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(54) Title: METHOD AND SYSTEM FOR IMPLEMENTING INTEGRATED VOICE OVER INTERNET PROTOCOL IN A CLOUD-BASED NETWORK

(57) Abstract: A system for implementing VoIP over a cloud-based network includes a first edge proxy server operatively connected to a plurality of target proxy servers to receive resource information from one or more of the target proxy servers. Each target proxy server is associated with the cloud-based network. A first endpoint is operatively connected to the first edge proxy server and is configured for voice communications with a second endpoint. The voice communications are facilitated by the first edge proxy server using the received resource information.



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# METHOD AND SYSTEM FOR IMPLEMENTING INTEGRATED VOICE OVER INTERNET PROTOCOL IN A CLOUD-BASED NETWORK

## S P E C I F I C A T I O N

### PRIORITY

**[0001]** Priority is claimed to U.S. Provisional Patent Application No. 60/304,642, filed February 15, 2010, the disclosure of which is incorporated herein by reference in its entirety.

### FIELD OF THE INVENTION

**[0002]** The field of the present invention is cloud-based communication networks, particularly cloud-based networks in which sessions may be established and controlled from a software-based or hardware-based communication terminal.

### BACKGROUND

**[0003]** By way of non-limiting example only, a cloud-based system refers to a network of connected computing and communication resources. A cloud-based system may represent a packet-switched network, like the Internet. The network may contain transmission lines, repeaters, routers, network backbones, network interconnect points, etc., depending upon the extent of the network which it represents. Voice over Internet Protocol ("VoIP") is a general term for a family of transmission technologies for delivery of voice communications over Internet Protocol ("IP") networks such as the Internet or other packet-switched networks.

**[0004]** When establishing a VoIP session over a traditional Time Division Multiplex ("TDM") or IP based communication system, a client or endpoint (irrespective of whether it is hardware or software based) configures and registers itself with a specific service or provider. For example, a Skype™ user downloads a Skype™ client on a laptop or on a phone, and registers for the services. A TDM based system uses an E.164 based phone number to make a phone call. However, if a service does not exist for any reason (e.g. overload, disaster, etc.), a VoIP session may not be established.

**[0005]** Accordingly, there is a need to support computing and communications services using the available resources of a cloud-based

system without any significant investments for building and maintenance of networks, storage, servers, network management, operations, and provisioning systems.

#### SUMMARY OF THE INVENTION

**[0006]** The present invention is directed toward systems and methods for establishing and controlling a session over cloud-based networks from a software or hardware based communication terminal.

**[0007]** In a first aspect of the present invention, a system for implementing VoIP over a cloud-based network comprises a first edge proxy server operatively connected to target servers, and receives resource information from the target servers, which are associated with the cloud-based network. A first endpoint is operatively connected to the first edge proxy server and is configured for voice communications with a second endpoint over the cloud-based network. The system also includes a second endpoint operatively connected to a second edge proxy server. The first and second endpoints are configured for voice communications over the cloud-based network. The voice communications are facilitated by the first edge proxy server using the received resource information.

**[0008]** In a second aspect of the present invention, a first edge proxy server receives resource information from one or more target proxy servers associated with a cloud-based network, wherein the first edge proxy server is registered with a first endpoint. Based at least in part on the received resource information, the first edge proxy server facilitates voice communications with a second endpoint over the cloud based network.

**[0009]** Any of the above aspects may be implemented alone or in combination.

**[0010]** Additional aspects and advantages of the improvements will appear from the description of the preferred embodiment.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]** Embodiments of the present invention are illustrated by way of the accompanying drawings, in which:

**[0012]** Fig. 1 illustrates a block diagram of an integrated VoIP over cloud-based network in which a session may be controlled from a communication terminal.

**[0013]** Fig. 2 illustrates a signaling method for establishing a session in an integrated VoIP over cloud-based network.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0014]** Referring now to Fig. 1, there is shown a block diagram of a system 10. The illustrated system 10 includes iVoCS (“integrated VoIP over Cloud-based System”) endpoints 1 and 5, an ingress edge proxy server (not shown) located in an ingress cloud 2, a target proxy server (not shown) located in a middle cloud 3, and an egress edge proxy server (not shown) located in an egress cloud 4. An iVoCS endpoint, as used herein, refers to a particular contact point, an associated VoIP device, and a unique VoIP client identifier. The contact point refers to, for example, an individual, organization, or company. The edge proxy servers may include middleware. The middleware keeps track of the best possible server for the desired service, and frequently downloads information about the server’s availability to endpoints of the system. For example, every minute (or any other predetermined time interval), the middleware downloads information about the server’s availability, loading condition, and other characteristics to the endpoints. In the event the endpoints are powered down, the edge proxy servers update the endpoints with the server information when the endpoints are subsequently powered up.

