted to an appropriate format for use by the application. In one embodiment, the content server performs the necessary resource retrieval and conversion operations and downloads the resources directly to the mobile device. In this embodiment, the resource profiles **204** specify the appropriate formats required. In another embodiment, the mobile device handset itself contains components to facilitate the downloading and conversion of resource files or data objects from common UI package content for use in resident application programs.

Resource API-Based Mobile Devices

[0040] In one embodiment, a mobile device in network **100** is configured to convert the file format from the common UI package directly in the handset itself. As shown in FIG. **1**, the mobile device (also referred to as a "handset") is configured to run one or more application programs **122** or software modules to execute or access the resources provided by the UI content package. The applications can be any program that can playback or perceive the image, video, sound files, etc. of the resources provided by the UI content package. The UI content package may be authored and provided by a content server **102**, as illustrated and described with reference to FIGS. **1-4**, or it may be UI content produced and provided by an alternate method.

[0041] FIG. **5** is a block diagram of a mobile device including a resource configured to download resources for a UI content package, under an embodiment. The mobile handset **502** executes an application program **506** that uses one or more resources for a UI content package. The mobile handset **502** also has a resource application program interface (API). The application **506** refers to UI resources by resource ID number rather than by file name or directory (storage location) path directly. The resource API thus provides a level of resource reference abstraction and facilitates the portability of resources in the system. The application **506** may be a software program or utility that alters the appearance or functionality of the mobile device, or it may be a program that, when executed, provides a service to the user, or any other functionality.

[0042] Through the resource API functionality, the mobile device is able to change the UI skin of the application **506** by UI content packages that are downloaded from a UI content server or are pre-installed in the mobile handset, without requiring modification of the application itself. Applications can also access the resources of various file types without requiring modification or implementation changes. Resource files can be placed in the handset itself or on server computers coupled to the mobile handset over the network. Different UI specifications can be accommodated for each device by converting the resource format through the resource API, without requiring modification of the application and the UI content packages.

[0043] As shown in FIG. **5**, the resident application **506** is functionally coupled to resource API **508**, which contains a number of functional components such as package selector **510**, description file parser **512**, an engine selector **520**, and one or more engines, such as Flash engine **514**, PNG (portable network graphics) engine **516**, JPEG (joint photographic experts group) engine **518**, and any other similar engines. These engines process the applicable resource using the appropriate playback format depending upon the type of data or program elements in the resource. Thus, for example, the resource is an applet, the flash engine **514** is invoked, and if the resource is a photograph, the JPEG engine **518** is invoked, and so on.

[0044] The actual UI content package to be downloaded is generally selected by the user of the mobile device. A setting application **504** sets the UI content package data for the application program, and the user can change the UI content by changing the setting application **504**. As shown in FIG.

5, the setting application **504** selection is input to a package selector module **510** in the resource API **502**.

[0045] The mobile handset **502** also includes a data storage component **522**, which can be implemented as any type of fixed, removable or on-board memory device. One or more user interface content packages **524** and **522** can be stored in this data storage. Each user interface content package contains a description file **526** and one or more resources **528** and **530**. The UI content packages stored on the data storage **522** of the mobile handset are typically pre-installed on the handset by the manufacturer of the device or a third party entity that provided configuration support. UI content packages can also be provided by external sources over network **538**, such as from UI content servers, such as content server **540**, which contains UI content package **542**. Such a content server may correspond to either the server **102** or server **106** of FIG. **1**. Each UI content package **542** provided by an external content provider server also contains a description file and one or more resources, the contents of which are described in greater detail below with reference to FIG. **6**.

[0046] The description file parser **512** selects the appropriate description file for the package selected by package selector **506**. In general, a description file describes the information of the resource files contained in the UI content package. The description file contains references to one or more resources to be downloaded to the application **506**. The description file **526** may reference resources contained within the same UI content package, or it may reference resources in other content packages that are either in pre-installed in the mobile handset or on an external server computer. For the example illustrated in FIG. **5**, the description file **526** reference resource A **528** and resource B **530**, which are contained in the UI content package A **524** resident in the mobile device data storage **522**, as well as resource C **536** which is provided by a UI resource server **534**. Resource server **534** represents a server computer or network resource that provides resources that have not been packaged into UI content packages, such as UI content package **542**. Such a resource server may correspond to either the server **102** or server **106** of FIG. **1**.

[0047] The resource API **508** retrieves each resource referenced by the description file selected for the UI content package selected by the package selector **510** and the description file parser **512**. The engine selector component **520** of the resource API selects the proper engine, which then converts each resource file to a format or embodiment that is compatible with the application **506**. The application dictates the format of the resource in terms of parameters such as image size, color, position, and so on.

