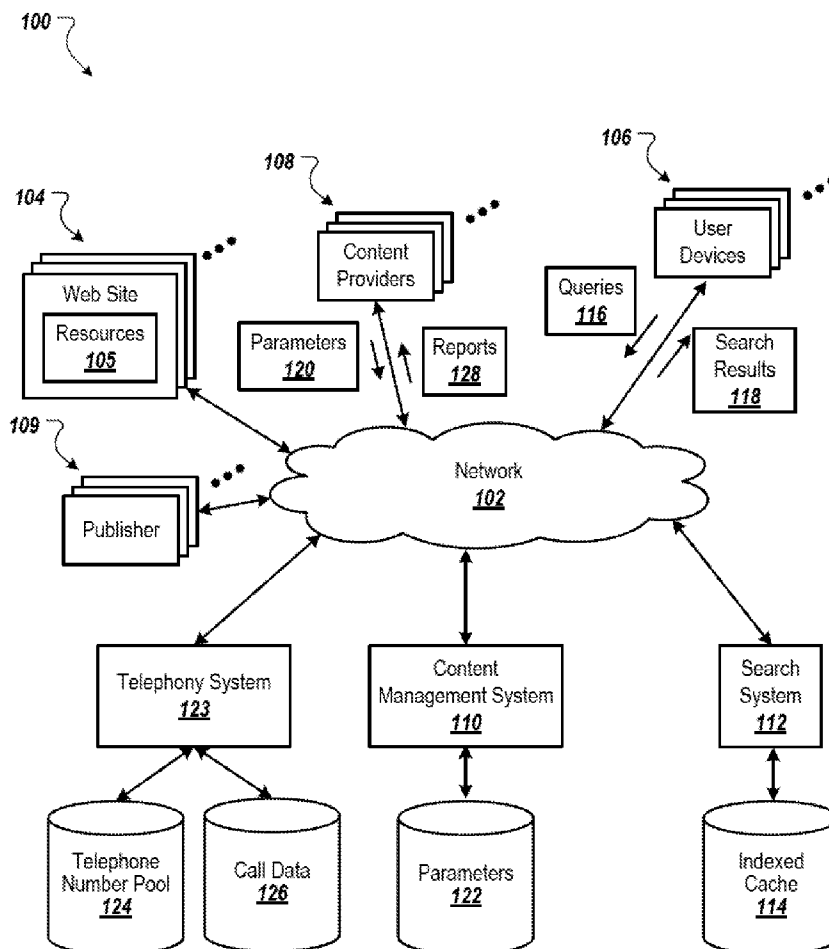




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Mountain View, CA (US)(73) Assignee: **Google Inc.**, Mountain View, CA (US)(21) Appl. No.: **14/015,451**(22) Filed: **Aug. 30, 2013****Publication Classification**(51) **Int. Cl.**  
**G06Q 30/02** (2006.01)(57) **ABSTRACT**

Methods, systems, and apparatus include computer programs encoded on a computer-readable storage medium for dynamic telephone number assignment. A method includes: providing a content item to a user device, the content item including a control for initiating a call to a content sponsor associated with the content item; assigning a telephone number from a pool to the content item; receiving a control interaction indication; facilitating a connection between the user and the content sponsor based on the interaction; storing an association between a user identifier, the telephone number, and a content sponsor identifier such that future calls from the user to the telephone number can be routed to the content sponsor, even after the telephone number has been returned to the pool; and linking a content item impression with the connection such that a report can be generated that shows an effectiveness of the content item impression.



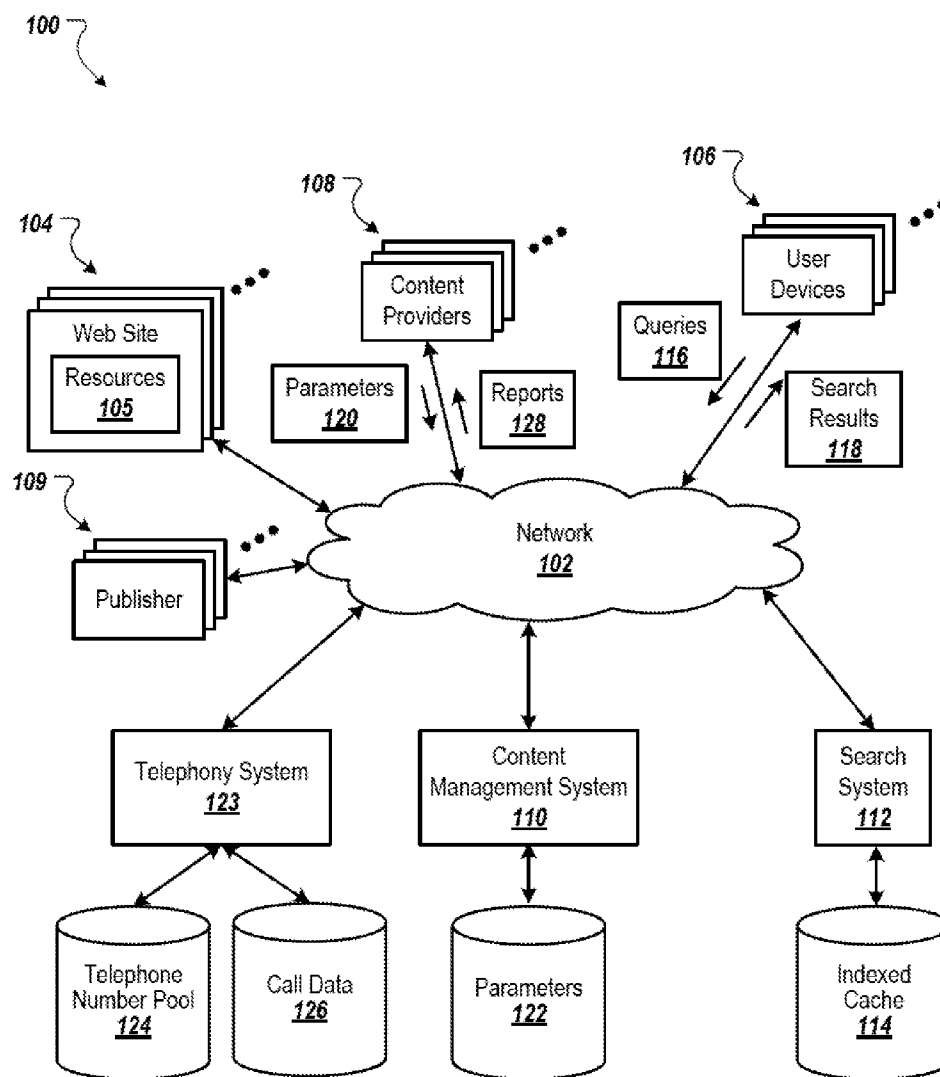
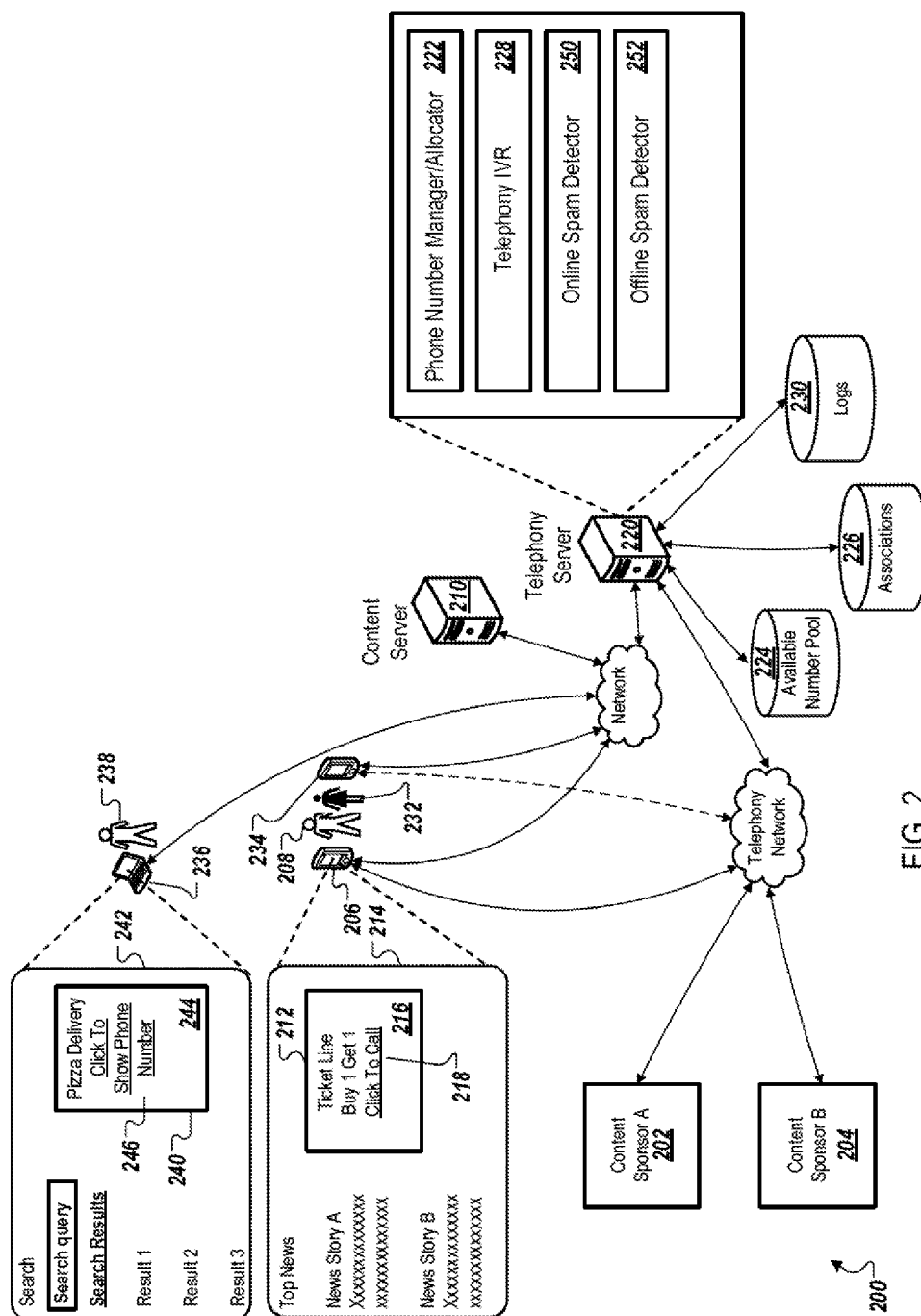


