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[Continued on nextpage]

(54) Title: URL PREFETCHING

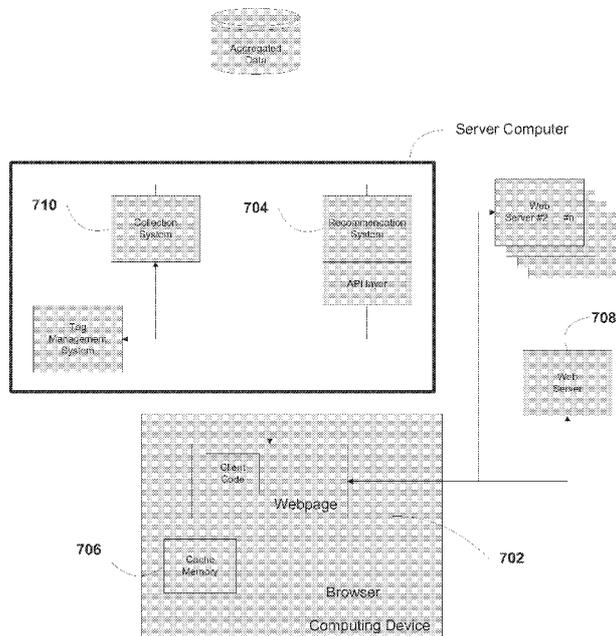


FIG. 7B

(57) **Abstract:** An enhanced tag management system is disclosed comprising a networked resource/asset prefetch feature. In some examples, the tag management system comprises a recommendation system, a collection system, a non-volatile data store, a user computing device with cache memory, and/or other components. The enhanced tag management system permits prefetching of resource/assets, such as images, videos, widgets, etc., while avoiding the skewing of analytical results. As a result, a user computing device may enjoy enhanced performance and reduced latency without sacrificing the reliability of collected analytics data.



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URL PREFETCHING

- [01] This application claims the benefit of priority from U.S. Provisional Patent Application Serial No. 61/978,814 (Attorney Docket No. 007662.00044), filed April 11, 2014, and which is herein incorporated by reference in its entirety.
- [02] In one example, a system including one or more of the features described herein may be built upon or incorporate aspects of a tag delivery system as described in U.S. Patent Application Serial No. 13/843,849 (Attorney Docket No. 007662.00019), which published as U.S. Patent Application Publication No. 2013/0290480 on October 30, 2013, which is herein incorporated by reference in its entirety.

Background

- [03] Site performance has an impact on user engagement and directly impacts conversion metrics. As websites become more sophisticated, browsers have to pull down more resources during page load, resulting in slower site performance. Apart from technically optimizing each page for performance, there are limited options for a marketer to improve site performance. In addition, some caching techniques can result in skewed analytics being collected. For example, some web assets (e.g., images) are commonly used for web analytics, and would thus skew analytical results if they were requested prematurely. Opportunities exist for improvements in the art.

Brief Summary

- [04] Aspects of the disclosure address one or more of the drawbacks mentioned above by disclosing methods, computer readable media, and apparatuses associated with a tag delivery network that employs one or more aspects of prefetching disclosed herein.
- [05] Aspects of the disclosure address one or more of the issues mentioned above by disclosing methods, computer readable media, and apparatuses for a tag management system comprising a networked resource/asset prefetch feature. In one example, the tag management system may involve a tag manager comprising first program

instructions configured to regulate execution of analytics tags at the user terminal and second program instructions configured to request and process a prefetch recommendation. The tag manager may executed on a user terminal analytics tags are associated with a web page. Meanwhile, the tag manager may bypass execution of analytics tags in those web pages downloaded/cached as part of a prefetch.

- [06] With another aspect of the disclosure, a recommendation system and collection system may communicate with a data store of aggregated data to estimate which web page(s) are likely to be next in a navigation sequence, then generating a prefetch recommendation.
- [07] Aspects of the disclosure may be provided in a computer-readable medium having computer-executable instructions to perform one or more of the process steps described herein.
- [08] This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the detailed description. The summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter. Moreover, one or more of the steps and/or components described above may be optional or may be combined with other steps.

Brief Description of Figures

- [09] Systems and methods are illustrated by way of example and are not limited in the accompanying figures in which like reference numerals indicate similar elements and in which:
- [10] Figure 1 shows an illustrative operating environment in which various aspects of the disclosure may be implemented.
- [11] Figure 2 is an illustrative block diagram of workstations and servers that may be used to implement the processes and functions of certain aspects of the disclosure.

- [12] Figure 3 shows a tag/content management system operating in a network in accordance with certain aspects of the disclosure.
- [13] Figure 4 shows a flow diagram for using a tag/content manager program to execute both global and page specific code in accordance with certain aspects of the disclosure.
- [14] Figure 5 shows a flow diagram for delivering page specific code to a tag management system in accordance with certain aspects of the disclosure.
- [15] Figure 6 shows a flow diagram for generating the tag/content manager in accordance with certain aspects of the disclosure.
- [16] Figure 7A and Figure 7B illustrate examples of network configurations of various systems interacting in accordance with certain aspects of the disclosure.

Detailed Description

- [17] In light of the foregoing background, the following presents a simplified summary of the present disclosure in order to provide a basic understanding of some aspects of the concepts disclosed herein. This description is not an extensive overview of the invention. This description is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter. This description is provided to introduce a selection of concepts in a simplified form that are further described below. It is to be understood that other embodiments may be utilized and structural and functional modifications may be made.
- [18] In accordance with various aspects of the disclosure, methods, computer-readable media, and apparatuses are disclosed involving an enhanced tag management system comprising a networked resource/asset prefetch feature. In some examples, the tag management system comprises a recommendation system, a collection system, a non-volatile data store, a user computing device with cache memory, and/or other

components. The enhanced tag management system permits prefetching of resource/assets, such as images, videos, widgets, etc., while avoiding the skewing of analytical results. As a result, a user computing device may enjoy enhanced performance and reduced latency without sacrificing the reliability of collected analytics data.

- [19] One example of a tag management system is disclosed in which an entity manages the delivery of content and program instructions that have been customized for each individual and/or web page. This entity (*e.g.*, a web consulting company) may use aspects of the disclosure to route customized content/instructions to a web browser and/or other computer applications. In general, aspects of the disclosure may be used to manipulate existing objects and add new objects to web pages. Within this context, an object may include both visual and non-visual elements on a web page. As part of the content/instruction delivery vehicle, a front-end user interface may facilitate a non-technical user to describe and implement object creation and manipulation. To provide these services, the entity may take advantage of both internal and external computing and storage capabilities. One example of program instructions delivered to a web browser and/or other application includes those related to initiate the capture of web analytics data when a user terminal accesses a client web page. This collected data may include the name of the web page visited, the download time of the web page, a setting of a cookie for the web page, and the movement of a mouse over a particular object (*i.e.*, "mouse overs") on a web page. In addition, content such as advertisements, modified images, buttons, and other graphics may be customized to a particular user through this service.
- [20] Certain embodiments of this disclosure allow for a content/tag management system/method/program executable instructions that is/are referenced with a single line of computer code that is inserted as a single tag and references a JavaScript™ file. The execution of program instructions in the JavaScript™ file may take care of all tag management, updates, configuration changes, and any other customizations that clients may wish to perform. Third-party vendors may be removed from a client

website to allow the manager to take responsibility for delivering the correct program instructions/content at the correct time.

