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Kruglick

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(54) **APPLICATION PROGRAMMING INTERFACE TESTING SERVICES**

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G06F 11/36 (2006.01)

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CPC ***G06F 11/3676*** (2013.01); ***G06F 11/3672*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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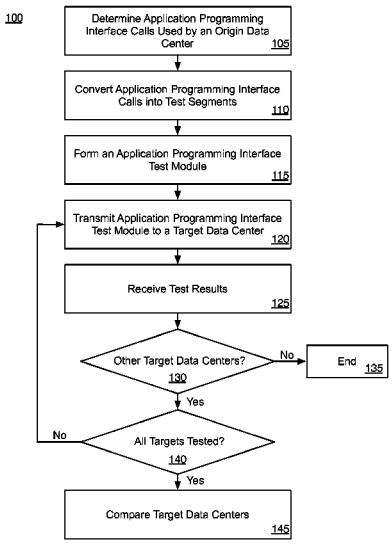
(57) **ABSTRACT**

Technologies and implementations for providing an application programming interface (API) testing services for transferring data center services. In some examples, multiple API calls used by a service at an origin data center are converted into respective test segments. An API test module including each of the test segments is formed for a multiple number of target data centers and the API test module is transmitted from the origin data center to the target data center centers for execution at the target data centers. One or more test results based at least in part on the transmitted API test module being executed at the target data centers are received, and a report based on the one or more test results that indicates which of the application programming interface calls from the origin data center are compatible with the target data centers is generated.

16 Claims, 5 Drawing Sheets



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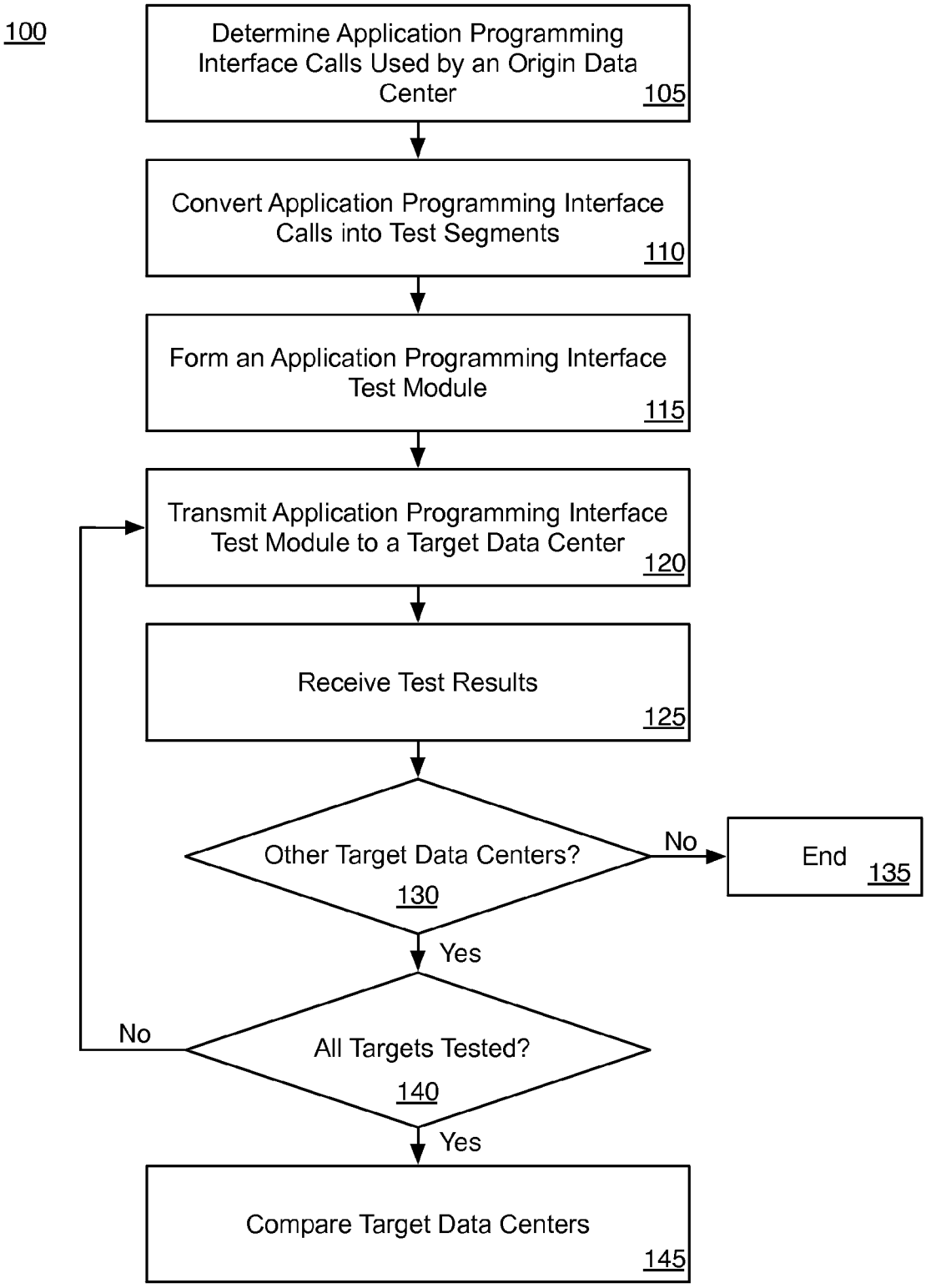
100
Determine Application Programming Interface Calls Used by an Origin Data Center
105
Convert Application Programming Interface Calls into Test Segments
110
Form an Application Programming Interface Test Module
115
Transmit Application Programming Interface Test Module to a Target Data Center
120
Receive Test Results
125
Other Target Data Centers?
130
No
End
135
Yes
All Targets Tested?
140
No
Yes
Compare Target Data Centers
145

Fig. 1

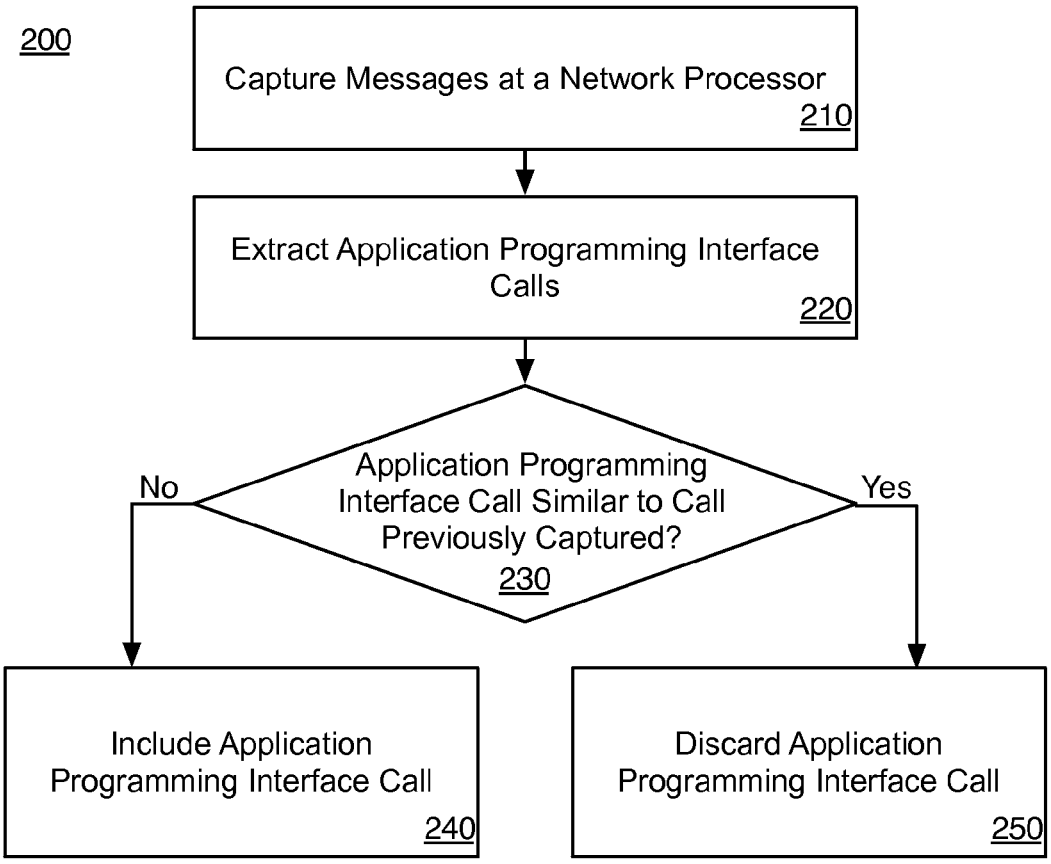
200
Capture Messages at a Network Processor
210
Extract Application Programming Interface Calls
220
Application Programming Interface Call Similar to Call Previously Captured?
230
No
Yes
Include Application Programming Interface Call
240
Discard Application Programming Interface Call
250