FIG. 1



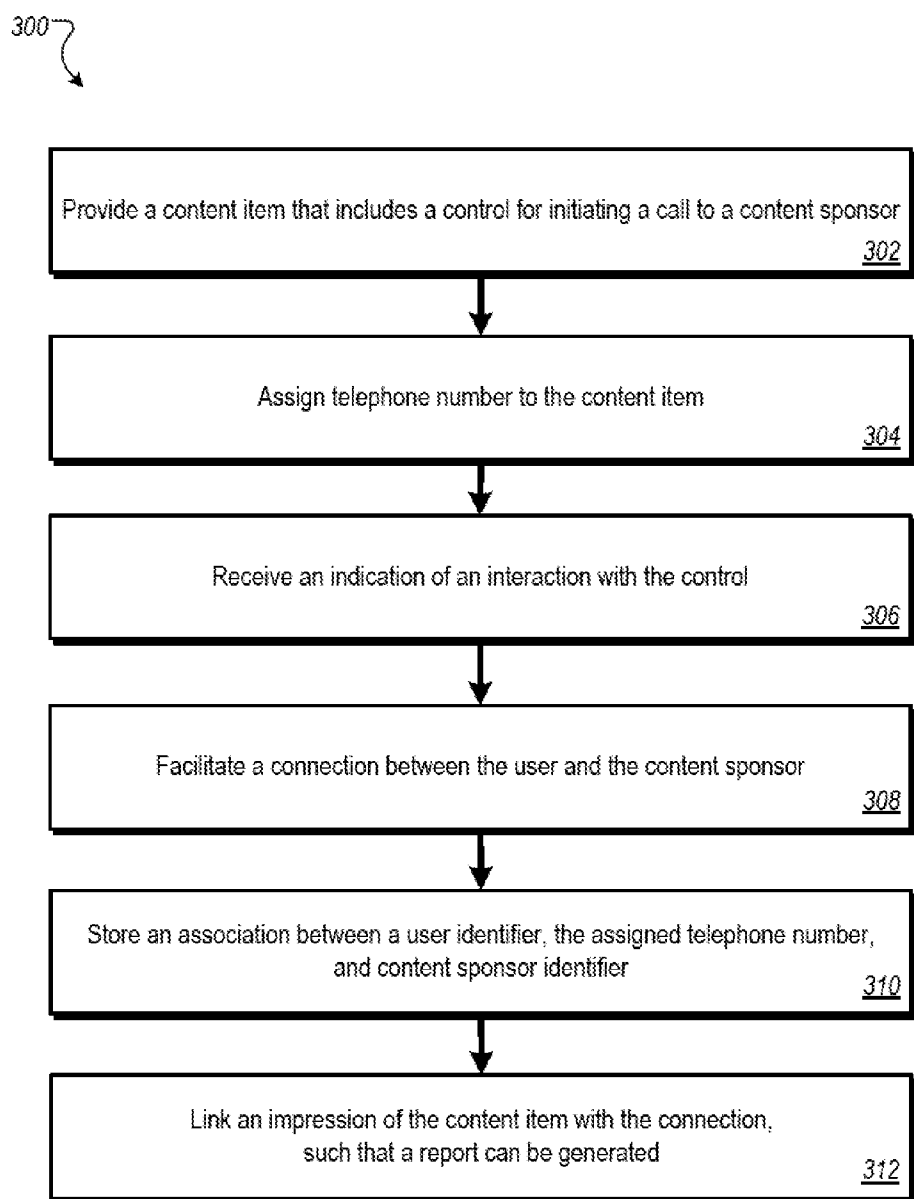


FIG. 3

Content Item Effectiveness Report				
Content Sponsor: 123 402				
Period: May 1 – May 31, 2013 404				
Campaign: Campaign A 406				
Content Group	Content Item	# of Impressions	# of Calls	# of Conversions
408 406 A	1	2,843	432	211
	2	2,421	211	54
	Subtotal: 410	5,264	643	265
412 406 B	3	1,812	89	33
	4	1,922	112	56
	Subtotal: 414	3,734	201	89
Total: 416		8,998	844	354