- [21] In the following description of the various embodiments of the disclosure, reference is made to the accompanying drawings, which form a part hereof, and in which is shown by way of illustration, various embodiments in which the disclosure may be practiced. It is to be understood that other embodiments may be utilized and structural and functional modifications may be made.
- [22] Figure 1 illustrates a block diagram of a tag/content manager 101 (e.g., a computer server) in communication system 100 that may be used according to an illustrative embodiment of the disclosure. The manager 101 may have a processor 103 for controlling overall operation of the manager 101 and its associated components, including RAM 105, ROM 107, input/output module 109, and memory 115.
- [23] I/O 109 may include a microphone, keypad, touch screen, and/or stylus through which a user of device 101 may provide input, and may also include one or more of a speaker for providing audio output and a video display device for providing textual, audiovisual and/or graphical output. Software may be stored within memory 115 to provide instructions to processor 103 for enabling manager 101 to perform various functions. For example, memory 115 may store software used by the manager 101, such as an operating system 117, application programs 119, and an associated database 121. Processor 103 and its associated components may allow the manager 101 to run a series of computer-readable instructions to deploy program instructions according to the type of request that the manager receives. For instance, if a client requests that program instructions for capturing mouse movements for complete session replay be executed, manager 101 may transmit the appropriate instructions to a user's computer when that user visits the client's website.
- [24] The manager 101 may operate in a networked environment supporting connections to one or more remote computers, such as terminals 141 and 151. The terminals 141 and 151 may be personal computers or servers that include many or all of the elements

described above relative to the manager 101. Alternatively, terminal 141 and/or 151 may be part of a "cloud" computing environment located with or remote from manager 101 and accessed by manager 101. The network connections depicted in Figure 1 include a local area network (LAN) 125 and a wide area network (WAN) 129, but may also include other networks. When used in a LAN networking environment, the manager 101 is connected to the LAN 125 through a network interface or adapter 123. When used in a WAN networking environment, the server 101 may include a modem 127 or other means for establishing communications over the WAN 129, such as the Internet 131. It will be appreciated that the network connections shown are illustrative and other means of establishing a communications link between the computers may be used. The existence of any of various well-known protocols such as TCP/IP, Ethernet, File Transfer Protocol (FTP), Hypertext Transfer Protocol (HTTP) and the like is presumed.

- [25] Additionally, an application program 119 used by the manager 101 according to an illustrative embodiment of the disclosure may include computer executable instructions for invoking functionality related to delivering program instructions and/or content.
- [26] Computing device 101 and/or terminals 141 or 151 may also be mobile terminals including various other components, such as a battery, speaker, and antennas (not shown).
- [27] The disclosure is operational with numerous other general purpose or special purpose computing system environments or configurations. Examples of well known computing systems, environments, and/or configurations that may be suitable for use with the disclosure include, but are not limited to, personal computers, server computers, hand-held or laptop devices, multiprocessor systems, microprocessor-based systems, set top boxes, programmable consumer electronics, network PCs, minicomputers, mainframe computers, and distributed computing environments that include any of the above systems or devices, and the like.

- [28] The disclosure may be described in the general context of computer-executable instructions, such as program modules, being executed by a computer. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. The disclosure may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote computer storage media including memory storage devices.
- [29] Referring to Figure 2, an illustrative system 200 for implementing methods according to the present disclosure is shown. As illustrated, system 200 may include one or more workstations 201. Workstations 201 may be local or remote, and are connected by one or more communications links 202 to computer network 203 that is linked via communications links 205 to tag/content manager 204. In certain embodiments, workstations 201 may be different storage/computing devices for storing and delivering client-specific program instructions or in other embodiments workstations 201 may be user terminals that are used to access a client website and/or execute a client-specific application. In system 200, manager 204 may be any suitable server, processor, computer, or data processing device, or combination of the same. Throughout this disclosure, tag/content manager 204 will be used to reference both the server/terminal that stores program instructions for tag/content management and the tag/content management program instructions themselves.
- [30] Computer network 203 may be any suitable computer network including the Internet, an intranet, a wide-area network (WAN), a local-area network (LAN), a wireless network, a digital subscriber line (DSL) network, a frame relay network, an asynchronous transfer mode (ATM) network, a virtual private network (VPN), or any combination of any of the same. Communications links 202 and 205 may be any communications links suitable for communicating between workstations 201 and server 204, such as network links, dial-up links, wireless links, hard-wired links, etc.

- [31] The steps that follow in the Figures may be implemented by one or more of the components in Figures 1 and 2 and/or other components, including other computing devices.
- [32] In some examples, a system is disclosed that results in an improved customer experience by accelerated page-load speeds. Aspects of the disclosed system pre-load web site assets (e.g., images, videos, audio, and other resources) for popular links, thus accelerating performance across a brand's site/domain (or sites/domains). Site performance has an impact on user engagement and directly impacts conversion metrics. As websites become more sophisticated, browsers have to pull down more resources during page load, resulting in slower site performance. Apart from technically optimizing each page for performance, there is little that the marketer can do to improve site performance.
- [33] Aspects of the disclosed system track popular (e.g., frequently accessed) URL paths within a brand's domains and calculate the most common paths based on aggregate data. A recommendation system may use at least some of the aggregate data to determine which pages are most likely to be next in a user's navigation sequence. The assets for the recommended pages may be pre-loaded, so that they are stored in the browser's cache. If a user proceeds to navigate to a recommended page, it will load quickly since the browser will already have most of the resources it needs to render the page. The disclosed URL prefetching features may optimize page-load performance across all (or at least some) of a brand's digital properties.
- [34] While the disclosure contemplates numerous different approaches to implementing the disclosed system, in one example, the system may be implemented through server-side components, client-side components, and JSON. In addition, the system may be integrated with a tag management system (such as the system described in U.S. Patent Application Serial No. 13/843,849) such that the prefetching may avoid skewing analytical result. For example, some web assets (e.g., images) are commonly used for web analytics, and would thus skew analytical results if they were requested prematurely. Part of the elegance of the prefetching design disclosed herein is that it

avoids this outcome by way of being deployed through a tag management system (TMS). In a TMS implementation configured in accordance with the features disclosed herein, the analytics resources would be delivered asynchronously, via the TMS. In other words, they are not hard-coded onto the page and therefore would not be prefetched. As a result, the web analytics results would not be skewed as a result of prefetching. For example, see Figure 7A, which illustrates just one example of a sample network configuration of the components/modules/systems interacting. Other configurations and interactions are contemplated (e.g., see Figure 7B) and the illustration of Figure 7A is not meant to be limiting.

[35] In addition to, or in lieu of, pre-fetching assets for the likely page a user may go to, in another example, the system may be configured to process and pre-fetch a particular number of top widgets that a user might be interested in viewing/purchasing/etc. In one example, the systems and methods disclosed herein may be integrated with a recommendation engine (e.g., from a book retailer site, toy retailer site, music streaming site, movie streaming site, etc.) to pre-fetch the appropriate content/assets/resources in advance of a user's actual request for such content. As a result, the user experience may be greatly enhanced.