[0048] FIG. **6** is a more detailed illustration of the user interface content package and resource references for the mobile device of FIG. **5**. As illustrated in FIG. **6**, user interface content package A **524** contains a description file **526**. The description file contains a number of item entries **601**. Each item entry consists of certain items of information, such as identifier (ID), path (location), and file type, among other parameters, relating to a particular resource. Thus, as illustrated in FIG. **6**, three example entries are illustrated for Resources A, B, and C. Resource A is a flash object, Resource B is a PNG object, and Resource C is a JPEG object.

[0049] The path parameter specified the location of the resource, and can be implemented as a pointer or as a link to a storage location. In general, the application **506** on the mobile device does not refer to resources by location, but rather by ID. The description Resource API accesses the appropriate description file which correlates the proper resource location to the resource ID for upload to the application. In this manner, the resource API **508** represents an abstracted interface between the application and the actual resources. As shown in diagrammatically in FIG. **6**, the path element of each item descriptor effectively points to the location of the corresponding resource. Thus, as shown, the link "Resource A" points to resource A **528**, and the link "Resource B" points to resource B **530**, and the line "Resource C" points to resource A **536**. The resources referenced by the description file can be contained in the same UI content package as the descriptor file, such as for Resources A and B, or they can be provided by in another UI content package (either in the mobile handset or in an external UI content server **540**), or an external UI resource server **536**, such as shown in FIG. **6**. The selected resources are then input to the engine selector component **520** of the resource API **502** for processing by the appropriate engine.

[0050] FIG. **7** is a flowchart that illustrates a method downloading resources to a mobile device through a resource API on the mobile device, according to an embodiment. In step **701**, the setting application sets or changes the setting of the UI package file path. In step **702**, the application on the mobile handset requests a resource by specifying the resource ID (e.g., ID_**1**). The package selector **510** and description file parser **512** use the package file path and resource ID number to locate the appropriate UI content package containing the referenced resource. As shown in block **704**, the resource API selects and reads the description file for the selected UI content package. The resource or resources may be contained in a single UI content package specified by the package selector, or they may be contained in different content packages either within or external to the mobile device. The description file references the resource file indicated by the file path in the UI content package or a resource server, or other external source, step **706**. This reference step is functionally illustrated in FIG. **6**.

[0051] After the selected resources have been properly referenced and located, they are retrieved by the resource API and input to the engine selector for processing by the appropriate engine, step **708**. As shown in block **710**, other UI content packages, such as **542**, can be specified by the package selector, in which case those resources are also retrieved. The resource API then uploads all referenced resources to the application, step **712**. As shown by the process of FIG. **7**, the application can gain access to local or external resources by simply specifying a resource ID, rather than the location of a resource. In this manner, changes can be made to resources through the use of different content packages or implementation in updateable UI resource servers, without requiring any change to the application program **506** itself. Furthermore, elements of the resource API **508** can be modified or upgraded without requiring a change to the application program. For example, different or new versions of engines for different types of data objects or programs can be implemented in the resource API by adding or modifying the engine components.

[0052] Although embodiments of the UI authoring system and mobile handset system described herein have been described with respect to networks of mobile communication devices, such as cellular phones, it should be noted that

alternative embodiments can be directed to any type of computing device that has a user interface that can be configured or modified using a UI skin or descriptor file. Such devices can be wired or wireless computers, workstations, embedded processing devices, and so on. Embodiments can also be implemented in user interface module provided in machinery, such as the UI interfaces in cars, planes, boats, and so on.

[0053] Aspects of the UI authoring and mobile handset system described herein may be implemented as functionality programmed into any of a variety of circuitry, including programmable logic devices ("PLDs"), such as field programmable gate arrays ("FPGAs"), programmable array logic ("PAL") devices, electrically programmable logic and memory devices and standard cell-based devices, as well as application specific integrated circuits. Some other possibilities for implementing aspects of the method include: microcontrollers with memory (such as EEPROM), embedded microprocessors, firmware, software, etc. Furthermore, aspects of the described method may be embodied in microprocessors having software-based circuit emulation, discrete logic (sequential and combinatorial), custom devices, fuzzy (neural) logic, quantum devices, and hybrids of any of the above device types. The underlying device technologies may be provided in a variety of component types, e.g., metal-oxide semiconductor field-effect transistor ("MOSFET") technologies like complementary metal-oxide semiconductor ("CMOS"), bipolar technologies like emitter-coupled logic ("ECL"), polymer technologies (e.g., silicon-conjugated polymer and metal-conjugated polymer-metal structures), mixed analog and digital, and so on.

[0054] It should also be noted that the various functions disclosed herein may be described using any number of combinations of hardware, firmware, and/or as data and/or instructions embodied in various machine-readable or computer-readable media, in terms of their behavioral, register transfer, logic component, and/or other characteristics. Computer-readable media in which such formatted data and/or instructions may be embodied include, but are not limited to, non-volatile storage media in various forms (e.g., optical, magnetic or semiconductor storage media) and carrier waves that may be used to transfer such formatted data and/or instructions through wireless, optical, or wired signaling media or any combination thereof. Examples of transfers of such formatted data and/or instructions by carrier waves include, but are not limited to, transfers (uploads, downloads, e-mail, etc.) over the Internet and/or other computer networks via one or more data transfer protocols (e.g., HTTP, FTP, SMTP, and so on).