Fig. 2

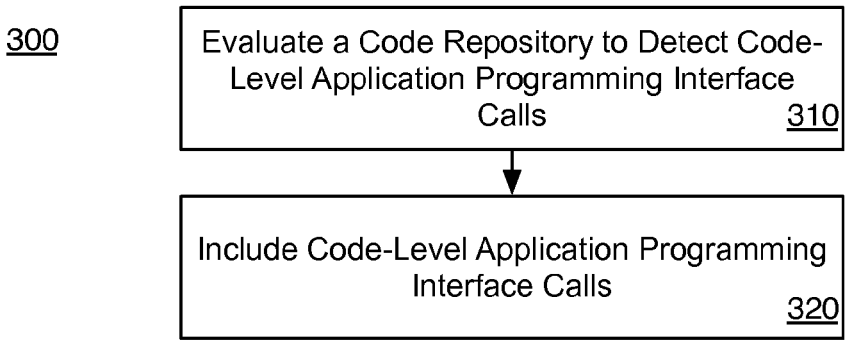
300
Evaluate a Code Repository to Detect Code-Level Application Programming Interface Calls
310
Include Code-Level Application Programming Interface Calls
320

Fig. 3

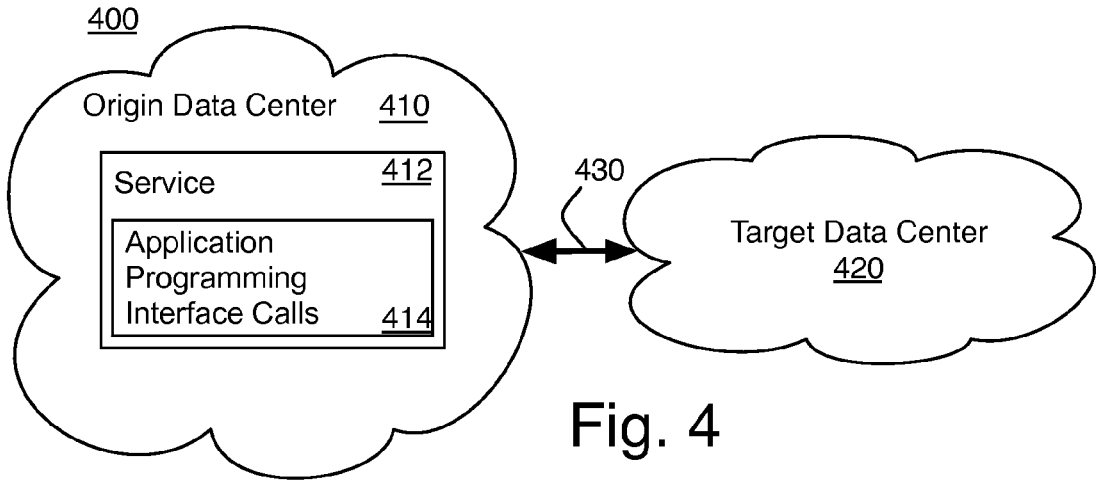
400
Origin Data Center 410
Service 412
Application Programming Interface Calls 414
430
Target Data Center 420

Fig. 4

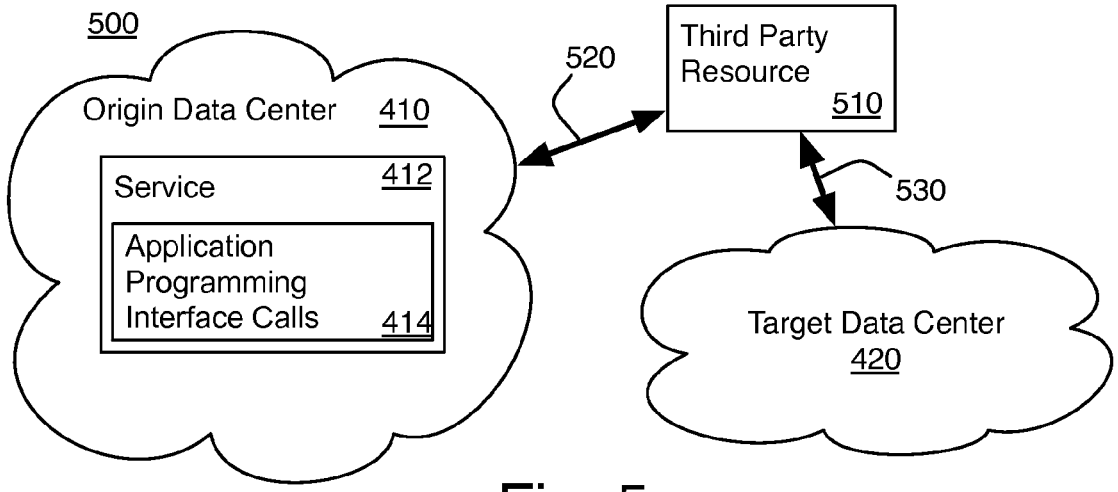
500
Origin Data Center 410
Service 412
Application Programming Interface Calls 414
520
Third Party Resource 510
530
Target Data Center 420

Fig. 5

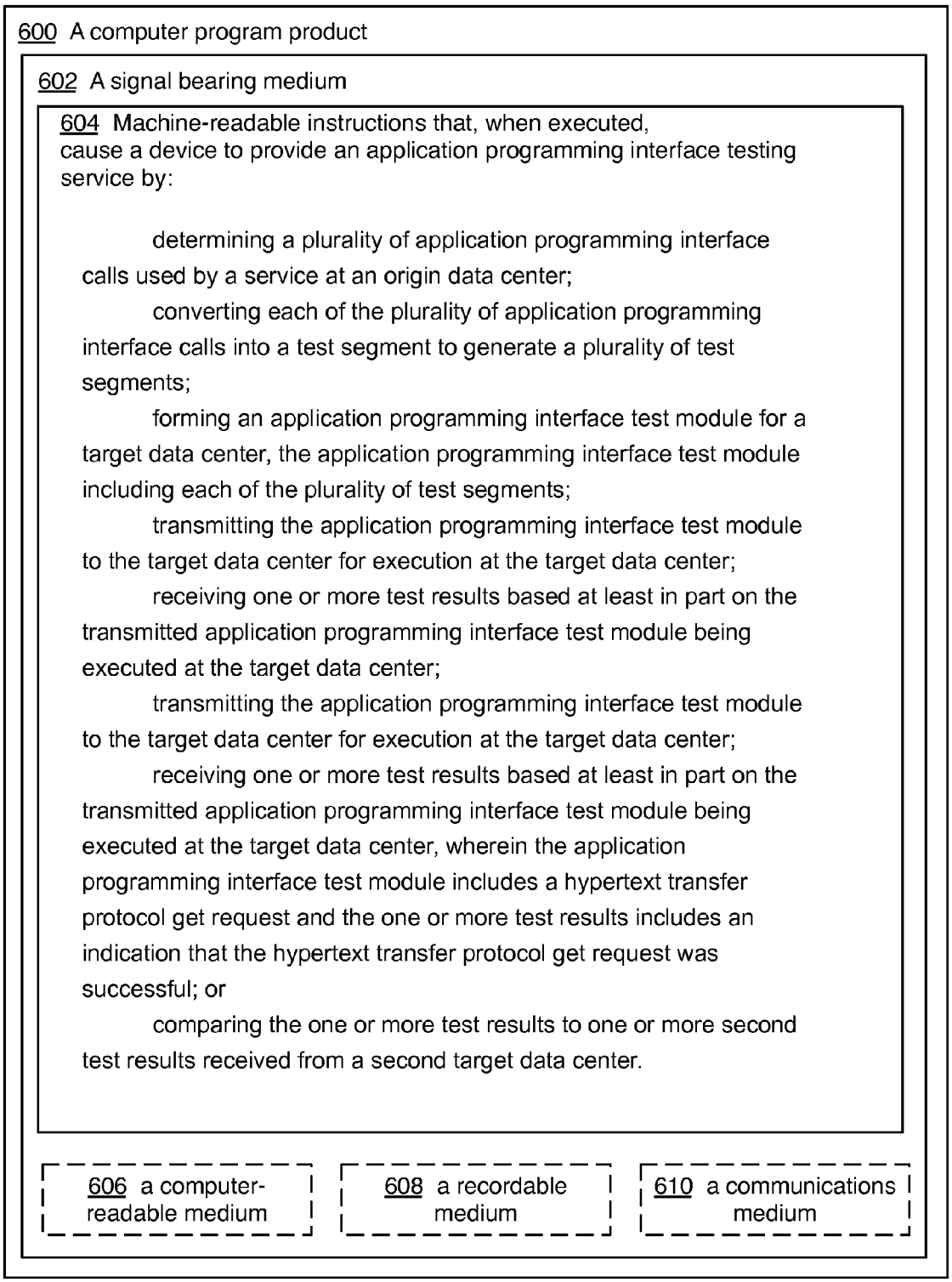
600 A computer program product
602 A signal bearing medium
604 Machine-readable instructions that, when executed, cause a device to provide an application programming interface testing service by:
determining a plurality of application programming interface calls used by a service at an origin data center;
converting each of the plurality of application programming interface calls into a test segment to generate a plurality of test segments;
forming an application programming interface test module for a target data center, the application programming interface test module including each of the plurality of test segments;
transmitting the application programming interface test module to the target data center for execution at the target data center;
receiving one or more test results based at least in part on the transmitted application programming interface test module being executed at the target data center;
transmitting the application programming interface test module to the target data center for execution at the target data center;
receiving one or more test results based at least in part on the transmitted application programming interface test module being executed at the target data center, wherein the application programming interface test module includes a hypertext transfer protocol get request and the one or more test results includes an indication that the hypertext transfer protocol get request was successful; or
comparing the one or more test results to one or more second test results received from a second target data center.
606 a computer-readable medium
608 a recordable medium
610 a communications medium