[36] With respect to the step of prefetching the assets/content/resources, in one example, a browser client (e.g., client code executing in a browser) may execute Javascript (or other code) to perform the steps of accessing a data structure (e.g., a JSON value) to identify one or more recommended URLs to prefetch, getting the HTML web page corresponding to the URL, and then downloading/pre-fetching the appropriate resources/assets identified in the received HTML web page. Some illustrative pseudo-code (with various portions redacted/abbreviated for ease of readability) includes:

```
window[ensightenOptions.ns].prefetchURL = (function(){
  var _private = {
    prefetchedList : [],
    httpGet: function(theUrl, cb) {
      cb = cb ||function() {};
    }

    var httpRequest;
```

```

*** //depending on browser type, the object type created may differ
httpRequest = new XMLHttpRequest();

httpRequest.open( "GET", theUrl);
httpRequest.send();
httpRequest.onreadystatechange = function() {
    *** // if httpRequest is in a ready state and appropriate status
        cb(httpRequest.responseText);
},

getAttributes: function(elems, attr) {
    var attrs = [];
    *** // iterative loop for the length of the array
    var value = elems[i].getAttribute(attr);
    attrs.push(value);
    return attrs;
},

findDocumentAssets: function(htmlString) {
    if(!(document.implementation && document.implementation.createHTMLDocument)) return [];
    var assetUrls = [];
    *** // create "doc" HTMLDocument variable and set its innerHTML attribute to htmlString
    var scripts = doc.getElementsByTagName("script"), styles = doc.getElementsByTagName("link"),
        html = doc.getElementsByTagName("html"), styleA = [];

    *** // iterative loop for the length of array
        styleA.push(styles[i]);

    assetUrls.push.apply(assetUrls, (_private.getAttributes(scripts, "src")));
    assetUrls.push.apply(assetUrls, (_private.getAttributes(styleA, "href")));
    return assetUrls;
}
};
return {
    prefetch: function(url) {
        _private.httpGet(url, function(data, err) {
            var assets = _private.findDocumentAssets(data), i = 0, k = 0, skip = false;
            var loadResource = function(asset){
                if(!_private.dataNode){
                    _private.dataNode = document.createElement('object');
                    _private.dataNode.height = _private.dataNode.width = 0;
                    document.body.appendChild(_private.dataNode);
                }
                var o = document.createElement('object');
                o.data = asset;
                o.width = o.height = 0;
                _private.dataNode.appendChild(o);
                var parent = o.parentNode;
                o.onload = function(){
                    parent.removeChild(o);
                }
            }
        }
    }

    *** // for each of the assets in the array, as appropriate
    if(window[ensightenOptions.ns].getIEVersion() > 1){
        (new Image()).src = assets[k];
    }else{

```

```

                                loadResource( assets[k]);
                                }
    })().prefetch;

```

Pseudo-code #1 ("prefetch.js")

[37] In addition, the system may be configured as to when the prefetching may be performed. For example, the system may be configured so that prefetching does not interfere with the user's normal web experience. In one example, an administrator/user may provide rules in advance to configure the prefetching to occur after a "window.onload" occurs. Meanwhile, a different administrator may configure his/her site/sites to perform prefetching at a different time or upon an occurrence of an event/trigger.

[38] In the pseudo-code above for pre-fetching, the steps are performed upon one or more recommended URLs for prefetching. The recommended URLs may be received from a remote server (e.g., a recommendation server) as data (e.g., JSON data) and then parsed/processed at the browser client to prepare for prefetching. Some illustrative pseudo-code (with various portions redacted/abbreviated for ease of readability) includes:

```

window[ensightenOptions.ns].getPageRecs = (function(){
return {
  getTopExitPages: function(){
    // prefetchedList : [],

    var httpRequest;
    *** //depending on browser type, the object type created may differ
    httpRequest = new XMLHttpRequest();

    var hashVal = _tinySHA1(window. location) + "_"

    //The host in the below url will come from a config file.
    var theUrl = "http://localhost:3400/recommendations/" + hashVal
    httpRequest.open( "GET", theUrl);
    httpRequest.send();
    httpRequest.onreadystatechange = function() {
      *** // if httpRequest is in a ready state and appropriate status
      var recs = JSON.parse(httpRequest.responseText);
      for (var i in recs.recommendations) {
        var topRec = recs.recommendations[i];
        // alert(topRec);
        window[ensightenOptions.ns].prefetchURL(topRec)
      }
    }
  }
}
}

```

```
};  
})();getTopExitPages;
```

Pseudo-code #2 ("recomend.js")

- [39] In the aforementioned example, JSON data may be received from the remote server to the browser client. The JavaScript Object Notation (JSON) standard formats human-readable text into name-value pairs to transmit data objects between a server and web applications. JSON is sometimes used in conjunction with, or in lieu of, XML. JSON is a language-independent data format and may be parsed/generated using various different programming languages, including JavaScript and other languages. In other examples, other data formats may be used to transmit information between the remote server and browser client.
- [40] After the browser client has caused the browser to download and pre-fetch particular assets/resources, the browser software itself may cache the downloaded assets in cache memory (e.g., volatile memory). At a later time, when the browser requires particular assets, the browser may check the cache memory to determine if that asset has already been downloaded and cached. In some examples, the browser may also check whether the asset is stale by, for example, checking the "last modified" date on the server against that of the asset in the cache. Other techniques may be used to confirm the staleness/freshness of a cache. Once freshness is confirmed, the browser may access the cache memory to retrieve the asset/resource instead of downloading it from a remote server. As a result, the user experience may be improved.
- [41] Although browser software has been described in the preceding example, the disclosure is not so limited. Any client software/hardware may be used to implement the steps disclosed herein, including but not limited to firmware executing in a settop box, software executing in a gaming console, an operating system executing on a smartphone, and other examples. In short, the client need not necessarily be tied to a browser, however, so long as particular features relied upon in a browser, such as the ability to cache an asset and later pull from that cache instead of re-downloading an asset, are also included in the replacement of the browser.

[42] Complementary to the prefetching and caching capabilities described herein, the system may also include collection and recommendation capabilities, as illustrated in Figure 7A and Figure 7B.

[43] When data is received by the collection system including information about what sequences are followed by a user (e.g., a user transitions from a first URL to a second URL), that data is received, processed, and/or stored by a collection system. Some illustrative pseudo-code (with various portions redacted/abbreviated for ease of readability) that may execute at the collection system server includes:

```
package com.ensighten.activate.recommendations.service;
*** // import various packages

public class RecommendationController {
    private static final ObjectMapper objectMapper = new ObjectMapper();
    private CouchbaseClient couchbaseClient;

    ***// perform Exception handling of potential errors

    public Map<String, Object> read(Request request, Response response) throws IOException {
        response.setContentType(ContentType.JSON);
        response.setSerializationSettings(new SerializationSettings(ContentType.JSON, new ResponseProcessor(new
        JacksonJsonProcessor(), new RawResponseWrapper())));
        Map<String, Object> result = new HashMap<>();
        String id = request.getHeader("itemId");
        final String couchbaseResult = (String)couchbaseClient.get(id);
        result.put("recommendations", objectMapper.readValue(couchbaseResult, ArrayList.class));
        return result;
    }
}
```

Pseudo-code #3 ("recommendationController.java")