FIG. 4

400

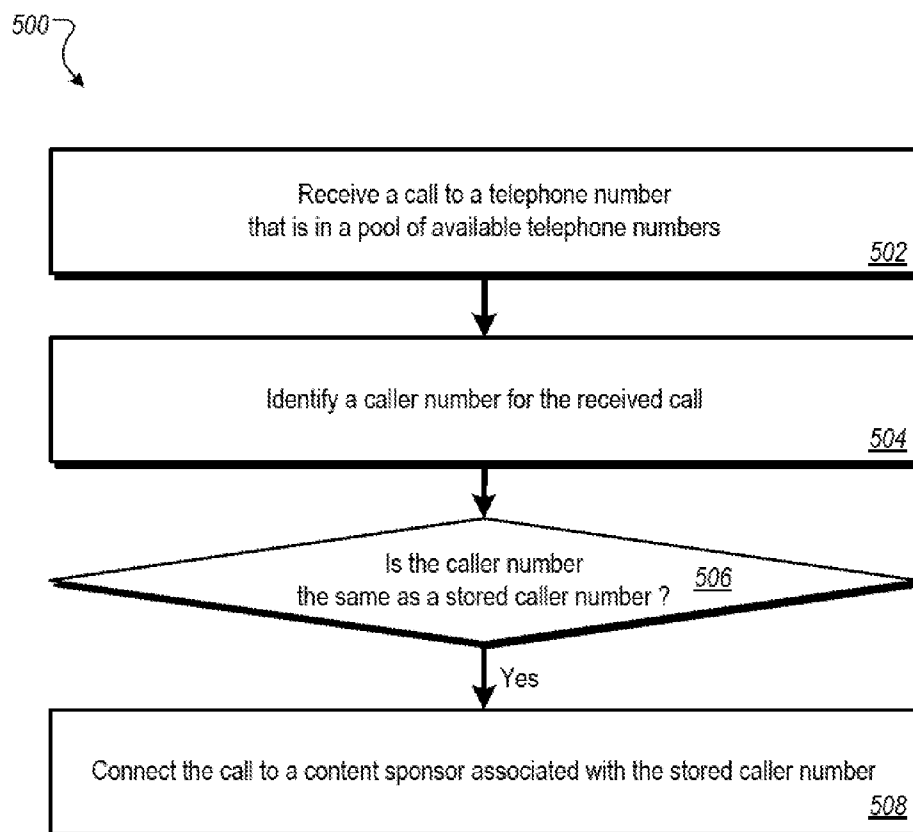


FIG. 5

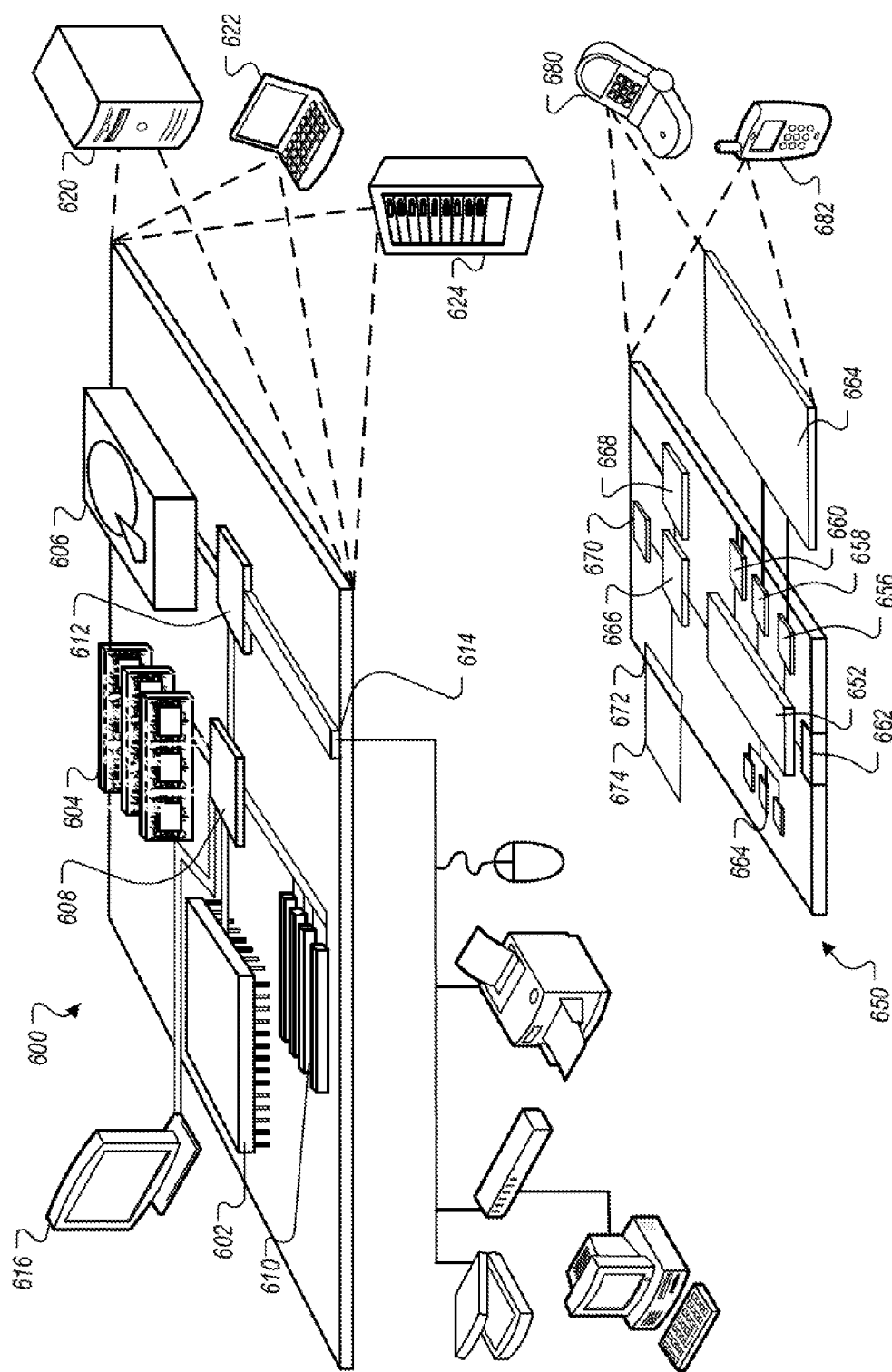


FIG. 6

## DYNAMIC TELEPHONE NUMBER ASSIGNMENT

### BACKGROUND

**[0001]** This specification relates to information presentation.

**[0002]** The Internet provides access to a wide variety of resources. For example, video and/or audio files, as well as web pages for particular subjects or particular news articles, are accessible over the Internet. Access to these resources presents opportunities for other content (e.g., advertisements) to be provided with the resources. For example, a web page can include slots in which content can be presented. These slots can be defined in the web page or defined for presentation with a web page, for example, along with search results.

**[0003]** Slots can be allocated to content sponsors through a reservation system or an auction. For example, content sponsors can provide bids specifying amounts that the sponsors are respectively willing to pay for presentation of their content. In turn, a reservation can be made or an auction can be performed, and the slots can be allocated to sponsors according, among other things, to their bids and/or the relevance of the sponsored content to content presented on a page hosting the slot or a request that is received for the sponsored content.

### SUMMARY

**[0004]** In general, one innovative aspect of the subject matter described in this specification can be implemented in methods that include a method for dynamic telephone number assignment. The method comprises: providing an impression including providing a content item for presentation on a device associated with a user, the content item including a control for initiating a call to a content sponsor associated with the content item; assigning a telephone number from a pool of available telephone numbers to the content item, wherein assigning includes associating the telephone number with the content item; receiving an indication of an interaction with the control; facilitating a connection between the user and the content sponsor based on the interaction; storing an association between an identifier associated with the user, the assigned telephone number and an identifier for the content sponsor such that future calls from the user to the telephone number can be routed to the content sponsor, even after the assigned telephone number has been returned to the pool of available telephone numbers; and linking an impression of the content item with the connection such that a report can be generated that shows an effectiveness of the impression of the content item.

**[0005]** In general, another aspect of the subject matter described in this specification can be implemented in computer program products. A computer program product is tangibly embodied in a computer-readable storage device and comprises instructions. The instructions, when executed by a processor, cause the processor to: provide an impression including providing a content item for presentation on a device associated with a user, the content item including a control for initiating a call to a content sponsor associated with the content item; assign a telephone number from a pool of available telephone numbers to the content item, wherein assigning includes associating the telephone number with the content item; receive an indication of an interaction with the control; facilitate a connection between the user and the content sponsor based on the interaction; store an association

between an identifier associated with the user, the assigned telephone number and an identifier for the content sponsor such that future calls from the user to the telephone number can be routed to the content sponsor, even after the assigned telephone number has been returned to the pool of available telephone numbers; and link an impression of the content item with the connection such that a report can be generated that shows an effectiveness of the impression of the content item.

**[0006]** In general, another aspect of the subject matter described in this specification can be implemented in systems. A system includes a content management system, a telephony system, and an available telephone number pool. The content management system is configured to: provide an impression including providing a content item for presentation on a device associated with a user, the content item including a control for initiating a call to a content sponsor associated with the content item; and receive an indication of an interaction with the control. The telephony system is configured to: assign a telephone number from the available telephone number pool to the content item, wherein assigning includes associating the telephone number with the content item; facilitate a connection between the user and the content sponsor based on the interaction with the control; store an association between an identifier associated with the user, the assigned telephone number and an identifier for the content sponsor such that future calls from the user to the telephone number can be routed to the content sponsor, even after the assigned telephone number has been returned to the available telephone number pool; and link an impression of the content item with the connection such that a report can be generated that shows an effectiveness of the impression of the content item.