Fig. 6

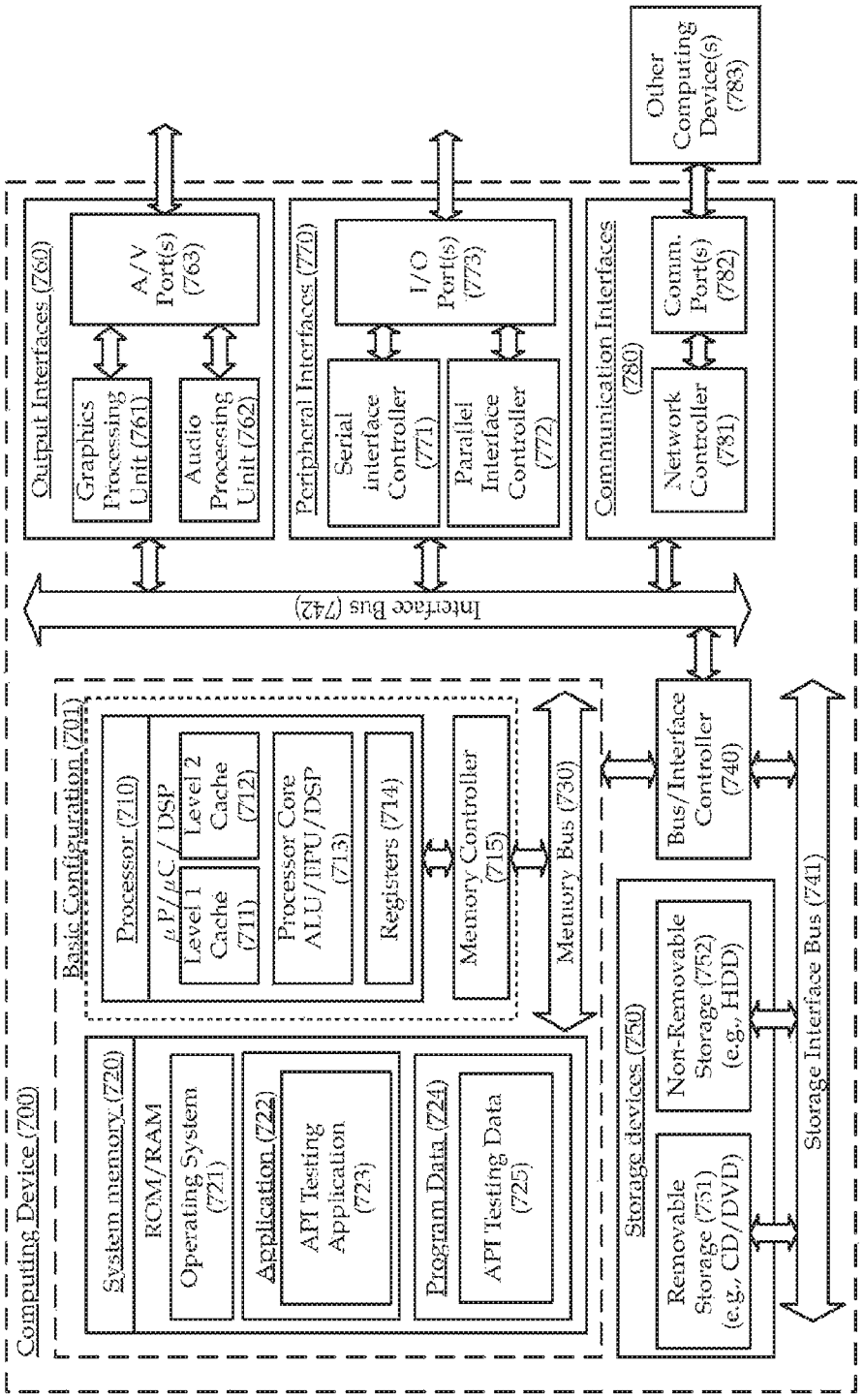
Computing Device (700)
Basic Configuration (701)
System memory (720)
ROM/RAM
Operating System (721)
Application (722)
API Testing Application (723)
Program Data (724)
API Testing Data (725)
Processor (710)
μP/μC / DSP
Level 1 Cache (711)
Level 2 Cache (712)
Processor Core ALU/FPU/DSP (713)
Registers (714)
Memory Controller (715)
Memory Bus (730)
Bus/Interface Controller (740)
Interface Bus (742)
Output Interfaces (760)
Graphics Processing Unit (761)
Audio Processing Unit (762)
A/V Port(s) (763)
Peripheral Interfaces (770)
Serial interface Controller (771)
Parallel Interface Controller (772)
I/O Port(s) (773)
Communication Interfaces (780)
Network Controller (781)
Comm. Port(s) (782)
Other Computing Device(s) (783)
Storage devices (750)
Removable Storage (751) (e.g., CD/DVD)
Non-Removable Storage (752) (e.g., HDD)
Storage Interface Bus (741)

Fig. 7

APPLICATION PROGRAMMING INTERFACE TESTING SERVICES

CROSS-REFERENCE TO RELATED APPLICATION

This Application is the U.S. National Stage filing under 35 U.S.C. §371 of PCT Application Ser. No. PCT/US12/35042 filed on Apr. 25, 2012. The disclosure of the PCT Application is hereby incorporated herein by reference in its entirety.

BACKGROUND

Unless otherwise indicated herein, the approaches described in this section are not prior art to the claims in this application and are not admitted to be prior art by inclusion in this section.

In a customer's data center deployment, a variety of application programming interface calls may be used. In general, when transferring from one data center to another, it may be useful to know which application programming interface calls in use at the origin data center may be available at the destination data center, and which application programming interface calls may not be available. In general, it may be difficult to determine which application programming interface calls may be in use at the origin data center.

SUMMARY

In various embodiments, the present disclosure describes example methods for providing an application programming interface testing service. Example methods may include determining application programming interface calls used by a service at an origin data center, converting each of the application programming interface calls into a test segment to generate test segments, and forming an application programming interface test module for a target data center, the application programming interface test module including the plurality of test segments.

In various embodiments, the present disclosure also describes example machine readable non-transitory media. Example machine readable non-transitory media may include instructions that, when executed, cause a device to provide an application programming interface testing service by determining application programming interface calls used by a service at an origin data center, converting each of the application programming interface calls into a test segment to generate test segments, and forming an application programming interface test module for a target data center, the application programming interface test module including the plurality of test segments.

In various embodiments, the present disclosure also describes example devices. Example devices may include a machine readable medium having instructions that, when executed, cause the device to provide an application programming interface testing service by determining application programming interface calls used by a service at an origin data center, converting each of the application programming interface calls into a test segment to generate test segments, and forming an application programming interface test module for a target data center, the application programming interface test module including the plurality of test segments, and a processor coupled to the machine readable medium to execute the instructions.

The foregoing summary may be illustrative only and may not be intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

Subject matter is particularly pointed out and distinctly claimed in the concluding portion of the specification. The foregoing and other features of the present disclosure will become more fully apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only several embodiments in accordance with the disclosure and are, therefore, not to be considered limiting of its scope, the disclosure will be described with additional specificity and detail through use of the accompanying drawings.