[44] Consequently, the received data (e.g., JSON content) may be parsed/processed and then stored in a data store. Meanwhile, a recommendation system, as illustrated in Figure 7A and Figure 7B, may access and/or analyze the data in the data store. In one example, the recommendation system may simply access the data store and retrieve prefetch recommendations for a browser client. The recommendation may be based on the current location (e.g., URL) of the browser client. The data store may contain analysis of previously collected data from the collection system to arrive at the best recommendations for prefetching. As such, the recommendation system may access the data store and determines which web pages are most likely to be next in a user's

navigation sequence. Some illustrative pseudo-code (with various portions redacted/abbreviated for ease of readability) that may execute at the recommendation system server includes:

```

package com.ensighten.activate.recommendations.service;

*** // import various packages

public class RecommendationServer {
    private static final Config config = ConfigFactory.parseFile(new File("conf/application.conf"));

    private static CouchbaseClient couchbaseClient;
    private static RestExpress server;
    public static void main(String[] args) throws NoSuchAlgorithmException, IOException {

        server = new RestExpress()
            .setName("«server name here»")
            .addMessageObserver(new SimpleConsoleLogMessageObserver());

        *** // setupCouchbaseClient function
            String bucket = config.getString("couchbase.bucket");
            String[] hosts = config.getString("couchbase.host").split(",");
            String port = config.getString("couchbase.port");
            String base = config.getString("couchbase.base");
            List<URI> uris = new ArrayList<URI>();
                *** // iterative loop
                    uris.add(URI.create("http://" + host + ":" + port + "/" + base));
                couchbaseClient = new CouchbaseClient(uris, bucket, "");

        *** // execute defineRoutes(server) function
            server.uri("/recommendations/{itemId}", new RecommendationController(couchbaseClient))
                .method(HttpMethod.GET)
                .name("recommendations")
                .parameter(Parameters.Cache.MAX_AGE, 3600); // Cache for 1 hour

        int port = config.getInt("server.port");
        new CorsHeaderPlugin("")
            .register(server);

        MetricRegistry registry = new MetricRegistryO;
        new MetricsPlugin(registry)
            .register(server);

        final Slf4jReporter reporter = Slf4jReporter.forRegistry(registry)
            .outputTo(LoggerFactory.getLogger(RecommendationServer.class))
            .convertRatesTo(TimeUnit.SECONDS)
            .convertDurationsTo(TimeUnit.MILLISECONDS)
            .build();

        reporter.start(1, TimeUnit.MINUTES);
        server.bind(port);
        server.setUseTcpNoDelay(false);
        server.setKeepAlive(true);
        server.setSoLinger(0);
    }
}

```

*** // code to ensure proper shutdown

}

Psuedo-code #4 ('recomendationServer.java')

[45] An illustrative value of prefetech recommendation data may include:

"[Yhttp://www.acmestore .com/store\", \"https ://www.acmestore.com/store/usa/en_US/Checkoff erEligibility\\\"https://www.acmestore.com/store/usa/en_US/DisplayDownl oadHistoryPageA\\\"https://www.acmestore.com/store/usa/en_US/DisplayEditProfPa geA\", \"http ://www.acmestore .com/store/usa/en_US/DisplayMainPage\\\", \"http ://www. acmestore .com/store/usa/en_US/cat/Office/categoryID .0 1234\\\", \"http ://www.acmesto re.com/store/usa/en_US/cat/categoryID.01288\\\"https://www.acmestore.com/store/u sa/en_US/DisplayAccountOrderPageA\" , \"http ://www.acmestore. com/store/usa/ en_US /DisplayHelpContactPageA\\\"https://www.acmestore.com/store/usa/en_US/DisplayC heckoutAddressPaymentPage/choose.payment/errorCode.payment\\"]"