**[0007]** These and other implementations can each optionally include one or more of the following features. The device can be a mobile device. The content item can be an advertisement. The assigning can occur either at a time of impression or after receiving the indication of an interaction. The control can be a button that does not include a visible telephone number. The pool can include a plurality of telephone numbers which may or may not have been previously assigned to other content items but are now available for assignment. The assigned telephone number can be returned back to the pool after either a predetermined amount of time after assignment to a content item, or after a pre-determined amount of time after assignment without receipt of an interaction by a user. The interaction can be a click and facilitating can include receiving a call from the user based on the interaction and connecting the received call to a telephone number associated with the content sponsor. The identifier associated with the user can be a caller telephone number. A call to a telephone number that is in the pool can be received. A caller number can be identified for the received call. A determination can be made regarding whether the caller number is the same as the stored caller number and when so, the call can be connected to the content sponsor. Assigning can include assigning a number to the content item that has historically been previously assigned to the content sponsor.

**[0008]** Particular implementations may realize none, one or more of the following advantages. A user interaction with a content item can be associated with a call by a user to a phone number associated with the content item. A determination can be made that a call was generated as a result of an interaction with a content item rather than from as a result of some other



action. A content sponsor can receive a report which displays how many calls were generated from each content item in a content campaign. A content sponsor can optimize a content campaign that includes multiple content items based on how many calls were generated from each content item. A content-interaction to call-placed mapping can be provided for a first number of content items using a pool including a second number of telephone numbers, wherein the first number is significantly larger (e.g., at least an order of magnitude larger) than the second number.

**[0009]** The details of one or more implementations of the subject matter described in this specification are set forth in the accompanying drawings and the description below. Other features, aspects, and advantages of the subject matter will become apparent from the description, the drawings, and the claims.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** FIG. 1 is a block diagram of an example environment for providing content to a user.

**[0011]** FIG. 2 is a block diagram of an example system for dynamic telephone number assignment.

**[0012]** FIG. 3 is a flowchart of an example process for dynamic telephone number assignment.

**[0013]** FIG. 4 illustrates an example content item effectiveness report.

**[0014]** FIG. 5 is a flowchart of an example process for connecting a telephone call.

**[0015]** FIG. 6 is a block diagram of computing devices that may be used to implement the systems and methods described in this document, as either a client or as a server or plurality of servers.

**[0016]** Like reference numbers and designations in the various drawings indicate like elements.

#### DETAILED DESCRIPTION

**[0017]** A content management system can provide a content item for presentation on a device associated with a user, wherein the content item includes a control for initiating a call to a content sponsor or a designated entity associated with the content item. The content management system can assign (e.g., dynamically) a telephone number from a pool of available telephone numbers to the content item which can include associating the telephone number with the content item. An indication of an interaction with the control can be received, and based on such an interaction, a connection between a user that initiated the interaction and the content sponsor can be facilitated. An association between an identifier associated with the user, the assigned telephone number, and an identifier for the content sponsor can be stored such that future calls from the user to the telephone number can be routed to the content sponsor. An impression of the content item can be linked with the connection such that a report can be generated that shows an effectiveness of the impression of the content item.

**[0018]** For situations in which the systems discussed here collect information about users, or may make use of information about users, the users may be provided with an opportunity to control whether programs or features collect user information (e.g., information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), or to control whether and/or how to receive content from the content server that may be more

relevant to the user. In addition, certain data may be manipulated in one or more ways before it is stored or used, so that certain information about the user is removed. For example, a user's identity may be manipulated so that no identifying information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over how information about the user is collected and used by a content server.

**[0019]** FIG. 1 is a block diagram of an example environment **100** for providing content to a user. The example environment **100** includes a network **102**, such as a local area network (LAN), a wide area network (WAN), the Internet, or a combination thereof. The network **102** connects websites **104**, user devices **106**, content providers **108**, publishers, and a content management system **110**. The example environment **100** may include many thousands of websites **104**, user devices **106**, and content providers **108**. The content management system **110** may be used for selecting and providing content in response to requests for content. The content providers **108** can be, for example, advertisers. Other types of content providers are possible.

**[0020]** A website **104** includes one or more resources **105** associated with a domain name and hosted by one or more servers. An example website **104** is a collection of web pages formatted in hypertext markup language (HTML) that can contain text, images, multimedia content, and programming elements, such as scripts. Each website **104** can be maintained by a content publisher, which is an entity that controls, manages and/or owns the website **104**.

**[0021]** A resource **105** can be any data that can be provided over the network **102**. A resource **105** can be identified by a resource address that is associated with the resource **105**. Resources **105** include HTML pages, word processing documents, portable document format (PDF) documents, images, video, and news feed sources, to name only a few. The resources **105** can include content, such as words, phrases, videos, images and sounds, that may include embedded information (such as meta-information hyperlinks) and/or embedded instructions (such as scripts).

**[0022]** A user device **106** is an electronic device that is under control of a user and is capable of requesting and receiving resources **105** over the network **102**. Example user devices **106** include personal computers, tablet computers, mobile communication devices (e.g., smartphones), televisions, set top boxes, personal digital assistants and other devices that can send and receive data over the network **102**. A user device **106** typically includes one or more user applications, such as a web browser, to facilitate the sending and receiving of data over the network **102**. The web browser can interact with various types of web applications, such as a game, a map application, or an e-mail application, to name a few examples.

**[0023]** A user device **106** can request resources **105** from a website **104**. In turn, data representing the resource **105** can be provided to the user device **106** for presentation by the user device **106**. User devices **106** can also submit search queries **116** to the search system **112** over the network **102**. In response to a search query **116**, the search system **112** can, for example, access the indexed cache **114** to identify resources **105** that are relevant to the search query **116**. The search system **112** identifies the resources **105** in the form of search results **118** and returns the search results **118** to the user

devices **106** in search results pages. A search result **118** is data generated by the search system **112** that identifies a resource **105** that is responsive to a particular search query **116**, and includes a link to the resource **105**. An example search result **118** can include a web page title, a snippet of text or a portion of an image extracted from the web page, and the URL (Unified Resource Location) of the web page.

[0024] The data representing the resource **105** or the search results **118** can also include data specifying a portion of the resource **105** or search results **118** or a portion of a user display (e.g., a presentation location of a pop-up window or in a slot of a web page) in which other content (e.g., advertisements) can be presented. These specified portions of the resource or user display are referred to as slots or impressions. An example slot is an advertisement slot.

[0025] When a resource **105** or search results **118** are requested by a user device **106**, the content management system **110** may receive a request for content to be provided with the resource **105** or search results **118**. The request for content can include characteristics of one or more slots or impressions that are defined for the requested resource **105** or search results **118**. For example, a reference (e.g., URL) to the resource **105** or search results **118** for which the slot is defined, a size of the slot, and/or media types that are available for presentation in the slot can be provided to the content management system **110**. Similarly, keywords associated with a requested resource ("resource keywords") or a search query **116** for which search results **118** are requested can also be provided to the content management system **110** to facilitate identification of content that is relevant to the resource or search query **116**.

[0026] Based, for example, on data included in the request for content, the content management system **110** can select content items that are eligible to be provided in response to the request, such as content items having characteristics matching the characteristics of a given slot. As another example, content items having selection criteria (e.g., keywords) that match the resource keywords or the search query **116** may be selected as eligible content items by the content management system **110**. One or more selected content items can be provided to the user device **106** in association with providing an associated resource **105** or search results **118**.

[0027] In some implementations, the content management system **110** can select content items based at least in part on results of an auction. For example, content providers **108** can provide bids specifying amounts that the content providers **108** are respectively willing to pay for presentation of their content items. In turn, an auction can be performed and the slots can be allocated to content providers **108** according, among other things, to their bids and/or the relevance of a content item to content presented on a page hosting the slot or a request that is received for the content item. For example, when a slot is being allocated in an auction, the slot can be allocated to the content provider **108** that provided the highest bid or a highest auction score (e.g., a score that is computed as a function of a bid and/or a quality measure). When multiple slots are allocated in a single auction, the slots can be allocated to a set of bidders that provided the highest bids or have the highest auction scores.