In the drawings:

FIG. **1** illustrates a flow diagram of an example method for providing an application programming interface testing service;

FIG. **2** illustrates a flow diagram of an example method for determining application programming interface calls used by a service at an origin data center;

FIG. **3** illustrates a flow diagram of an example method for determining application programming interface calls used by a service at an origin data center;

FIG. **4** illustrates a block diagram of an example system for providing an application programming interface testing service;

FIG. **5** illustrates a block diagram of an example system for providing an application programming interface testing service;

FIG. **6** illustrates an example computer program product; and

FIG. **7** illustrates a block diagram of an example computing device, all arranged in accordance with at least some embodiments of the present disclosure.

DETAILED DESCRIPTION

Subject matter is particularly pointed out and distinctly claimed in the concluding portion of the specification. The foregoing and other features of the present disclosure will become more fully apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only several embodiments in accordance with the disclosure and are, therefore, not to be considered limiting of its scope, the disclosure will be described with additional specificity and detail through use of the accompanying drawings.

The following description sets forth various examples along with specific details to provide a thorough understanding of claimed subject matter. It will be understood by those skilled in the art, however, that claimed subject matter may be practiced without some or more of the specific details disclosed herein. Further, in some circumstances, well-known methods, procedures, systems, components and/or circuits have not been described in detail in order to avoid unnecessarily obscuring claimed subject matter.

In the following detailed description, reference is made to the accompanying drawings, which form a part hereof. In the drawings, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative embodiments described in the detailed description, drawings, and claims are not meant to be limiting. Other embodiments may be utilized, and other changes may be

made, without departing from the spirit or scope of the subject matter presented here. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the Figures, can be arranged, substituted, combined, and designed in a wide variety of different configurations, all of which are explicitly contemplated and make part of this disclosure.

This disclosure is drawn, inter alia, to methods, devices, systems and computer readable media related to providing an application programming interface testing service for transferring data center services.

In general, a data center customer may utilize a service at the data center. The service may include a variety of sub-services, such as data storage, telecommunications, data center based applications, hosted applications, or the like. In some examples, the applications or their software components may utilize application programming interface (API) calls and/or a web service protocol such as simple object access protocol (SOAP) or representational state transfer (REST). In general, an API may provide a specification for use by applications or application components indicating available functions or processes, or the like. An API call may include a call, such as a command (with or without arguments and/or other relevant data), that may invoke one or more functions or processes indicated as supported by the API. In some examples, a web service protocol may provide a protocol for exchanging structured information including API calls.

Further, in some instances, a data center customer may seek to move from one data center to another for lower cost or better service, or the like. As will be appreciated, when a data center customer moves from one data center to another, it may be difficult to predict what API calls may be in use at the origin data center (i.e., the customer's current data center) and, further, which API calls may be supported at a target data center or data centers (i.e., data center or centers to which the customer may be considering a move). In general, the embodiments discussed herein may provide for an application programming interface testing service such that a data center customer may determine API calls used in their service and generate a test module to test at least some of those API calls at one or more target data centers. In some examples, an origin data center or a third party computing device may transmit the test module to a target data center and may receive test results based on the test module being executed at the target data center. Based on the test results, a data center customer may better evaluate a potential data center move and may better evaluate potential target data centers. In some examples, the discussed application programming interface testing service may be performed by a third party service provider such as a data center services broker, or the like. The discussed application programming interface testing service may provide a user certainty as to which programs, applications, or other sub-services may run at a destination data center which may remove fear, uncertainty or doubt regarding a data center transfer. Further, with programs, applications, or other sub-services that may not be fully supported at a destination data center, the customer may employ contingency planning, such as software upgrades, or the like to ensure a smooth transfer.

FIG. **1** illustrates a flow diagram of an example method **100** for providing an application programming interface testing service, arranged in accordance with at least some embodiments of the present disclosure. In general, method **100** may be performed by any suitable device, devices, or systems such as those discussed herein. In some examples, method **100** may be performed by a data center. In some examples, method **100** may be performed by a data center resource or resources. In some examples, method **100** may be performed by a virtual machine, a data center cluster, one or more network processors, one or more routers, gateway systems, data loss prevention systems, or the like. In some examples, method **100** may be performed by a virtual machine of a data center. In some examples, method **100** may be performed by a third party resource such as a third party computing device, or the like.

Method **100** sets forth various functional blocks or actions that may be described as processing steps, functional operations, events and/or acts, etc., which may be performed by hardware, software, and/or firmware. Numerous alternatives to the functional blocks shown in FIG. **1** may be practiced in various implementations. For example, intervening actions not shown and/or additional actions not shown may be employed and/or some of the actions shown may be eliminated, without departing from the scope of claimed subject matter. Method **100** may include one or more of functional operations as indicated by one or more of blocks **105**, **110**, **115**, **120**, **125**, **130**, **135**, **140**, and/or **145**. The process of method **100** may begin at block **105**.

At block **105**, "Determine Application Programming Interface Calls Used by an Origin Data Center", one or multiple of application programming interface calls used by an origin data center service may be determined. In general, the one or multiple of application programming interface calls used by a service at an origin data center may be determined using any suitable technique or techniques. In some examples, the one or multiple of application programming interface calls used by the origin data center may be determined by extracting application interface calls from messages captured at network processors, as is discussed further with respect to FIG. **2** and elsewhere herein. In some examples, the one or multiple of application programming interface calls used by the origin data center may be determined by evaluating a code repository to detect the application programming interface calls, as is discussed further with respect to FIG. **3** and elsewhere herein.

In general, the application programming interface calls may include any application programming interface calls. As discussed, in some examples, an application programming interface call may include a call, such as a command (with our without arguments and/or other relevant data), that may invoke one or more functions or processes indicated as supported by the application programming interface. In some examples, the application programming interface calls may include a hypertext transfer protocol get request, a hypertext transfer protocol put request, a key-value store command, a messaging call, a queuing call, a remote storage call, a delivery to a content delivery network request, a management command to a content delivery network, or the like. In some examples, an application programming interface call may be implemented using the simple object access protocol (SOAP). In general, the simple object access protocol may provide a structure for exchanging information and may rely on extensible markup language (XML) or JavaScript Object Notation (JSON) or the like for its message format. In some examples, an application programming interface call may be implemented using representational state transfer (REST), which may provide a software architecture for distributed systems.

In general, any number of application programming interface calls may be used by a customer service at a data center. In some examples, the number of application programming interface calls used by a customer service may be in the range of about 100 to about 1,000. In some examples, the

number of application programming interface calls used by a customer service may be in the range of about 1,000 to about 10,000. Determining the application programming interface calls used in the origin data center may provide a list or database of the mix of application programming interface calls utilized by in use applications of the customer's service. In some examples, the mix of application programming interface calls utilized by in use applications, even if known at the time of set up of the customer service, may change over time as new applications, programs, or other sub-services may be added over time.

In general, the service at the origin data center may include any suitable customer service or services and may include a single service, a variety of sub-services, one or more virtual machines, or the like. In some examples, the service may include an in-use application. In some examples, the service may include one or more data center based applications, one or more hosted applications, one or more data storage services, one or more telecommunication services, or the like. In some examples, customer service at a data center may be considered a customer deployment, a data center deployment, a cloud computing deployment, or the like. The process of method **100** may continue at block **110**.

At block **110**, "Convert Application Programming Interface Calls into Test Segments", one or more of the application programming interface calls may be converted into test segments. In some examples, each of the multiple application programming interface calls may be converted into a test segment to generate a multiple number of test segments. In some examples, some application programming interface calls may be combined into a single test segment. In some examples, one application programming interface call may be separated into two or more test segments. As is discussed further herein, in some examples, duplicate application programming interface calls may be discarded and test segments may be generated only for substantially unique application programming interface calls. In general, the test segments may include any suitable test segments. In some examples, a test segment may include an application programming interface setup call. In some examples, a test segment may include an application programming interface call within an error detecting loop configured to record whether the application programming interface call executed correctly or returned an error. In some examples, a test segment may include an application programming interface call within an error detecting loop including a header and/or a footer, such that the error detecting loop may be configured to record whether the application programming interface call executed correctly or returned an error.

As discussed, in some examples, a test segment may include an application programming interface call converted to a test segment by calling it within an error-detecting loop of code that may record whether the application programming interface call executed correctly, returned an error, or in any way does not return confirmation, or the like. In some examples, the test segment may include a header or footer or may utilize error detecting code particular to a target data center. Sample code (1) below illustrates an example test segment that may write test results to a console (in practice, the test result may be written to a report file, for example).

```
catch (Exception ex)
    {
      Console.WriteLine("Caught Exception: " + ex.Message);
      Console.WriteLine("Response Status Code: " + ex.StatusCode);
      Console.WriteLine("Error Code: " + ex.ErrorCode);
      Console.WriteLine("Error Type: " + ex.ErrorType);
      Console.WriteLine("Request ID: " + ex.RequestId);
      Console.WriteLine("XML: " + ex.XML);
    }
```

(1)

In some examples, for successful application programming interface calls, the test segment may capture further information such as elapsed time taken to execute, or the like, such that direct comparisons between the origin data center and the target data center may be made. The process of method **100** may continue at block **115**.