[46] For example, in some examples the data store may be formatted as SQL tables or other database format. In other examples, the data store may store JSON and use that information for a session that represents a user's visit. For example the below excerpt is a redacted portion from one session for an illustrative website visitor. As illustrated below, the JSON information may include more than just the next URL for prefetching, it may include various parameters and other information that may assist the recommendation system in computing:

```
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```

Illustrative JSON value

[47] Aspects of the invention have been described in terms of illustrative embodiments thereof. Numerous other embodiments, modifications and variations within the scope and spirit of the appended claims will occur to persons of ordinary skill in the art from a review of this disclosure. For example, one of ordinary skill in the art will appreciate that the steps illustrated in the illustrative figures may be performed in other than the recited order, and that one or more steps illustrated may be optional in accordance with aspects of the invention.

[48] In various examples, the following methods/apparatuses/systems are described:

[49] First, a method comprising one or more of the following steps:

- Browser client 702 sends its URL to a recommendation system 704
- The recommendation system 704 determines one or more prefetch recommendations for the browser client 702
- The recommendation system 704 retrieves a JSON object (or other data structure) with the prefetch recommendations from a data store
- The recommendation system sends the JSON object (or other data structure) to the browser client
- The browser client receives the JSON object (or other data structure) and parses/interprets/processes the data contained therein
- At the appropriate time, the browser client 702 generates one or more asset/resource requests to one or more remote servers based on the parsed/processed/interpreted data
 - In some illustrative methods, the appropriate time may be based on particular rules provided by a client/customer/user/administrator
- The browser 702 receives the assets/resources from the remote servers and caches the assets/resources
- At a future visit to a particular URL including the assets/resources, the browser determines if the assets/resources are already saved in its cache memory 706 (and are not "stale")
- The browser 702 retrieves the assets/resources from its cache memory 706 instead of from the remote server 708, thus improving the user experience and/or performance

[50] Second, another method comprising one or more of the following steps:

- Receiving notification of a browser 702 changing from first URL to a second URL

- Recording in computer memory the transition from the first URL to the second URL
- Transmitting this transition information to a collection system 710