[0028] In some implementations, some content providers **108** prefer that the number of impressions allocated to their content and the price paid for the number of impressions be more predictable than the predictability provided by an auction. For example, a content provider **108** can increase the

likelihood that its content receives a desired or specified number of impressions, for example, by entering into an agreement with a publisher **109**, where the agreement requires the publisher **109** to provide at least a threshold number of impressions (e.g., 1,000 impressions) for a particular content item provided by the content provider **108** over a specified period (e.g., one week). In turn, the content provider **108**, publisher **109**, or both parties can provide data to the content management system **110** that enables the content management system **110** to facilitate satisfaction of the agreement.

[0029] For example, the content provider **108** can upload a content item and authorize the content management system **110** to provide the content item in response to requests for content corresponding to the website **104** of the publisher **109**. Similarly, the publisher **109** can provide the content management system **110** with data representing the specified time period as well as the threshold number of impressions that the publisher **109** has agreed to allocate to the content item over the specified time period. Over time, the content management system **110** can select content items based at least in part on a goal of allocating at least a minimum number of impressions to a content item in order to satisfy a delivery goal for the content item during a specified period of time.

[0030] A content provider **108** or content sponsor can create a content campaign associated with one or more content items using tools provided by the content management system **110**. For example, the content management system **110** can provide one or more account management user interfaces for creating and managing content campaigns. The account management user interfaces can be made available to the content provider **108**, for example, either through an online interface provided by the content management system **110** or as an account management software application installed and executed locally at a content provider's client device.

[0031] A content provider **108** can, using the account management user interfaces, provide campaign parameters **120** which define a content campaign. The content campaign can be created and activated for the content provider **108** according to the parameters **120** specified by the content provider **108**. The campaign parameters **120** can be stored in a parameters data store **122**. Campaign parameters **120** can include, for example, a campaign name, a preferred content network for placing content, a budget for the campaign, start and end dates for the campaign, a schedule for content placements, content (e.g., creatives), bids, and selection criteria. Selection criteria can include, for example, a language, one or more geographical locations or websites, and/or one or more selection terms.

[0032] Some or all content items associated with a content provider **108** can be associated with a telephone number of the content provider **108** or another designated entity. For example, a content item can include a control (e.g., a "call" button) for initiating a call to the content provider **108**. A content provider **108** may desire to know which calls originated from or are a result of presentation of a specific content item. A solution of assigning a unique telephone number to each content item may not be practical since the number of content items provided by the content management system **110** may exceed a number of available telephone numbers.

[0033] Rather than associating a unique telephone number with each content item, a pool of telephone numbers can be used. For example, the control included in a content item can be configured to place a call, but not display a specific telephone number. The user can interact with (e.g., select or click)

the control to initiate a call to the content provider **108** or other designated entity associated with the content item. In response to the control interaction, a request for a forwarding telephone number can be sent to a telephony system **123**. The telephony system **123** can select an available forwarding number from a telephone number pool **124** and, in some implementations, can provide the selected forwarding number to the user device **106** of the user.

[0034] In some implementations, the user device **106** can initiate a call to the forwarding number and the call can be received by the telephony system **123**. The telephony system **123** can route the call to the telephone number associated with the content provider **108** or the designated entity. The telephony system **123** can associate the impression of the content item with the call to the telephone number of the content provider **108**, such as in a call data datastore **126**.

[0035] The telephony system **123** can generate one or more reports which include information which indicates which calls to the content provider **108** or designated entity were generated from which content items. The one or more reports can be provided to the content provider **108**, as illustrated by reports **128**.

[0036] FIG. 2 is a block diagram of an example system **200** for dynamic phone number assignment. Content sponsors, such as content sponsors **202** and **204**, may desire, as part of respective content campaigns, to track effectiveness of content items included in the respective content campaigns. For example, some or all content items included in a content campaign for the content sponsor **202** may be configured to facilitate a connection with (e.g., placing a call to) the content sponsor **202**. The user, for example, can call the content sponsor **202** to make a purchase, inquire about a product or service, etc. The content sponsor **202** may desire to track, for example, how many calls to the content sponsor **202** are generated from each content item included in the content campaign and to track how many conversions (e.g., completed purchases) result from the calls generated from each content item.

[0037] A content item included in the content campaign of the content sponsor **202** can be provided to a user in response to a request for content from a user device. For example, a mobile user device **206** of a user **208** can send a request for content to a content server **210** for a content item to be presented in a content slot **212** of a web page **214** that is presented on the user device **206**. The content server **210** can select a content item to be provided to the user device **206** and the selected content item can be presented in the content slot **212**, as illustrated by a content item **216**.

[0038] The content item **216** includes a control **218** for initiating a call to the content sponsor **202** or other designated entity. The user **208** can interact with (e.g., select or click) the control **218**. In response to an interaction with the control **218**, a request can be sent to a telephony server **220**. The request sent to the telephony server **220** can include a unique identifier (e.g., an impression identifier) corresponding to the presentation of the content item **216** in the content slot **212**.

[0039] A phone number manager/allocator **222** included in the telephony server **220** can select an available forwarding telephone number from an available number pool **224**. The available number pool **224** can include a set of forwarding telephone numbers that are available to be assigned in response to interaction with a control such as the control **218**. The phone number manager/allocator **222** can store a first type of association between the impression identifier associ-

ated with the impression of the content item **216**, the selected forwarding telephone number, and a telephone number associated with the content sponsor **202**, in an associations data store **226**.

[0040] In some implementations, the telephony server **220** can send the selected forwarding telephone number to the user device **206**. In some implementations, the user device **206** can automatically dial the forwarding telephone number in response to receiving the forwarding telephone number. In some implementations, the user device **206** can load a dialer on the user device **206**, and using the received forwarding telephone number, initiate a call to the forwarding telephone number (e.g., by selecting a dial control on the user device **206**). In some implementations, the user device **206** displays the forwarding telephone number and the user **206** enters the forwarding telephone number into the dialer and initiates a call to the forwarding telephone number. In some implementations, the telephony server **220** can place the call using the selected forwarding telephone number and connect the user device **206** to the call. Other dialing options are possible.

[0041] In some implementations, when the forwarding telephone number is dialed, the call is received by a telephony IVR (Interactive Voice Response) system **228**. The telephony IVR system **228** bridges the call placed to the forwarding telephone number to a telephone number associated with the content sponsor **202** or designated entity. In response to receiving the call using the forwarding number, the telephony server **220** can store, in the associations data store **226**, a second type of association between a caller identifier associated with the user device **206**, the forwarding telephone number, and the telephone number of the content sponsor **202** or designated entity. A record of the call can be stored in a logs data store **230**, and the record can include, for example, the impression identifier, the forwarding telephone number, an identifier of the content sponsor **202** or designated entity (e.g., the telephone number of the content sponsor **202**), the caller identifier, a date and time of the call, and/or a call duration.

[0042] After the telephony IVR system **228** connects the call to the content sponsor **202** or designated entity, the phone number manager/allocator **222** can return the forwarding telephone number to the available number pool **224**, and the forwarding number can be assigned to an impression of another content item, such as a content item associated with another content sponsor (e.g., the content sponsor **204**), in response to a user interacting with a control in the other content item. In some implementations, the phone number manager/allocator **222** maintains the first type of association between the selected forwarding number and the telephone number of the content sponsor **202** for a first predetermined period of time (e.g., thirty minutes to three days) after the forwarding telephone number is provided to the user device **206**. Such an association can be maintained, for example, so that if the user **208** happens to dial the forwarding telephone number from a different calling device, the call will still be connected to the content sponsor **202** or designated entity. For example, the user **208** may see the forwarding telephone number displayed on the user device **206** and may dial the forwarding number from the user device **206** or alternatively from a different calling device. As another example, the user **208** may share the forwarding number with another user (e.g., a user **232**), and the user **232** may dial the forwarding number, such as with a user device **234**.