At block **115**, "Form an Application Programming Interface Test Module", an application programming interface test module may be formed based on the test segments. In general, the application programming interface test module may be formed using any suitable technique or techniques. In some examples, the application programming interface test module may include each of the multiple test segments discussed above. In some examples, the application programming interface test module may be intended for one or more target data centers, as is discussed further herein. In some examples, the application programming interface test module may be considered a compatibility test program, a compatibility test module, or the like. In some examples, the application programming interface test module may provide for substantially quick testing of one or more target data centers. Sample pseudo-code (2) illustrates an example portion of a test module.

```
for each (APIs_to_test)
    {
     Record API under test in report;
     Send API test message;
     Wait a reasonable time if no response is received;
     Catch any errors [e.g., code (1) shown above] or record functional
    response;
     Record end of API test in report;
     Get next API to test;
    }
```

(2)

As discussed, in some examples, pseudo-code (2) or similar may be utilized to form a test module. As is discussed below with respect to block **120**, in some examples, the test module may be transmitted in its entirety for testing at a test module. In other examples, each test segment may be transmitted to a target data center for testing. In some examples, the test segments may be transmitted as simple object access protocol messages. In some examples, a group or subset of test modules may be transmitted to a target data center for testing. The process of method **100** may continue at block **120**.

At block **120**, "Transmit Application Programming Interface Test Module to a Target Data Center", the application programming interface test module may be transmitted to one or more target data centers for execution at the one or more target data centers. In some examples, the application programming interface test module may be transmitted to a single target data center. In some examples, as discussed further below with respect to decision block **130** and elsewhere herein, the application programming interface test module may be transmitted to multiple target data centers such that the target data centers may be compared. In some

examples, the application programming interface test module may be transmitted to multiple target data centers simultaneously or substantially simultaneously. In general, the application programming interface test module may be transmitted using any suitable technique or techniques using any suitable communications channel. In some examples, the application programming interface test module may be transmitted over the internet. In some examples, the application programming interface test module may be transmitted over a virtual private network (VPN). As discussed, in some examples, test segments or groups of test segments may be separately transmitted to one or more target data centers for testing. The process of method **100** may continue at block **125**.

At block **125**, "Receive Test Results", one or more test results may be received. In some examples, the one or more test results may be received based at least in part on the transmitted application programming interface test module being executed at the target data center. In some examples, the one or more test results may be received after the application programming interface test module has run at the one or more target data centers. In general, the one or more test results may be received using any suitable technique or techniques and over any suitable communications channel. In some examples, the one or more test results may be received over the internet or a virtual private network, or the like. In general, the one or more test results may include test results in any suitable format. In some examples, the test results may include multiple test results corresponding to the multiple test segments that may make up the application programming interface test module. In some examples, the test results may include a test report. In some examples, the test report may include a test result for each of the multiple test segments. In general, the test results may include any suitable test results for the discussed test segments. In some examples, the test results may indicate whether a test segment executed successfully. In some examples, the test results may indicate whether a test segment failed. In some examples, the test results may indicate whether a test segment returned an error. As discussed, in some examples, the application programming interface test module may include a hypertext transfer protocol get request. In such examples, the test results may include an indication indicating whether the hypertext transfer protocol get request was successful. The process of method **100** may continue at decision block **130**.

At decision block **130**, "Other Target Data Centers?", it may be determined whether other target data centers are to be tested with the application programming interface test module. If other target data centers are not to be tested (i.e., only one target data center is being tested), the process of method **100** may end, as shown at block **135**, "End". If other target data centers are to be tested, the process of method **100** may continue at decision block **140**.

At decision block **140**, "All Targets Tested?", it may be determined whether all of the target data centers have been tested. If all of the target data centers have not been tested, the process of method **100** may continue at block **120** and the process may continue as described again until all of the target data centers to be tested may have completed testing such that each target data center to be tested may have received and executed the application programming interface test module and the test results for each target data center may have been received. If all of the target data centers have been tested, the process of method **100** may continue at block **145**.

At block **145**, "Compare Target Data Centers", the tested target data centers may be compared. In general, the tested target data centers may be compared using any suitable technique or techniques. In some examples, the tested target data centers may be compared to determine which data center may support the greatest number of application programming interface calls. In some examples, the tested target data centers may be compared to determine which data center may support any number of priority application programming interface calls.

As discussed, the process of method **100** may be utilized to test and compare any number of target data centers. In some examples, an application programming interface test module may be transmitted to a first target data center for execution at the first target data center, first test results may be received based on the transmitted application programming interface test module being executed at the first target data center, the application programming interface test module may be transmitted to a second target data center for execution at the second target data center, and/or second test results may be received based on the transmitted application programming interface test module being executed at the second target data center. In a similar manner, the application programming interface test module may be transmitted to any number of target data centers for execution, and any number of test results may be received from the target data centers for comparison.

As discussed, the process of method **100** may return test results from one or more target data centers. In some examples, the test results may indicate whether various application programming interface calls were executed successfully, failed, or reported errors, or the like. In some examples, any reported errors may be further examined or probed to determine more detail about the error. In some examples, the error may indicate an application programming interface call may not be supported. In some examples, the error may indicate the application programming interface call may be supported but a piece of data may not have been passed correctly by the application programming interface call. In some examples, the error may indicate the application programming interface call may be supported but that a piece of data may not have been available at the destination data center. Such further details and evaluation may indicate support for one or more application programming interface calls and that the code may only need to be updated or that necessary data may need to be provided at the data center, or the like.

FIG. **2** illustrates a flow diagram of an example method **200** for determining application programming interface calls used by a service at an origin data center, arranged in accordance with at least some embodiments of the present disclosure. In general, method **200** may be performed by any suitable device, devices, or systems such as those discussed herein. In some examples, method **200** may be performed by a data center. In some examples, method **200** may be performed by a data center resource or resources. In some examples, method **200** or portions of method **200** may be performed by a virtual machine, a data center cluster, one or more network processors, one or more routers, gateway systems, data loss prevention systems, or the like. In some examples, method **200** may be performed by a virtual machine of a data center. In some examples, method **200** may be performed by an origin data center.

Method **200** sets forth various functional blocks or actions that may be described as processing steps, functional operations, events and/or acts, etc., which may be performed by hardware, software, and/or firmware. Numerous alternatives

to the functional blocks shown in FIG. **2** may be practiced in various implementations. For example, intervening actions not shown and/or additional actions not shown may be employed and/or some of the actions shown may be eliminated, without departing from the scope of claimed subject matter. Method **200** may include one or more of functional operations as indicated by one or more of blocks **210**, **220**, **230**, **240**, and/or **250**. The process of method **200** may begin at block **210**.

At block **210**, "Capture Messages at a Network Processor", multiple messages may be captured at a network processor. In general, any suitable messages may be captured at the network processor. In some examples, the captured messages may include an in-operation network message. In some examples, the captured messages may include a simple object access protocol (SOAP) message. In some examples, the captured messages may include a representational state transfer (REST) message. In general, the messages may be captured using any suitable technique or techniques. In some examples, network messages may be snooped to detect whether a network message may have an application programming interface call. In some examples, network messages may be evaluated at full line speed. In some examples, network messages may be handled by an added service handler or the like, which may evaluate the messages either serially or in batches. In general, network messages may be evaluated over any time frame to collect application programming interface calls. In some examples, network messages may be evaluated over days, weeks, or months. In general, network messages may be evaluated over a duration that may capture as much usage as necessary to capture both commonly used and seldom used application programming interface calls. As discussed, in some examples, messages may be captured at one or more network processors. In some examples, messages may be captured at a router, at dedicated hardware, at a gateway system, or a data loss prevention system, or the like. The process of method **200** may continue at block **220**.

At block **220**, "Extract Application Programming Interface Calls", application programming interface calls may be extracted from the captured messages. In general, the application programming interface calls may be extracted using any suitable technique or techniques. In some examples, the application programming interface calls may be extracted from a simple object access protocol message. In some examples, the application programming interface calls may be extracted, copied and transferred to another process for inclusion in a list of application programming interface calls used by a customer's service or for a determination of whether the application programming interface calls has previously been included in a list of the application programming interface calls used by a customer's service, as is further discussed below. The process of method **200** may continue at decision block **230**.