 - In some illustrative examples, the browser may identify its current location, and the recommendation/collection system 704, 710 may infer transition information based on a history of previous browser locations
- The collection system 710 saving the transition information in a data store
- A recommendation system 704 accessing and analyzing the transition information to formulate prefetch recommendations for a particular URL
 - In some illustrative methods, the recommendation system being specific to a particular user/entity (or group of users)
 - In some illustrative methods, the recommendation system being specific to a particular website/domain (or group of websites/domains)
 - In some illustrative methods, the recommendation system being based on particular rules provided by a client/customer/user/administrator (e.g., based on data usage charges, a user/device may be configured to automatically activate or deactivate the URL prefetch feature)
- The recommendation system periodically updating the prefetch recommendations based on updated transition information

[51] Third, a non-transitory computer-readable storage medium having computer-executable program instructions stored thereon that when executed by a processor, cause the processor to perform one or more of the method steps described above.

[52] Fourth, an apparatus comprising: (1) a processor, and (2) a memory having stored therein computer executable instructions, that when executed by the processor, cause the apparatus to perform one or more of the method steps described above.

I/We Claim:

1. A method comprising:

receiving, at a user terminal from a server computer, a tag manager comprising first program instructions configured to regulate execution of analytics tags at the user terminal, including asynchronous execution of the analytics tags at the user terminal;

receiving from the server computer, in response to a request sent by the tag manager executing on the user terminal to the server computer, analytics tags configured to execute at the user terminal, wherein the analytics tags are associated with a web page;

sending by the tag manager, which further comprises second program instructions configured to request a prefetch recommendation, to the server computer a uniform resource locator (URL) associated with the web page;

receiving from the server computer, in response to the request for the prefetch recommendation, a plurality of uniform resource locators associated with the prefetch recommendation;

downloading, at the user terminal, a web page corresponding to at least one of the plurality of uniform resource locators associated with the prefetch recommendation;

bypassing execution, by the tag manager residing on the user terminal, of analytics tags in the downloaded web page;

downloading, to the user terminal, a plurality of resources identified in the downloaded web page;

storing the downloaded plurality of resources in a cache memory at the user terminal;
and