[0043] In some implementations, the phone number manager/allocator **222** maintains the second type of association

between the caller identifier associated with the user device **206**, the selected forwarding telephone number, and the telephone number of the content sponsor **202** for a second predetermined period of time (e.g., ninety days to six months) after the telephony IVR system **228** connects the call to the content sponsor **202** or designated entity. Such an association can be maintained, for example, so that if the user **208** dials the forwarding number during the second (e.g., longer) predetermined period of time, the call will connect to the content sponsor **202** or designated entity. This association allows for calls that are received from a caller having the stored caller identifier to be routed to the content sponsor **202** or designated entity even when the forwarding number has been returned to the available number pool **224** and has been potentially reassigned to one or more other content impressions that may be associated with one or more different content sponsors. In some implementations, the phone number manager/allocator **222** maintains an association between the forwarding telephone number, the telephone number of the content sponsor **202**, and a caller identifier associated with any calling device (e.g., the user device **234**) that places a call to the forwarding number in the first predetermined time period, such that subsequent calls received to the forwarding number from such calling devices within the second predetermined time period are connected to the content sponsor **202**.

**[0044]** In some implementations, the first predetermined time period is a short time period as compared to the second predetermined time period. For example, the first predetermined time period can be one hour and the second predetermined time period can be ninety days. The first predetermined time period can be short, for example, to allow forwarding telephone numbers to be returned to the pool to make the returned forwarding telephone numbers available for assignment to other content impressions shown to potentially other users.

**[0045]** In some implementations, a content item configured to facilitate a connection to a content sponsor (e.g., the content sponsor **204**) can be displayed on a user device which does not have calling capability (e.g., a laptop user device **236** of a user **238**). For example, the user device **236** can send a request for content to the content server **210** for a content item to be presented in a content slot **240** of a web page **242** that is presented on the user device **236**. The content server **210** can select a content item to be provided to the user device **236** and the selected content item can be presented in the content slot **240**, as illustrated by a content item **244**.

**[0046]** The content item **244** includes a control **246** for displaying a telephone number associated with the content sponsor **204**. The user **238** can interact with (e.g., select or click) the control **246**. In response to an interaction with the control **246**, a request can be sent to the telephony server **220**. The request sent to the telephony server **220** can include an impression identifier corresponding to the presentation of the content item **244** in the content slot **240**.

**[0047]** The phone number manager/allocator **222** can select an available forwarding telephone number from the available number pool **224**. The phone number manager/allocator **222** can store an association between the impression identifier associated with the impression of the content item **244**, the forwarding telephone number selected in response to the request received from the user device **236**, and a telephone number associated with the content sponsor **204**, in the associations data store **226**. The telephony server **220** can send the selected forwarding telephone number to the user device **206**.

The forwarding telephone number can be displayed in the content item **244**. The phone number manager/allocator **222** can store an association between the selected forwarding telephone number and the telephone number associated with the content sponsor **204** for the first predetermined period of time. During the first predetermined period of time, if a call is received by the telephony IVR system **228** to the selected forwarding number, the telephony IVR system **228** can connect the call to the telephone number associated with the content sponsor **204**.

**[0048]** In some implementations, the phone number manager/allocator **222** determines, in response to a received request that is associated with a content item from a content sponsor, whether a forwarding number has already been assigned to an impression of that content item in response to a previous request. If a forwarding number has already been assigned to an impression of that content item, the phone number manager/allocator **222** can select the same forwarding number in response to the current request. Selecting the same forwarding number can result in the same or a same set of forwarding numbers being selected for a particular content sponsor.

**[0049]** The telephony server **220** can include an online spam detector **250** and an offline spam detector **252**, to protect, for example, against malicious attempts to deplete the available number pool **224**. The online spam detector **250** can be used, for example, to detect and prevent denial of service attacks.

**[0050]** The offline spam detector **252** can periodically (e.g., daily) evaluate the logs datastore **230**, for example, to evaluate a volume of activity from a same IP (Internet Protocol) address or IP address range and/or from a same telephone number. When, for example, a greater than a threshold number of requests are received from a same IP address, but none or less than a threshold of valid calls are made in association with those requests, the content server **210** can be configured to not send content items to the IP address and/or the phone number manager/allocator **222** can be configured to not provide a forwarding number in response to requests received from the IP address. The online spam detector **250** can be updated in response to determinations made by the offline spam detector **250**. In response to offline or online spam detection, forwarding numbers determined to be associated with invalid activity can be returned to the available number pool **224**.

**[0051]** FIG. 3 is a flowchart of an example process **300** for dynamic telephone number assignment. The process **300** can be performed, for example, by the telephony system **123** described above with respect to FIG. 1, or the telephony server **220** described above with respect to FIG. 2.

**[0052]** An impression is provided (**302**), including providing a content item for presentation on a device associated with a user, the content item including a control for initiating a call to a content sponsor or designated entity associated with the content item. The device can be, for example, a mobile device with call-making capability. The content item can be, for example, an advertisement or some other type of content item. The control can be, for example, a button or a link. The button or link can include a caption which does not include a displayed telephone number.

**[0053]** A telephone number is assigned from a pool of available telephone numbers to the content item (**304**), wherein the assigning includes associating the telephone number with the content item. The assigning can occur, for

example, at the time the impression of the content item is provided. As described below, the assigning can occur after an indication of an interaction with the control is received. The pool can include a plurality of telephone numbers which may or may not have been previously assigned to other content items but are now available for assignment. In some implementations, a number can be assigned to the content item that has historically been previously assigned to the content sponsor.

**[0054]** An indication of an interaction with the control is received (306). The interaction can be, for example, a selection (e.g., click) of the control. In some implementations, the telephone number is assigned to the content item in response to the interaction. The assigned telephone number can be provided to the device associated with the user in response to the interaction. In some implementations, a call is received from the device based on the interaction.

**[0055]** A connection between the user and the content sponsor is facilitated, based on the interaction (308). For example, a call received from the device can be connected to a telephone number associated with the content sponsor or other designated entity.

**[0056]** An association is stored between an identifier associated with the user, the assigned telephone number, and an identifier for the content sponsor (310), such that future calls from the user to the telephone number can be routed to the content sponsor, even after the assigned telephone number has been returned to the pool of available telephone numbers. The association can be maintained, for example, for a predetermined period of time (e.g., ninety days, six months).

**[0057]** An impression of the content item is linked with the connection (312), such that a report can be generated that shows an effectiveness of the impression of the content item. The report can be provided, for example, to the content sponsor. The report can be provided on demand to the content sponsor and/or the report can be provided automatically on a periodic basis (e.g., monthly).

**[0058]** FIG. 4 illustrates an example content item effectiveness report 400. The report 400 is provided to a content sponsor “123”, for a period of May 1 to May 31, 2013, for a campaign “A”, as indicated by labels 402, 404, and 406, respectively. A section 408 includes information for a content item “1” and a content item “2” included in a content group “A” that is included in the campaign “A”. For example, the section 408 includes information that indicates that out of 2,843 impressions, the content item “1” generated four hundred thirty two calls to the content sponsor, with two hundred eleven of those calls resulting in a conversion, and that out of 2,421 impressions, the content item “2” generated two hundred eleven calls to the content sponsor, with fifty four of those calls resulting in a conversion. A subtotal section 410 displays totals for the content group “A”.

**[0059]** A section 412 includes information about a content item “3” and a content item “4” included in a content group “B”. For example, out of 1,812 impressions, the content item “3” generated eighty nine calls to the content sponsor, with thirty three calls resulting in a conversion, and out of 1,922 impressions, the content item “4” generated one hundred twelve calls to the content sponsor, with fifty six calls resulting in a conversion. A subtotal section 414 displays totals for the content group “B” and a totals section 416 displays totals for the campaign “A”.

**[0060]** The content sponsor “123” can use the report 400, for example, to optimize the content campaign “A”. For

example, the content sponsor can determine that the content items in the content group “A” have been more effective than the content items included in the content group “B”. The content sponsor can determine, for example, to increase a campaign budget portion allocated to the content group “A” content items, can determine to reconfigure the content items in the content group “B” (e.g., change bids, change creative content) to attempt to make the content items in the content group “B” more effective, or can determine to remove the content items included in the content group “B” from the campaign “A”. In some implementations, some or all such optimizations can be performed automatically. For example, a bid for a content item can be automatically adjusted based on a rate of call generation and/or a rate of conversion for a time period.