At decision block **230**, "Application Programming Interface Call Similar to Call Previously Captured?", it may be determined whether the extracted application programming interface call may be substantially similar to or the same as an already captured and/or extracted application programming interface call. In general, it may it may be determined whether the extracted application programming interface call may be substantially similar to or the same as an already captured and/or extracted application programming interface call by any suitable technique or techniques. In some examples, the similarity may be based on a comparison of the application programming interface call to a list or database of previously captured and/or extracted calls. In some examples, the similarity may be based on a comparison of the programming code of the captured and/or extracted application programming interface calls. In general, the determination of whether the application programming interface call is similar to a previous application programming interface call may err on the side of including application programming interface calls. If it determined the application programming interface call is substantially similar to or the same as a previously captured and/or extracted call, the process of method **200** may continue at block **250**, "Discard Application Programming Interface Call", such that the application programming interface call may be discarded. If it determined the application programming interface call is not substantially similar to or the same as a previously captured and/or extracted call, the process of method **200** may continue at block **240**.

At block **240**, "Include Application Programming Interface Call", the extracted application programming interface calls may be included in the application programming interface calls used at the origin data center. In some examples, the application programming interface calls used may be used by a customer having a service at an origin data center, as discussed herein. In general, the application programming interface calls may be included in the application programming interface calls used using any suitable technique or techniques. In some examples, the application programming interface calls may be added to a list of application programming interface calls, a database of application programming interface calls, or the like.

As discussed, the process of method **200** includes a comparison of captured and/or extracted application programming interface calls to previously captured and/or extracted application programming interface calls. In some examples, such a comparison may be omitted such that all captured and/or extracted application programming interface calls may be included as discussed with respect to block **240**. In some examples, the list of all captured and/or extracted application programming interface calls may be subsequently reduced to remove duplicates.

FIG. **3** illustrates a flow diagram of an example method **300** for determining application programming interface calls used by a service at an origin data center, arranged in accordance with at least some embodiments of the present disclosure. In general, method **300** may be performed by any suitable device, devices, or systems such as those discussed herein. In some examples, method **300** may be performed by a data center. In some examples, method **300** may be performed by a data center resource or resources. In some examples, method **300** may be performed by a virtual machine, a data center cluster, one or more network processors, one or more routers, gateway systems, data loss prevention systems, or the like. In some examples, method **300** may be performed by a virtual machine of a data center. In some examples, method **300** may be performed by an origin data center.

Method **300** sets forth various functional blocks or actions that may be described as processing steps, functional operations, events and/or acts, etc., which may be performed by hardware, software, and/or firmware. Numerous alternatives to the functional blocks shown in FIG. **3** may be practiced in various implementations. For example, intervening actions not shown and/or additional actions not shown may be employed and/or some of the actions shown may be eliminated, without departing from the scope of claimed subject matter. Method **300** may include one or more of

functional operations as indicated by one or more of blocks **310** and/or **320**. The process of method **300** may begin at block **310**.

At block **310**, "Evaluate a Code Repository to Detect Code-Level Application Programming Interface Calls", a code repository may be evaluated to detect code-level application programming interface calls. In general, the code repository may be evaluated to detect code-level application programming interface calls using any suitable technique or techniques. In some examples, evaluating the code repository may include textual search of the code repository for application programming interface calls or code representative of application programming interface calls, or the like. The process of method **300** may continue at block **320**.

At block **320**, "Include Code-Level Application Programming Interface Calls", the code-level application programming interface calls may be included in the application programming interface calls used at the origin data center. In some examples, the application programming interface calls used may be used by a customer having a service at an origin data center, as discussed herein. In general, the application programming interface calls may be included in the application programming interface calls used using any suitable technique or techniques. In some examples, the application programming interface calls may be added to a list of application programming interface calls, a database of application programming interface calls, or the like.

As discussed, method **200** may include capturing and/or extracting application programming interface calls and method **300** may include evaluating a code repository to detect application programming interface calls. In some examples, the processes of method **200** and method **300** may be combined to determine the application programming interface calls used by a customer's service at a data center. In some examples, the process of method **200** may be performed first. In some examples, the process of method **300** may be performed first. In some examples, the processes may be performed simultaneously or substantially simultaneously. As discussed with respect to method **200**, in some examples, duplicate application programming interface calls may be removed from the list of in use application programming interface calls used by the customer's service.

The above techniques describe methods for determining application programming interface calls used by a customer's service at a data center. In some examples, the described techniques may use message duplication and low level access to determine general application programming interface calls, such that programming libraries or custom code for each data center may not be required. Such techniques may offer the advantages of low cost, speed, and scalability. Further, the determined list of application programming interface calls used by a customer's service (or the services of multiple customers) at a data center may be useful for a variety of purposes such as, for example, as a source for other data centers to check if they support widely used application programming interface calls, to improve upon support of performance of widely used application programming interface calls, or the like.

FIG. **4** illustrates a block diagram of an example system **400** for providing an application programming interface testing service, arranged in accordance with at least some embodiments of the present disclosure. As shown, system **400** may include an origin data center **410** having a service **412** including application programming interface calls **414**. System **400** may also include a target data center **420** in communication with origin data center **410** by a connection **430**.

In general, origin data center **410** may include any suitable data center having service **412** for a customer, or multiple services for one or more customers. In some examples, origin data center **410** may include computers, servers, server systems, data storage systems, telecommunications systems, computing clusters, and/or ancillary environmental systems, or the like. In some examples, data center **410** may be implemented in a cloud computing environment. In some examples, data center **410** may include one or more network processors, one or more routers, gateway systems, data loss prevention systems, or the like. In some examples, data center **410** may include a database or databases that may serve as a repository for a code repository associated with service **412**. In general, service **412** may be implemented at data center **410** in any suitable manner. As will be appreciated, origin data center **410** may include any number of services **412** corresponding to any number of customers serviced by the origin data center **410**. In general, application programming interface calls **414** may include any application programming interface calls as discussed herein.

In general, target data center **420** may include any suitable data center that may execute an application programming interface test module as discussed herein. In some examples, target data center **420** may include computers, servers, server systems, data storage systems, telecommunications systems, computing clusters, network processors, databases, and/or ancillary environmental systems, or the like. In some examples, target data center **420** may be implemented in a cloud computing environment. In general, application programming interface test module may be executed at target data center **420** in any suitable manner. As shown, in some examples, system **400** may include one target data center. In some examples, system **400** may include multiple target data centers for testing, as discussed herein.

As shown, origin data center **410** and target data center **420** may be in communication via connection **430**. In general, connection **430** may include any suitable communication connection. In some examples, the communicative connection may include a virtual private network (VPN) tunnel. In some examples, the communicative connection may include a management connection. In some examples, the communicative connection may be over the internet.

As discussed herein, in some examples, an application programming interface testing service may be provided. In some examples, the application programming interface testing service may be provided by at the origin data center. For example, application programming interface calls **414** used by service **412** may be determined at origin data center **410** using any of the techniques discussed herein, such as, for example, extraction from captured messages at a network processor (as discussed with respect to FIG. **2**) and/or by evaluating a code repository (as discussed with respect to FIG. **3**). In some examples, the application programming interface calls may be converted to test segments, an application programming interface test module may be formed, the application programming interface test module may be transmitted, and test results may be received at origin data center **410**. In some examples, target data center **420** may receive and execute an application programming interface test module or test segments, as discussed herein.

FIG. **5** illustrates a block diagram of an example system **500** for providing an application programming interface testing service, arranged in accordance with at least some embodiments of the present disclosure. As shown, system **500** may include origin data center **410** having service **412** including application programming interface calls **414**, as

discussed with respect to FIG. **4** and elsewhere herein. System **500** may also include target data center **420**, as discussed with respect to FIG. **4** and elsewhere herein. System **500** may also include a third party resource **510** in communication with origin data center **410** by a connection **520** and in communication with target data center **420** by a connection **530**.

In general, third party resource **510** may include any suitable computing device or devices. In some examples, third party resource **510** may include computers, servers, server systems, data storage systems, telecommunications systems, computing clusters, and/or ancillary environmental systems, or the like. As shown, third party resource **510** may be in communication with origin data center **410** via connection **520** and in communication with target data center **420** via connection **530**. In general, connections **520**, **530** may include any suitable communication connections. In some examples, one or both communicative connections may include a virtual private network (VPN) tunnel. In some examples, one or both communicative connections may include a management connection. In some examples, one or both communicative connections may be over the internet.

As discussed herein, in some examples, an application programming interface testing service may be provided. In some examples, the application programming interface testing service may be provided by third party resource **510**. For example, application programming interface calls **414** used by service **412** may be determined at origin data center **410** via software or commands provided by third party resource **510** and using any of the techniques discussed herein, such as, for example, extraction from captured messages at a network processor (as discussed with respect to FIG. **2**) and/or by evaluating a code repository (as discussed with respect to FIG. **3**). In some examples, the application programming interface calls may be converted to test segments, an application programming interface test module may be formed, the application programming interface test module may be transmitted, and test results may be received at third party resource **510**. In some examples, third party resource **510** may be managed and/or operated by a party that provides information or support or the like for customers to transfer between data centers. In some examples, third party resource **510** may be managed and/or operated by a data center or cloud services broker, or the like.