in response to a subsequent request for the plurality of resources identified in the web page, providing from the cache memory the stored plurality of resources instead of downloading the plurality of resources again.

2. The method of claim 1, further comprising: determining whether the stored plurality of resources is stale by checking a last modified date on a remote resource server against a date associated with the stored plurality of resources.
3. The method of claim 1, wherein the prefetch recommendation is generated by a recommendation system at the server computer, wherein the recommendation system uses aggregate data gathered by a collection system to estimate which web pages are likely to be next in a navigation sequence.
4. The method of claim 1, wherein the prefetch recommendation comprises a predetermined plurality of web pages within a domain name based on high frequency of access.
5. An analytics tag management system comprising:

a recommendation system configured to send a plurality of uniform resource locators associated with a prefetch recommendation, in response to receiving a uniform resource locator (URL) associated with a web page;

a collection system configured to aggregate data to estimate which web pages are likely to be next in a navigation sequence based on a URL;

a non-volatile data store storing the aggregated data, wherein the prefetch recommendation comprises a plurality of uniform resource locators that are likely to be next in the navigation sequence; and

a user computing device comprising:

a processor;

a volatile cache memory;

a memory storing computer-executable instructions that, when executed by the processor, cause the user computing device to:

receive a tag manager comprising first program instructions configured to regulate execution of analytics tags at the user computing device, including asynchronous execution of the analytics tags at the user computing device;

receive, in response to a request sent by the tag manager executing on the user computing device, analytics tags configured to execute at the user computing device, wherein the analytics tags are associated with the web page;

send by the tag manager, which further comprises second program instructions configured to request a prefetch recommendation, to the recommendation system the uniform resource locator (URL) associated with the web page;

receive from the recommendation system, in response to the request for the prefetch recommendation, a plurality of uniform resource locators associated with the prefetch recommendation;

download, at the user computing device, a web page corresponding to at least one of the plurality of uniform resource locators associated with the prefetch recommendation;

bypass execution, by the tag manager residing on the user computing device, of analytics tags in the downloaded web page;

download, to the user computing device, a plurality of resources identified in the downloaded web page;