**[0061]** FIG. 5 is a flowchart of an example process 500 for connecting a telephone call. The process 500 can be performed, for example, by the telephony system 123 described above with respect to FIG. 1, or the telephony server 220 described above with respect to FIG. 2.

**[0062]** A call to a telephone number that is in a pool of available telephone numbers is received (502). For example, the telephone number can be included in the telephone number pool 124. The call can be received, for example, by the telephony system 123, from a user device 106, such as a mobile device. The user, for example, can interact with a call control included in a presented content item. In association with the receipt of the call, an impression identifier of the content item can be received.

**[0063]** A caller number for the received call is identified (504). The caller number can be, for example, a caller identification number.

**[0064]** A determination is made as to whether the caller number is the same as a stored caller number (506). For example, a determination can be made as to whether the caller number is included in a set of stored associations, where the stored associations each associate a caller number, an impression identifier of an impression of a previously presented content item, a first telephone number associated with a content sponsor, and a second telephone number. If the caller number is included in a stored association, the stored association that includes the caller number and the impression identifier can be identified. The presence of a stored association between a caller number, a telephone number of a content sponsor or other designated entity, an impression identifier, and a second telephone number can indicate that the second telephone number was previously associated with (e.g., assigned to) the caller number and the impression identifier.

**[0065]** When the caller number matches a stored caller number which is associated with a stored impression identifier that matches the received impression identifier, a call to a content sponsor or other designated entity associated with the stored caller number is connected (508). For example, the telephone number associated with the stored caller number can be accessed using the identified stored association. Connecting the call to the content sponsor associated with the stored caller number can create a consistent user experience for the user—for example, the user may have previously called the content sponsor using a particular assigned telephone number and expects a call placed to that number will result in a connection to the same content sponsor.

**[0066]** FIG. 6 is a block diagram of computing devices 600, 650 that may be used to implement the systems and methods described in this document, as either a client or as a server or

plurality of servers. Computing device **600** is intended to represent various forms of digital computers, such as laptops, desktops, workstations, personal digital assistants, servers, blade servers, mainframes, and other appropriate computers. Computing device **650** is intended to represent various forms of mobile devices, such as personal digital assistants, cellular telephones, smartphones, and other similar computing devices. The components shown here, their connections and relationships, and their functions, are meant to be illustrative only, and are not meant to limit implementations of the inventions described and/or claimed in this document.

[0067] Computing device **600** includes a processor **602**, memory **604**, a storage device **606**, a high-speed interface **608** connecting to memory **604** and high-speed expansion ports **610**, and a low speed interface **612** connecting to low speed bus **614** and storage device **606**. Each of the components **602**, **604**, **606**, **608**, **610**, and **612**, are interconnected using various busses, and may be mounted on a common motherboard or in other manners as appropriate. The processor **602** can process instructions for execution within the computing device **600**, including instructions stored in the memory **604** or on the storage device **606** to display graphical information for a GUI on an external input/output device, such as display **616** coupled to high speed interface **608**. In other implementations, multiple processors and/or multiple buses may be used, as appropriate, along with multiple memories and types of memory. Also, multiple computing devices **600** may be connected, with each device providing portions of the necessary operations (e.g., as a server bank, a group of blade servers, or a multi-processor system).

[0068] The memory **604** stores information within the computing device **600**. In one implementation, the memory **604** is a computer-readable medium. The computer-readable medium is not a propagating signal. In one implementation, the memory **604** is a volatile memory unit or units. In another implementation, the memory **604** is a non-volatile memory unit or units.

[0069] The storage device **606** is capable of providing mass storage for the computing device **600**. In one implementation, the storage device **606** is a computer-readable medium. In various different implementations, the storage device **606** may be a floppy disk device, a hard disk device, an optical disk device, or a tape device, a flash memory or other similar solid state memory device, or an array of devices, including devices in a storage area network or other configurations. In one implementation, a computer program product is tangibly embodied in an information carrier. The computer program product contains instructions that, when executed, perform one or more methods, such as those described above. The information carrier is a computer- or machine-readable medium, such as the memory **604**, the storage device **606**, or memory on processor **602**.

[0070] The high speed controller **608** manages bandwidth-intensive operations for the computing device **600**, while the low speed controller **612** manages lower bandwidth-intensive operations. Such allocation of duties is illustrative only. In one implementation, the high-speed controller **608** is coupled to memory **604**, display **616** (e.g., through a graphics processor or accelerator), and to high-speed expansion ports **610**, which may accept various expansion cards (not shown). In the implementation, low-speed controller **612** is coupled to storage device **606** and low-speed expansion port **614**. The low-speed expansion port, which may include various communication ports (e.g., USB, Bluetooth, Ethernet, wireless

Ethernet) may be coupled to one or more input/output devices, such as a keyboard, a pointing device, a scanner, or a networking device such as a switch or router, e.g., through a network adapter.

[0071] The computing device **600** may be implemented in a number of different forms, as shown in the figure. For example, it may be implemented as a standard server **620**, or multiple times in a group of such servers. It may also be implemented as part of a rack server system **624**. In addition, it may be implemented in a personal computer such as a laptop computer **622**. Alternatively, components from computing device **600** may be combined with other components in a mobile device (not shown), such as device **650**. Each of such devices may contain one or more of computing device **600**, **650**, and an entire system may be made up of multiple computing devices **600**, **650** communicating with each other.

[0072] Computing device **650** includes a processor **652**, memory **664**, an input/output device such as a display **654**, a communication interface **666**, and a transceiver **668**, among other components. The device **650** may also be provided with a storage device, such as a microdrive or other device, to provide additional storage. Each of the components **650**, **652**, **664**, **654**, **666**, and **668**, are interconnected using various buses, and several of the components may be mounted on a common motherboard or in other manners as appropriate.

[0073] The processor **652** can process instructions for execution within the computing device **650**, including instructions stored in the memory **664**. The processor may also include separate analog and digital processors. The processor may provide, for example, for coordination of the other components of the device **650**, such as control of user interfaces, applications run by device **650**, and wireless communication by device **650**.

[0074] Processor **652** may communicate with a user through control interface **658** and display interface **656** coupled to a display **654**. The display **654** may be, for example, a TFT LCD display or an OLED display, or other appropriate display technology. The display interface **656** may comprise appropriate circuitry for driving the display **654** to present graphical and other information to a user. The control interface **658** may receive commands from a user and convert them for submission to the processor **652**. In addition, an external interface **662** may be provide in communication with processor **652**, so as to enable near area communication of device **650** with other devices. External interface **662** may provide, for example, for wired communication (e.g., via a docking procedure) or for wireless communication (e.g., via Bluetooth or other such technologies).

[0075] The memory **664** stores information within the computing device **650**. In one implementation, the memory **664** is a computer-readable medium. In one implementation, the memory **664** is a volatile memory unit or units. In another implementation, the memory **664** is a non-volatile memory unit or units. Expansion memory **674** may also be provided and connected to device **650** through expansion interface **672**, which may include, for example, a SIMM card interface. Such expansion memory **674** may provide extra storage space for device **650**, or may also store applications or other information for device **650**. Specifically, expansion memory **674** may include instructions to carry out or supplement the processes described above, and may include secure information also. Thus, for example, expansion memory **674** may be provide as a security module for device **650**, and may be programmed with instructions that permit secure use of

device **650**. In addition, secure applications may be provided via the SIMM cards, along with additional information, such as placing identifying information on the SIMM card in a non-hackable manner.

**[0076]** The memory may include for example, flash memory and/or MRAM memory, as discussed below. In one implementation, a computer program product is tangibly embodied in an information carrier. The computer program product contains instructions that, when executed, perform one or more methods, such as those described above. The information carrier is a computer- or machine-readable medium, such as the memory **664**, expansion memory **674**, or memory on processor **652**.

**[0077]** Device **650** may communicate wirelessly through communication interface **666**, which may include digital signal processing circuitry where necessary. Communication interface **666** may provide for communications under various modes or protocols, such as GSM voice calls, SMS, EMS, or MMS messaging, CDMA, TDMA, PDC, WCDMA, CDMA2000, or GPRS, among others. Such communication may occur, for example, through radio-frequency transceiver **668**. In addition, short-range communication may occur, such as using a Bluetooth, WiFi, or other such transceiver (not shown). In addition, GPS receiver module **670** may provide additional wireless data to device **650**, which may be used as appropriate by applications running on device **650**.