FIG. **6** illustrates an example computer program product **600**, arranged in accordance with at least some embodiments of the present disclosure. Computer program product **600** may include machine readable non-transitory medium having stored therein a plurality of instructions that, when executed, cause the machine to provide an application programming interface testing service according to the processes and methods discussed herein. Computer program product **600** may include a signal bearing medium **602**. Signal bearing medium **602** may include one or more machine-readable instructions **604**, which, when executed by one or more processors, may operatively enable a computing device to provide the functionality described herein. In various examples, some or all of the machine-readable instructions may be used by the devices discussed herein.

In some examples, the machine readable instructions **604** may include instructions that, when executed, cause a device to provide an application programming interface testing service by determining a plurality of application programming interface calls used by a service at an origin data center. In some examples, the machine readable instructions **604** may include instructions that, when executed, cause a device to provide an application programming interface testing service by converting each of the plurality of application programming interface calls into a test segment to generate a plurality of test segments. In some examples, the machine readable instructions **604** may include instructions that, when executed, cause a device to provide an application programming interface testing service by forming an application programming interface test module for a target data center, the application programming interface test module including each of the plurality of test segments. In some examples, the machine readable instructions **604** may include instructions that, when executed, cause a device to provide an application programming interface testing service by transmitting the application programming interface test module to the target data center for execution at the target data center. In some examples, the machine readable instructions **604** may include instructions that, when executed, cause a device to provide an application programming interface testing service by receiving one or more test results based at least in part on the transmitted application programming interface test module being executed at the target data center. In some examples, the machine readable instructions **604** may include instructions that, when executed, cause a device to provide an application programming interface testing service by transmitting the application programming interface test module to the target data center for execution at the target data center. In some examples, the machine readable instructions **604** may include instructions that, when executed, cause a device to provide an application programming interface testing service by receiving one or more test results based at least in part on the transmitted application programming interface test module being executed at the target data center, wherein the application programming interface test module includes a hypertext transfer protocol put request and the one or more test results includes an indication that the hypertext transfer protocol get request was successful. In some examples, the machine readable instructions **604** may include instructions that, when executed, cause a device to provide an application programming interface testing service by comparing the one or more test results to one or more second test results received from a second target data center.

In some implementations, signal bearing medium **602** may encompass a computer-readable medium **606**, such as, but not limited to, a hard disk drive, a Compact Disc (CD), a Digital Versatile Disk (DVD), a digital tape, memory, etc. In some implementations, signal bearing medium **602** may encompass a recordable medium **608**, such as, but not limited to, memory, read/write (R/W) CDs, R/W DVDs, etc. In some implementations, signal bearing medium **602** may encompass a communications medium **610**, such as, but not limited to, a digital and/or an analog communication medium (e.g., a fiber optic cable, a waveguide, a wired communication link, a wireless communication link, etc.). In some examples, signal bearing medium **602** may encompass a machine readable non-transitory medium.

FIG. **7** is a block diagram illustrating an example computing device **700**, arranged in accordance with at least some embodiments of the present disclosure. In various examples, computing device **700** may be configured to provide application programming interface testing services as discussed herein. In one example basic configuration **701**, computing device **700** may include one or more processors **710** and system memory **720**. A memory bus **730** can be used for communicating between the processor **710** and the system memory **720**.

Depending on the desired configuration, processor **710** may be of any type including but not limited to a micro-

processor (μP), a microcontroller (μC), a digital signal processor (DSP), or any combination thereof. Processor **710** can include one or more levels of caching, such as a level one cache **711** and a level two cache **712**, a processor core **713**, and registers **714**. The processor core **713** can include an arithmetic logic unit (ALU), a floating point unit (FPU), a digital signal processing core (DSP Core), or any combination thereof. A memory controller **715** can also be used with the processor **710**, or in some implementations the memory controller **715** can be an internal part of the processor **710**.

Depending on the desired configuration, the system memory **720** may be of any type including but not limited to volatile memory (such as RAM), non-volatile memory (such as ROM, flash memory, etc.) or any combination thereof. System memory **720** may include an operating system **721**, one or more applications **722**, and program data **724**. Application **722** may include API testing application **723** that can be arranged to perform the functions, actions, and/or operations as described herein including the functional blocks, actions, and/or operations described herein. Program Data **724** may include API testing data **725** for use with API testing application **723**. In some example embodiments, application **722** may be arranged to operate with program data **724** on an operating system **721**. This described basic configuration is illustrated in FIG. **7** by those components within dashed line **701**.

Computing device **700** may have additional features or functionality, and additional interfaces to facilitate communications between the basic configuration **701** and any required devices and interfaces. For example, a bus/interface controller **740** may be used to facilitate communications between the basic configuration **701** and one or more data storage devices **750** via a storage interface bus **741**. The data storage devices **750** may be removable storage devices **751**, non-removable storage devices **752**, or a combination thereof. Examples of removable storage and non-removable storage devices include magnetic disk devices such as flexible disk drives and hard-disk drives (HDD), optical disk drives such as compact disk (CD) drives or digital versatile disk (DVD) drives, solid state drives (SSD), and tape drives to name a few. Example computer storage media may include volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, program modules, or other data.

System memory **720**, removable storage **751** and non-removable storage **752** are all examples of computer storage media. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which may be used to store the desired information and which may be accessed by computing device **700**. Any such computer storage media may be part of computing device **700**.

Computing device **700** may also include an interface bus **742** for facilitating communication from various interface devices (e.g., output interfaces, peripheral interfaces, and communication interfaces) to the basic configuration **701** via the bus/interface controller **740**. Example output interfaces **760** may include a graphics processing unit **761** and an audio processing unit **762**, which may be configured to communicate to various external devices such as a display or speakers via one or more A/V ports **763**. Example peripheral interfaces **770** may include a serial interface controller **771** or a parallel interface controller **772**, which may be configured to communicate with external devices such as input devices (e.g., keyboard, mouse, pen, voice input device, touch input device, etc.) or other peripheral devices (e.g., printer, scanner, etc.) via one or more I/O ports **773**. An example communication interface **780** includes a network controller **781**, which may be arranged to facilitate communications with one or more other computing devices **783** over a network communication via one or more communication ports **782**. A communication connection is one example of a communication media. Communication media may typically be embodied by computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as a carrier wave or other transport mechanism, and may include any information delivery media. A "modulated data signal" may be a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media may include wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency (RF), infrared (IR) and other wireless media. The term computer readable media as used herein may include both storage media and communication media.

Computing device **700** may be implemented as a portion of a small-form factor portable (or mobile) electronic device such as a cell phone, a mobile phone, a tablet device, a laptop computer, a personal data assistant (PDA), a personal media player device, a wireless web-watch device, a personal headset device, an application specific device, or a hybrid device that includes any of the above functions. Computing device **700** may also be implemented as a personal computer including both laptop computer and non-laptop computer configurations. In addition, computing device **700** may be implemented as part of a wireless base station or other wireless system or device.

Some portions of the foregoing detailed description are presented in terms of algorithms or symbolic representations of operations on data bits or binary digital signals stored within a computing system memory, such as a computer memory. These algorithmic descriptions or representations are examples of techniques used by those of ordinary skill in the data processing arts to convey the substance of their work to others skilled in the art. An algorithm is here, and generally, is considered to be a self-consistent sequence of operations or similar processing leading to a desired result. In this context, operations or processing involve physical manipulation of physical quantities. Typically, although not necessarily, such quantities may take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared or otherwise manipulated. It has proven convenient at times, principally for reasons of common usage, to refer to such signals as bits, data, values, elements, symbols, characters, terms, numbers, numerals or the like. It should be understood, however, that all of these and similar terms are to be associated with appropriate physical quantities and are merely convenient labels. Unless specifically stated otherwise, as apparent from the following discussion, it is appreciated that throughout this specification discussions utilizing terms such as "processing," "computing," "calculating," "determining" or the like refer to actions or processes of a computing device, that manipulates or transforms data represented as physical electronic or magnetic quantities within memories, registers, or other information storage devices, transmission devices, or display devices of the computing device.