store the downloaded plurality of resources in the volatile cache memory at the user computing device; and

in response to a subsequent request for the plurality of resources identified in the web page, provide from the volatile cache memory the stored plurality of resources.

6. The system of claim 5, wherein the memory of the user computing device stores computer-executable instructions that, when executed by the processor, further cause the user computing device to: determine whether the stored plurality of resources is stale by checking a last modified date on a remote resource server against a date associated with the stored plurality of resources.

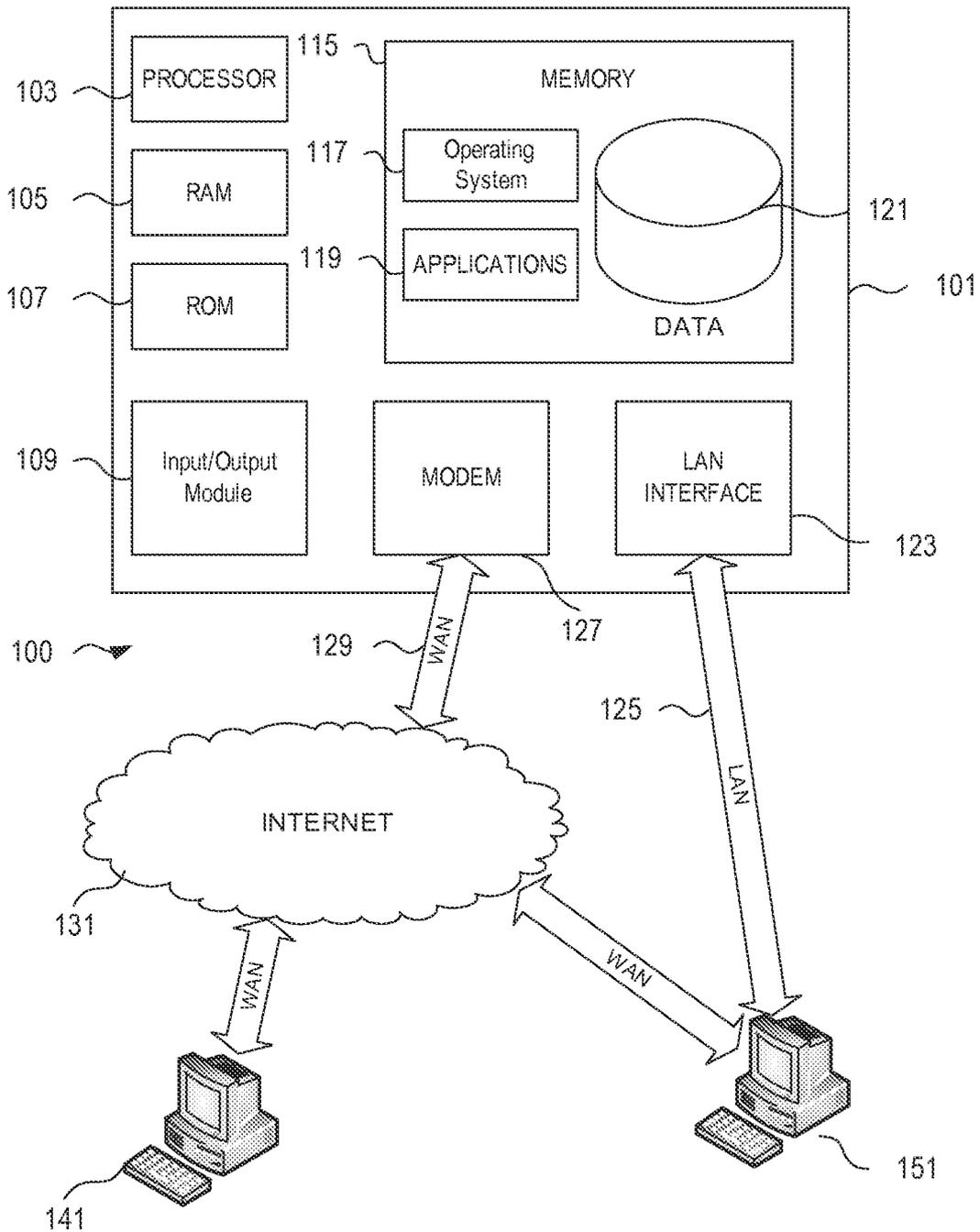


FIG. 1

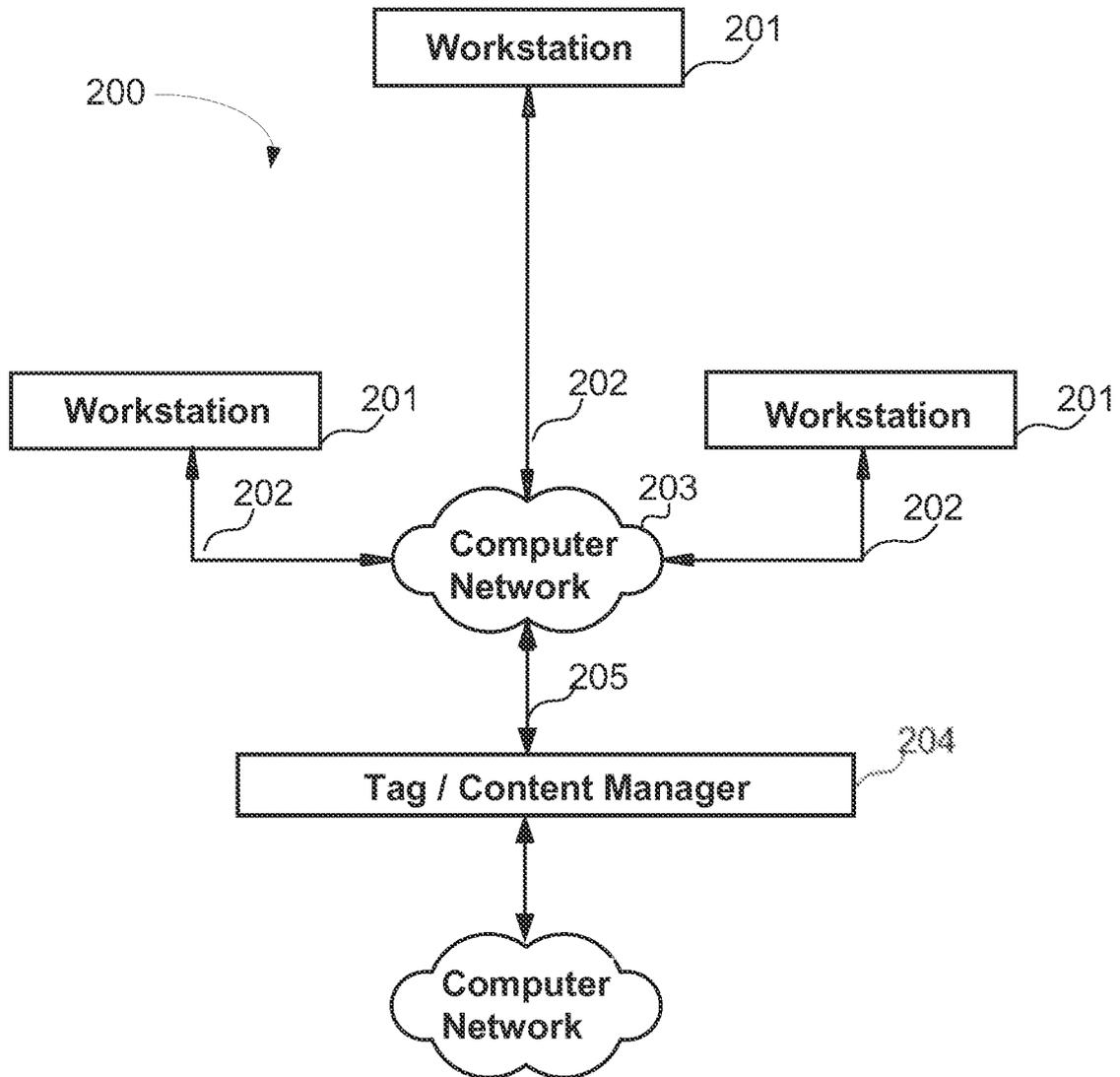


FIG. 2

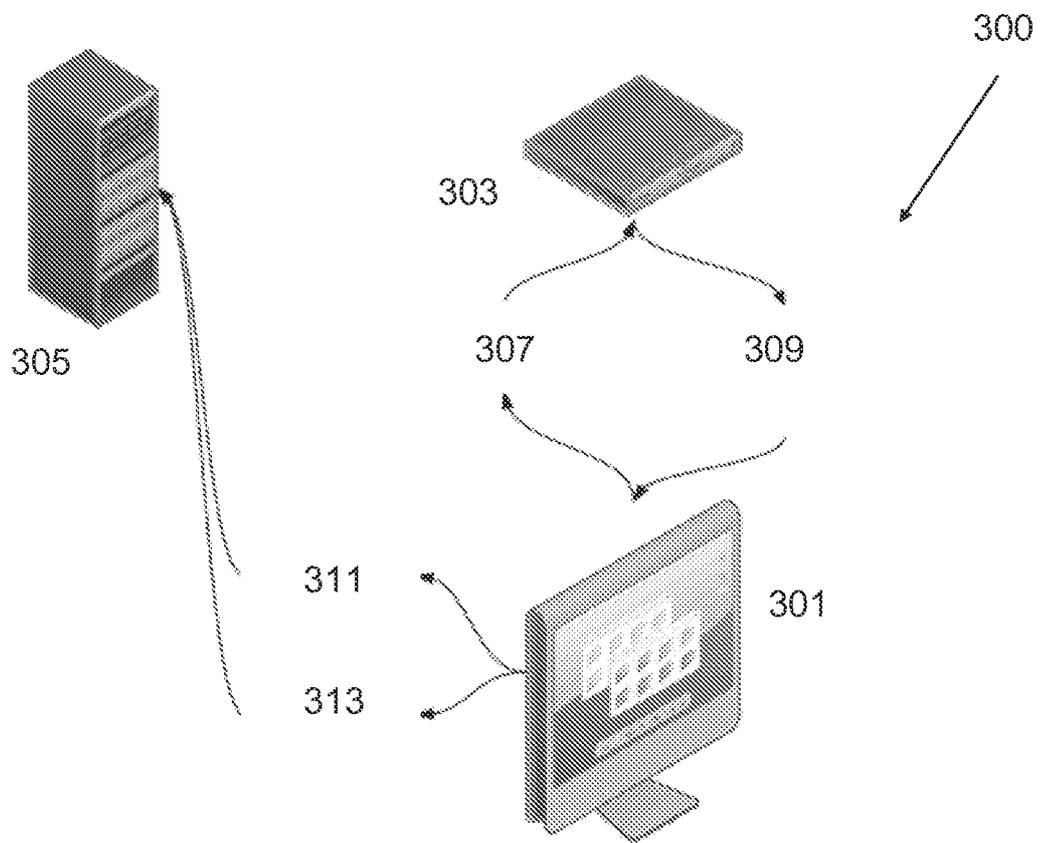


FIG. 3

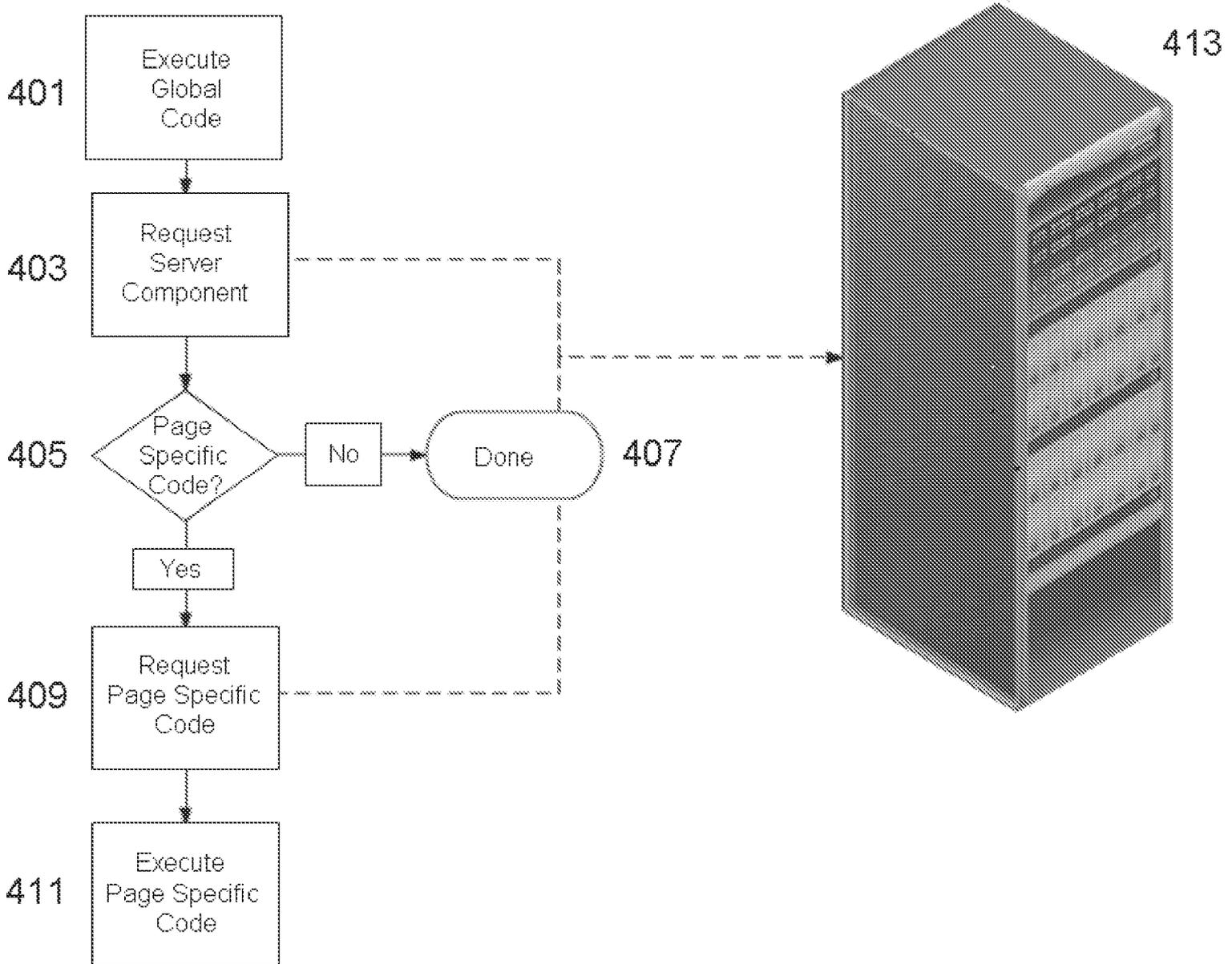


FIG. 4

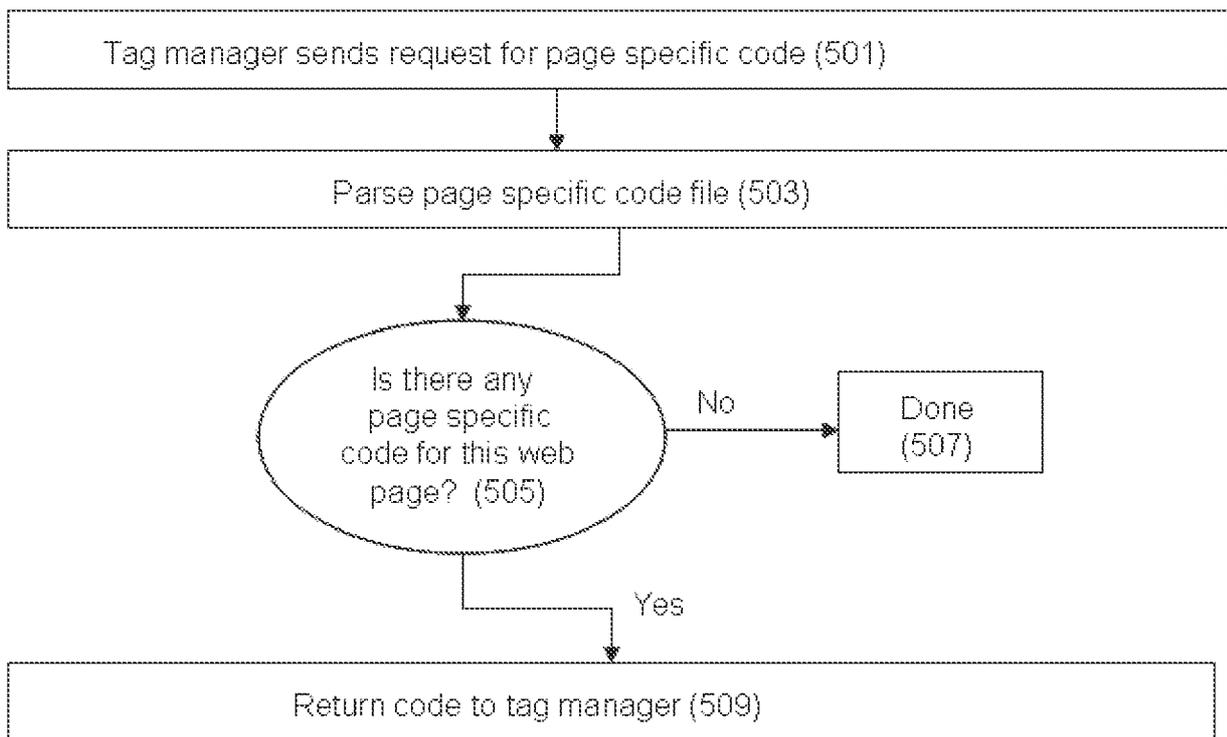


FIG. 5

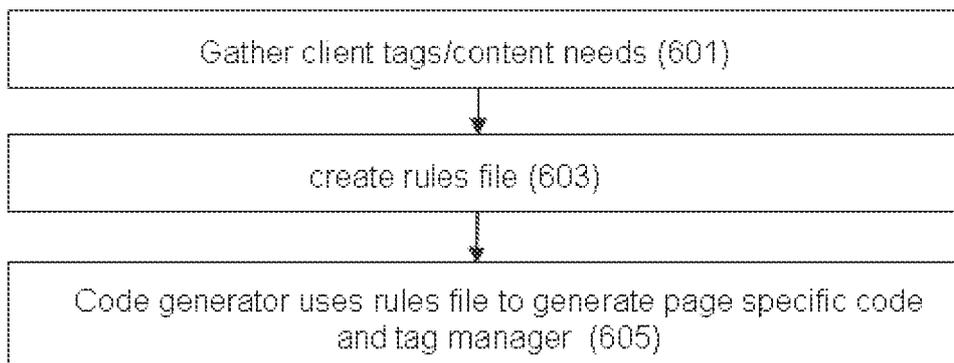


FIG. 6

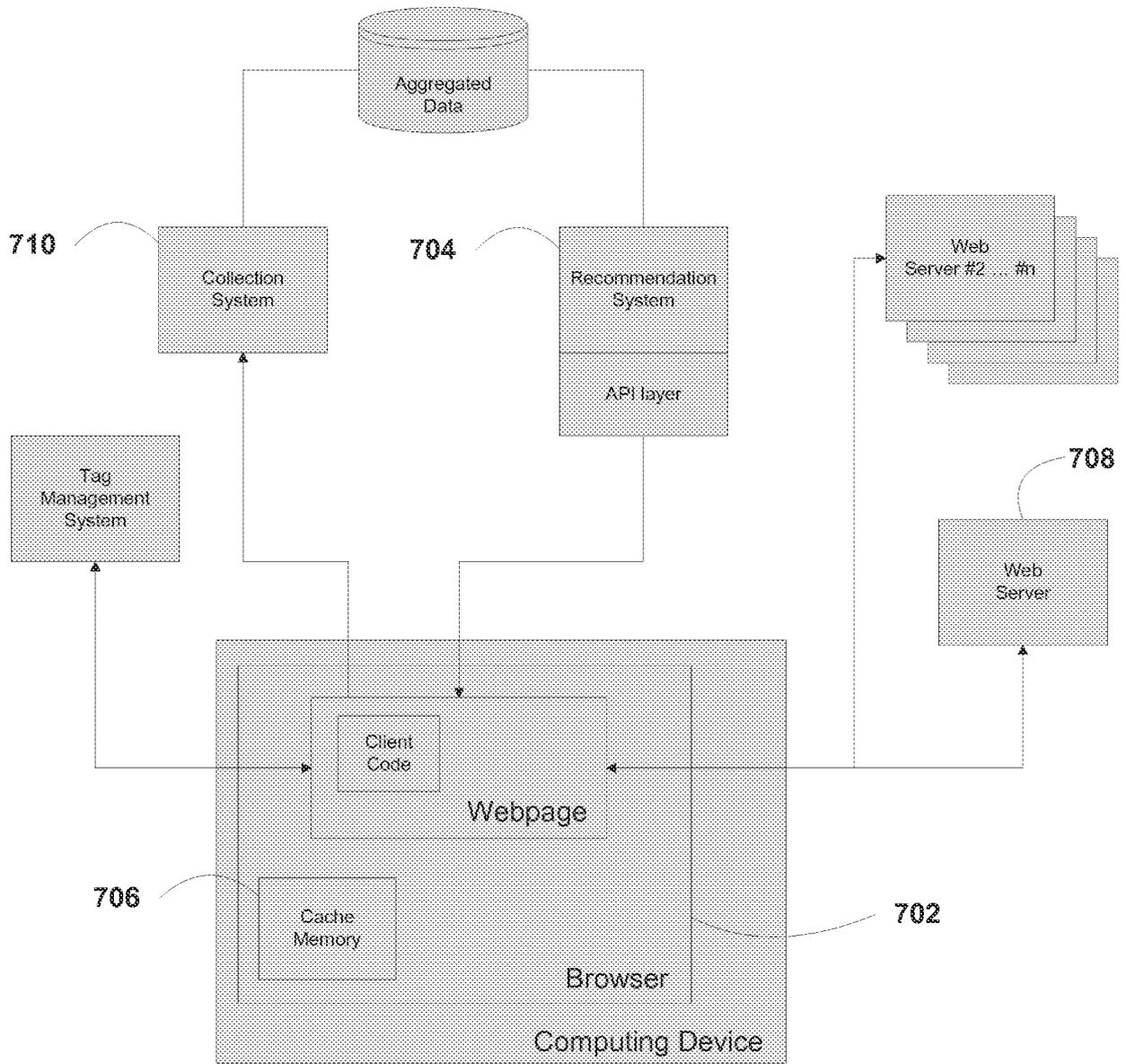


FIG. 7A

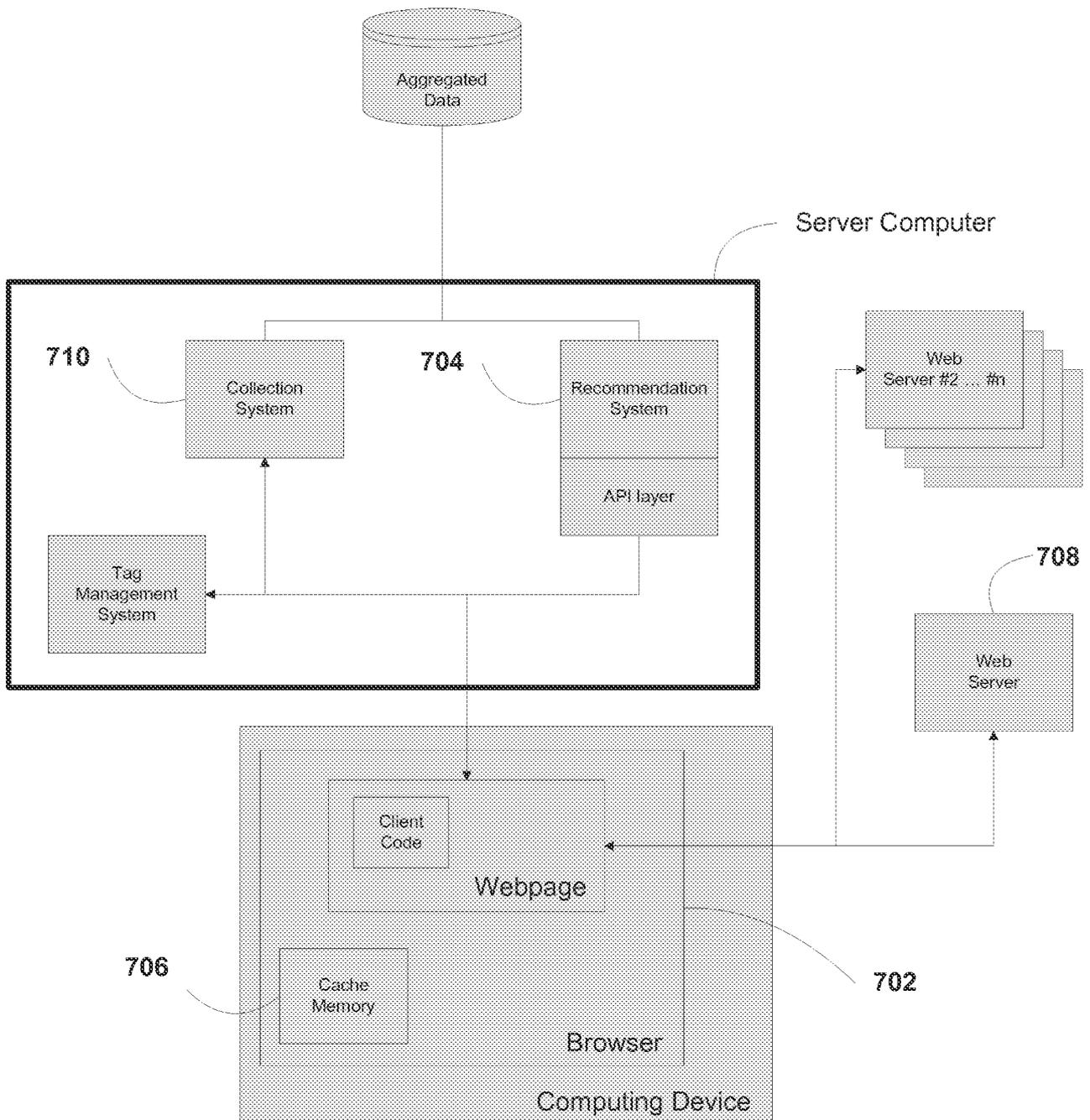


FIG. 7B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/025325

A. CLASSIFICATION OF SUBJECT MATTER

H04L 12/24(2006.01)i, H04L 12/26(2006.01)i, H04L 29/08(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04L 12/24; G06F 15/16; H04L 29/08; G06F 17/30; G06F 9/45; H04L 12/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords:tag manager, analytics tag, prefetch, download, URL, web page

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category ¹	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2013-0290480 AI (ENSIGHTEN, INC.) 31 October 2013 See paragraphs [0024] , [0038] , [0040] , [0043] ; and figures 1, 3 .	1-6
A	US 2002-0078165 AI (DENISE M. GENTY et al.) 20 June 2002 See paragraphs [0006] - [0009] ; and figure 2 .	1-6
A	US 2008-0114773 AI (SEUNG-HAK CHOI et al.) 15 May 2008 See paragraphs [0033]- [0040] ; and figure 2 .	1-6
A	wo 03-085560 AI (HEWLETT-PACKARD DEVELOPMENT COMPANY LP) 16 October 2003 See paragraphs [0004]- [0006] ; and figure 2 .	1-6
A	US 2010-0318976 AI (DAVID EVERLY et al.) 16 December 2010 See paragraphs [0010]- [0011] ; and figure 1 .	1-6

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search

22 July 2015 (22.07.2015)

Date of mailing of the international search report

23 July 2015 (23.07.2015)

Name and mailing address of the ISA/KR

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KIM, Seong Woo

Telephone No. +82-42-481-3348



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/025325

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013-0290480 AI	31/10/2013	wo 2014-144498 A2 wo 2014-144498 A3	18/09/2014 27/11/2014
US 2002-0078165 AI	20/06/2002	None	
US 2008-0114773 AI	15/05/2008	KR 10-0881668 BI	06/02/2009
wo 03-085560 AI	16/10/2003	AU 2003-222074 AI EP 1490797 AI JP 2006-501535 A JP 4294494 B2 US 2003-0195940 AI US 6868439 B2	20/10/2003 29/12/2004 12/01/2006 15/07/2009 16/10/2003 15/03/2005
US 2010-0318976 AI	16/12/2010	US 2014-223005 AI US 8713536 B2	07/08/2014 29/04/2014