**[0078]** Device **650** may also communicate audibly using audio codec **660**, which may receive spoken information from a user and convert it to usable digital information. Audio codec **660** may likewise generate audible sound for a user, such as through a speaker, e.g., in a handset of device **650**. Such sound may include sound from voice telephone calls, may include recorded sound (e.g., voice messages, music files, etc.) and may also include sound generated by applications operating on device **650**.

**[0079]** The computing device **650** may be implemented in a number of different forms, as shown in the figure. For example, it may be implemented as a cellular telephone **680**. It may also be implemented as part of a smartphone **682**, personal digital assistant, or other similar mobile device.

**[0080]** Various implementations of the systems and techniques described here can be realized in digital electronic circuitry, integrated circuitry, specially designed ASICs (application specific integrated circuits), computer hardware, firmware, software, and/or combinations thereof. These various implementations can include implementation in one or more computer programs that are executable and/or interpretable on a programmable system including at least one programmable processor, which may be special or general purpose, coupled to receive data and instructions from, and to transmit data and instructions to, a storage system, at least one input device, and at least one output device.

**[0081]** These computer programs (also known as programs, software, software applications or code) include machine instructions for a programmable processor, and can be implemented in a high-level procedural and/or object-oriented programming language, and/or in assembly/machine language. As used herein, the terms “machine-readable medium” “computer-readable medium” refers to any computer program product, apparatus and/or device (e.g., magnetic discs, optical disks, memory, Programmable Logic Devices (PLDs)) used to provide machine instructions and/or data to a programmable processor, including a machine-readable medium that receives machine instructions as a machine-

readable signal. The term “machine-readable signal” refers to any signal used to provide machine instructions and/or data to a programmable processor.

**[0082]** To provide for interaction with a user, the systems and techniques described here can be implemented on a computer having a display device (e.g., a CRT (cathode ray tube) or LCD (liquid crystal display) monitor) for displaying information to the user and a keyboard and a pointing device (e.g., a mouse or a trackball) by which the user can provide input to the computer. Other kinds of devices can be used to provide for interaction with a user as well; for example, feedback provided to the user can be any form of sensory feedback (e.g., visual feedback, auditory feedback, or tactile feedback); and input from the user can be received in any form, including acoustic, speech, or tactile input.

**[0083]** The systems and techniques described here can be implemented in a computing system that includes a back-end component (e.g., as a data server), or that includes a middleware component (e.g., an application server), or that includes a front-end component (e.g., a client computer having a graphical user interface or a Web browser through which a user can interact with an implementation of the systems and techniques described here), or any combination of such back-end, middleware, or front-end components. The components of the system can be interconnected by any form or medium of digital data communication (e.g., a communication network). Examples of communication networks include a local area network (“LAN”), a wide area network (“WAN”), and the Internet.

**[0084]** The computing system can include clients and servers. A client and server are generally remote from each other and typically interact through a communication network. The relationship of client and server arises by virtue of computer programs running on the respective computers and having a client-server relationship to each other.

**[0085]** A number of embodiments of the invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. For example, various forms of the flows shown above may be used, with steps re-ordered, added, or removed. Also, although several applications of the payment systems and methods have been described, it should be recognized that numerous other applications are contemplated. Accordingly, other embodiments are within the scope of the following claims.

What is claimed is:

1. A method comprising:

- providing an impression including providing a content item for presentation on a device associated with a user, the content item including a control for initiating a call to a content sponsor associated with the content item;
- assigning a telephone number from a pool of available telephone numbers to the content item, wherein assigning includes associating the telephone number with the content item;
- receiving an indication of an interaction with the control;
- facilitating a connection between the user and the content sponsor based on the interaction;
- storing an association between an identifier associated with the user, the assigned telephone number and an identifier for the content sponsor such that future calls from the user to the telephone number can be routed to the content

sponsor, even after the assigned telephone number has been returned to the pool of available telephone numbers; and

linking an impression of the content item with the connection such that a report can be generated that shows an effectiveness of the impression of the content item.

2. The method of claim 1 wherein the device is a mobile device.

3. The method of claim 1 wherein the content item is an advertisement.

4. The method of claim 1 wherein the assigning occurs either at a time of impression or after receiving the indication of an interaction.

5. The method of claim 1 wherein the control is a button that does not include a visible telephone number.

6. The method of claim 1 wherein the pool includes a plurality of telephone numbers which may or may not have been previously assigned to other content items but are now available for assignment.

7. The method of claim 6 further comprising returning the assigned telephone number back to the pool after either a predetermined amount of time after assignment to a content item, or after a pre-determined amount of time after assignment without receipt of an interaction by a user.

8. The method of claim 1 wherein the interaction is a click and facilitating includes receiving a call from the user based on the interaction and connecting the received call to a telephone number associated with the content sponsor.

9. The method of claim 1 wherein the identifier associated with the user is a caller telephone number and wherein the method further includes receiving a call to a telephone number that is in the pool, identifying a caller number for the received call, determining whether the caller number is the same as the stored caller number and when so, connecting the call to the content sponsor.

10. The method of claim 1 wherein assigning includes assigning a number to the content item that has historically been assigned to the content sponsor previously.

11. A system comprising:  
a content management system;  
a telephony system; and  
an available telephone number pool;  
wherein the content management system is configured to:  
provide an impression including providing a content item for presentation on a device associated with a user, the content item including a control for initiating a call to a content sponsor associated with the content item; and  
receive an indication of an interaction with the control;  
and  
wherein the telephony system is configured to:  
assign a telephone number from the available telephone number pool to the content item, wherein assigning includes associating the telephone number with the content item;  
facilitate a connection between the user and the content sponsor based on the interaction with the control;  
store an association between an identifier associated with the user, the assigned telephone number and an identifier for the content sponsor such that future calls from the user to the telephone number can be routed to the content

sponsor, even after the assigned telephone number has been returned to the available telephone number pool; and  
link an impression of the content item with the connection such that a report can be generated that shows an effectiveness of the impression of the content item.

12. The system of claim 11 wherein the assigning occurs either at a time of impression or after receiving the indication of an interaction.

13. The system of claim 11 wherein the control is a button that does not include a visible telephone number.

14. The system of claim 11 wherein the pool of available telephone numbers includes a plurality of telephone numbers which may or may not have been previously assigned to other content items but are now available for assignment.

15. The system of claim 11 wherein the telephony system is further configured to return the assigned telephone number back to the pool after either a predetermined amount of time after assignment to a content item, or after a pre-determined amount of time after assignment without receipt of an interaction by a user.

16. A computer program product tangibly embodied in a computer-readable storage device and comprising instructions that, when executed by a processor, cause the processor to:  
provide an impression including providing a content item for presentation on a device associated with a user, the content item including a control for initiating a call to a content sponsor associated with the content item;  
assign a telephone number from a pool of available telephone numbers to the content item, wherein assigning includes associating the telephone number with the content item;  
receive an indication of an interaction with the control;  
facilitate a connection between the user and the content sponsor based on the interaction;  
store an association between an identifier associated with the user, the assigned telephone number and an identifier for the content sponsor such that future calls from the user to the telephone number can be routed to the content sponsor, even after the assigned telephone number has been returned to the pool of available telephone numbers; and  
link an impression of the content item with the connection such that a report can be generated that shows an effectiveness of the impression of the content item.

17. The product of claim 16 wherein the assigning occurs either at a time of impression or after receiving the indication of an interaction.

18. The product of claim 16 wherein the control is a button that does not include a visible telephone number.

19. The product of claim 16 wherein the pool includes a plurality of telephone numbers which may or may not have been previously assigned to other content items but are now available for assignment.

20. The product of claim 16 further comprising instructions that, when executed by a processor, cause the processor to return the assigned telephone number back to the pool after either a predetermined amount of time after assignment to a content item, or after a pre-determined amount of time after assignment without receipt of an interaction by a user.