The foregoing detailed description has set forth various embodiments of the devices and/or processes via the use of block diagrams, flowcharts, and/or examples. Insofar as such block diagrams, flowcharts, and/or examples contain one or more functions and/or operations, it will be understood by those within the art that each function and/or operation within such block diagrams, flowcharts, or examples can be implemented, individually and/or collectively, by a wide range of hardware, software, firmware, or virtually any combination thereof. In some embodiments, several portions of the subject matter described herein may be implemented via Application Specific Integrated Circuits (ASICs), Field Programmable Gate Arrays (FPGAs), digital signal processors (DSPs), or other integrated formats. However, those skilled in the art will recognize that some aspects of the embodiments disclosed herein, in whole or in part, can be equivalently implemented in integrated circuits, as one or more computer programs running on one or more computers (e.g., as one or more programs running on one or more computer systems), as one or more programs running on one or more processors (e.g., as one or more programs running on one or more microprocessors), as firmware, or as virtually any combination thereof, and that designing the circuitry and/or writing the code for the software and/or firmware would be well within the skill of one of skill in the art in light of this disclosure. In addition, those skilled in the art will appreciate that the mechanisms of the subject matter described herein are capable of being distributed as a program product in a variety of forms, and that an illustrative embodiment of the subject matter described herein applies regardless of the particular type of signal bearing medium used to actually carry out the distribution. Examples of a signal bearing medium include, but are not limited to, the following: a recordable type medium such as a flexible disk, a hard disk drive (HDD), a Compact Disc (CD), a Digital Versatile Disk (DVD), a digital tape, a computer memory, etc.; and a transmission type medium such as a digital and/or an analog communication medium (e.g., a fiber optic cable, a waveguide, a wired communication link, a wireless communication link, etc.).

The herein described subject matter sometimes illustrates different components contained within, or connected with, different other components. It is to be understood that such depicted architectures are merely examples and that in fact many other architectures can be implemented which achieve the same functionality. In a conceptual sense, any arrangement of components to achieve the same functionality is effectively "associated" such that the desired functionality is achieved. Hence, any two components herein combined to achieve a particular functionality can be seen as "associated with" each other such that the desired functionality is achieved, irrespective of architectures or intermedial components. Likewise, any two components so associated can also be viewed as being "operably connected", or "operably coupled", to each other to achieve the desired functionality, and any two components capable of being so associated can also be viewed as being "operably couplable", to each other to achieve the desired functionality. Specific examples of operably couplable include but are not limited to physically mateable and/or physically interacting components and/or wirelessly interactable and/or wirelessly interacting components and/or logically interacting and/or logically interactable components.

With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (e.g., bodies of the appended claims) are generally intended as "open" terms (e.g., the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim recitation to claimed subject matter containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (e.g., "a" and/or "an" should typically be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation is explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean at least the recited number (e.g., the bare recitation of "two recitations," without other modifiers, typically means at least two recitations, or two or more recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to "at least one of A, B, or C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B."

While certain example techniques have been described and shown herein using various methods and systems, it should be understood by those skilled in the art that various other modifications may be made, and equivalents may be substituted, without departing from claimed subject matter. Additionally, many modifications may be made to adapt a particular situation to the teachings of claimed subject matter without departing from the central concept described herein. Therefore, it is intended that claimed subject matter not be limited to the particular examples disclosed, but that

such claimed subject matter also may include all implementations falling within the scope of the appended claims, and equivalents thereof.

What is claimed is:

1. A method to provide an application programming interface (API) testing service, the method comprising:
- determining a plurality of API calls used by a service at an origin data center;
- generating a plurality of test segments by detecting and discarding one or more duplicate API calls from the determined plurality of API calls;
- forming an API test module for a plurality of target data centers, the API test module including each of the plurality of test segments;
- transmitting, via a communication network, the API test module from the origin data center to the plurality of target data centers for execution of the API test module, including each of the plurality of test segments, at the plurality of target data centers;
- receiving test results based at least in part on the transmitted API test module being executed at the plurality of target data centers, wherein the test results include one or more first test results based at least in part on the transmitted API test module being executed at a first target data center and one or more second test results based at least in part on the transmitted API test module being executed at a second target data center, each of the one or more first test results and the one or more second test results including an indication of whether execution of each respective one of the plurality of test segments is successful or returns an error;
- comparing the one or more first test results and the one or more second test results; and
- generating a report based on the test results and results of the comparison that indicate which of the plurality of API calls from the origin data center are compatible with the plurality of target data centers.

2. The method of claim 1, further comprising:
- receiving a test report including a test result for each of the plurality of test segments based at least in part on the transmitted API test module being executed at the plurality of target data centers.

3. The method of claim 1, further comprising:
- wherein the API test module includes a hypertext transfer protocol get request and the test results includes an indication that the hypertext transfer protocol get request was successful.

4. The method of claim 1, wherein determining the plurality of API calls used by the service at the origin data center comprises:
- capturing a first in-operation network message at a network processor of the origin data center;
- extracting a first API call from the first in-operation network message; and
- including the first API call in the plurality of API calls.

5. The method of claim 1, wherein determining the plurality of API calls used by the service at the origin data center comprises:
- capturing a first simple object access protocol message at a network processor of the origin data center;
- extracting a first API call from the first simple object access protocol message; and
- including the first API call in the plurality of API calls.

6. The method of claim 1, wherein determining the plurality of API calls used by the service at the origin data center comprises:
- snooping network messages for API calls at a network processor of the origin data center to detect a first message having a first API call and a second message having a second API call;
- determining whether the detected first API call and the detected second API call are substantially similar; and
- if the detected first API call and the detected second API call are substantially similar, including the first API call in the plurality of API calls.

7. The method of claim 6, further comprising:
- discarding the second API call.

8. The method of claim 1, wherein the plurality of API calls comprises at least one of a hypertext transfer protocol get request, a hypertext transfer protocol put request, a key-value store command, a messaging call, a queuing call, a remote storage call, a delivery to a content delivery network request, or a management command to a content delivery network.

9. The method of claim 1, wherein the service at the origin data center comprises an in-use application.

10. The method of claim 1, wherein the plurality of test segments comprises an API setup call.

11. The method of claim 1, wherein the plurality of test segments comprises an API call within an error detecting loop configured to record whether the API call executed correctly or returned an error.

12. The method of claim 1, wherein the plurality of test segments comprises an API call within an error detecting loop configured to record whether the API call executed correctly or returned an error, wherein the error detecting loop comprises at least one of a header or a footer.

13. The method of claim 1, wherein determining the plurality of API calls used by the service at the origin data center comprises:
- evaluating a code repository to detect a code-level API call; and
- including the code-level API call in the plurality of API calls.

14. The method of claim 1, wherein the API test module is configured to cycle through each of the plurality of test segments at the plurality of target data centers.

15. A machine readable non-transitory medium having stored therein instructions that, when executed, cause a device to provide an application programming interface (API) testing service by:
- determining a plurality of API calls used by a service at an origin data center;
- generating a plurality of test segments by detecting and discarding one or more duplicate API calls from the determined plurality of API calls;
- forming an API test module for a plurality of target data centers, the API test module including each of the plurality of test segments;
- transmitting, via a communication network, the API test module from the origin data center to the plurality of target data centers for execution of the API test module, including each of the plurality of test segments, at the plurality of target data centers;
- receiving test results based at least in part on the transmitted API test module being executed at the plurality of target data centers, wherein the received test results include one or more first test results based at least in part on the transmitted API test module being executed at a first target data center and one or more second test results based at least in part on the transmitted API test module being executed at a second target data center, each of the one or more first test results and the one or

more second test results including an indication of whether execution of each respective one of the plurality of test segments is successful or returns an error;

comparing the one or more first test results and the one or more second test results; and

generating a report based on the test results and results of the comparing that indicates which of the API calls from the origin data center are compatible with the plurality of target data centers.

16. A device comprising:

a machine readable medium having stored therein instructions that, when executed, cause the device to provide an application programming interface (API) testing service by:

determining a plurality of API calls used by a service at an origin data center;

generating a plurality of test segments by detecting and discarding one or more duplicate API calls from the determined plurality of API calls;

forming an API test module for a plurality of target data centers, the API test module including each of the plurality of test segments;

transmitting, via a communication network, the API test module from the origin data center to the plurality of target data centers for execution of the API test module, including each of the plurality of test segments, at the plurality of target data centers;

receiving test results based at least in part on the transmitted API test module being executed at the plurality of target data centers, wherein the test results include one or more first test results based at least in part on the transmitted API test module being executed at a first target data center and one or more second test results based at least in part on the transmitted API test module being executed at a second target data center, each of the one or more first test results and the one or more second test results including an indication of whether execution of each respective one of the plurality of test segments is successful or returns an error;

comparing the one or more first test results and the one or more second test results; and

generating a report based on the test results and results of the comparing that indicates which of the API calls from the origin data center are compatible with the plurality of target data centers; and

a processor coupled to the machine readable medium to execute the instructions.

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