[0055] Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in a sense of "including, but not limited to." Words using the singular or plural number also include the plural or singular number respectively. Additionally, the words "herein," "hereunder," "above," "below," and words of similar import refer to this application as a whole and not to any particular portions of this application. When the word "or" is used in reference to a list of two or more items, that word covers all of the following interpretations of the word: any of the items in the list, all of the items in the list and any combination of the items in the list.

[0056] The above description of illustrated embodiments of the UI authoring and mobile handset system is not intended to be exhaustive or to limit the embodiments to the precise form or instructions disclosed. While specific embodiments of, and examples for, the UI authoring system are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the described embodiments, as those skilled in the relevant art will recognize.

[0057] The elements and acts of the various embodiments described above can be combined to provide further embodiments. These and other changes can be made to the disclosed system in light of the above detailed description.

[0058] In general, in any following claims, the terms used should not be construed to limit the described system to the specific embodiments disclosed in the specification and the claims, but should be construed to include all operations or processes that operate under the claims. Accordingly, the described system is not limited by the disclosure, but instead the scope of the recited method is to be determined entirely by the claims.

[0059] While certain aspects of the UI authoring and mobile handset system may be presented in certain claim forms, the inventor contemplates the various aspects of the methodology in any number of claim forms. For example, while only one aspect of the system is recited as embodied in machine-readable medium, other aspects may likewise be embodied in machine-readable medium. Accordingly, the inventor reserves the right to add additional claims after filing the application to pursue such additional claim forms for other aspects of the described systems and methods.

What is claimed is:

1. A method of obtaining a resource for use by an application on a mobile device, comprising:

referencing a resource through the application by a resource identifier;

locating the referenced resource in a user interface content package, the user interface content package comprising a description file containing a path specifying a location of the referenced resource;

inputting the referenced resource in a processing engine to convert one or more resource data objects to a format compatible with the application.

2. The method of claim **1** wherein the resource comprises one or more data objects that comprise user interface elements of the mobile device.

3. The method of claim **1** wherein the resource comprises one of an image, a video clip, and a sound clip.

4. The method of claim **3** wherein the processing engine comprises at least one of a Flash engine, a PNG engine, and a JPEG engine.

5. The method of claim **2** wherein the resource identifier comprises an alphanumeric reference that does not directly indicate a location of the resource.

6. The method of claim **3** wherein the resource is contained in the user interface content package containing the description file.

7. The method of claim **3** the resource is contained in a user interface content package on a server computer coupled to the mobile device over a network.

8. The method of claim **3** wherein the description file contains descriptors containing the resource identifier, the

location of the resource specified by the resource identifier, and a file type of the resource specified by the resource identifier.

9. The method of claim **1** wherein the mobile device comprises at least one of a cellular phone, a personal digital assistant device, a notebook computer, and a game console.

10. An apparatus for obtaining a resource for use by an application on a mobile device, comprising:

a data store storing a one or more user interface content packages, each containing a description file and one or more resources; and

a resource application programming interface configured to:

locate a resource specified by the application, the resource containing one or more data objects;

convert the resource data objects to a format compatible with the application; and

upload the resource to the application on the mobile device.

11. The apparatus of claim **10** wherein the resource comprises one or more data objects that comprise user interface elements of the mobile device.

12. The apparatus of claim **11** wherein the resource comprises one of an image, a video clip, and a sound clip.

13. The apparatus of claim **12** wherein resource application programming interface includes a processing engine component that comprises at least one of a Flash engine, a PNG engine, and a JPEG engine.

14. The apparatus of claim **10** wherein application specified the resource through an alphanumeric reference that does not directly indicate a location of the resource.

15. The apparatus of claim **14** wherein the referenced resource is contained one of the user interface content package containing the description file, and in a user interface content package on a server computer coupled to the mobile device over a network.

16. The apparatus of claim **15** wherein the description file contains descriptors containing the resource identifier, the location of the resource specified by the resource identifier, and a file type of the resource specified by the resource identifier.

17. The apparatus of claim **16** wherein the mobile device comprises at least one of a cellular phone, a personal digital assistant device, a notebook computer, and a game console.

18. A computer-readable medium including executable instructions, which when executed in a processing system, obtain a resource for use by an application on a mobile device by:

referencing a resource through the application by a resource identifier;

locating the referenced resource in a user interface content package, the user interface content package comprising a description file containing a path specifying a location of the referenced resource;

inputting the referenced resource in a processing engine to convert one or more resource data objects to a format compatible with the application.

19. The medium of claim **18** wherein the resource comprises one of an image, a video clip, and a sound clip.

20. The medium of claim **19** wherein the referenced resource is contained one of the user interface content package containing the description file, and in a user interface content package on a server computer coupled to the mobile device over a network.

* * * * *