**[0015]** Inter-cloud interfaces facilitate exchanges of resources and the resource availability information to and/or from all the clouds, 2, 3, and 4, of which they are attached. If the middle cloud 3 belongs to an administrative domain as the respective inter-cloud interface, the inter-cloud interfaces will be null. However, if the middle cloud 3 belongs to a different administrative domain; security, policy, and load balancing features must be properly managed across the inter-cloud interfaces. For purposes of non-limiting explanation only, an administrative domain refers to a network domain having authority to manage or control users with internal components of that domain.

**[0016]** For non-limiting purposes of explanation only, a “computer”, as referred to herein, refers to a general purpose computing device that includes a processor. “Processor”, as used herein, refers generally to a device including a Central Processing Unit (“CPU”), such as a microprocessor. A CPU generally includes an arithmetic logic unit (“ALU”), which performs arithmetic and logical operations, and a control unit, which extracts instructions (e.g., code) from memory and decodes and executes them, calling on the ALU when necessary. “Memory”, as used herein, refers to one or more devices capable of storing data, such as in the form of chips. Memory may take the form of one or more random-access memory (“RAM”), read-only memory (“ROM”), programmable read-only memory (“PROM”), erasable programmable read-only memory (“EPROM”), or electrically erasable programmable read-only memory (“EEPROM”) chips. Memory may be internal or external to an integrated unit including the processor. Memory may be internal or external to the computer. Such memory may store a computer program, e.g., code or a sequence of instructions being operable by the processor. Such a computer may include one or more data inputs. Such a computer may include one or more data outputs. The code stored in memory may cause the processor, when executed by the processor, to set an output to a value responsive to a sensed input.

**[0017]** One type of computer executable code typically stored in memory so as to be executable by an Internet enabled computer is a browser application. For non-limiting purposes of explanation only, “browser” as used herein generally refers to computer executable code used to locate and display web pages. Two commercially available browsers are Microsoft Internet Explorer, Netscape Navigator, Apple Safari and Firefox, which all support text, graphics and multimedia information, including sound and video (sometimes through browser plug-in applications).

**[0018]** “Server”, as used herein, generally refers to a computing device communicatively coupled to a network and that manages network resources. A server may refer to a discrete computing device, or may refer to an application that is managing resources rather than the entire computing device. An edge proxy server may be a proxy server which is designed to run at the edge of the network, e.g., separating a local network from the Internet.

**[0019]** Referring now to Fig. 2, there is shown a diagram illustrating the steps of a signaling method for establishing an iVoCS session. In step 1, ingress and egress iVoCS endpoints establish communication with ingress and egress edge proxy servers, respectively, for session and non-session based services. In step 2, the ingress edge proxy server locates a target proxy server. In step 3, the ingress edge proxy server locates, via the target proxy server, the egress edge proxy server. In step 4, both the ingress edge proxy server and the egress edge proxy server identify the most feasible resources for requested sessions, and then finalize the resource allocation. The ingress and egress edge proxies also identify and assign resources in a middle cloud. In step 5, the ingress and egress edge proxies communicate the resource information to the iVoCS endpoints. A resource list is continuously monitored, and overloaded resources are relinquished if/when required. Media paths, translation and routing paths, if/when desired may be established in a similar fashion as the steps described above. Sub-application and sub-session layer inter-cloud resource allocation and communications may also follow methods as described in Fig. 2.

**[0020]** While embodiments of this invention have been shown and described, it will be apparent to those skilled in the art that many more modifications are possible without departing from the inventive concepts herein. The invention, therefore, is not to be restricted except in the spirit of the following claims.

## CLAIMS

What is claimed is:

1. A system for implementing VoIP over a cloud-based network, the system comprising:
  - a first edge proxy server operatively connected to a plurality of target proxy servers to receive resource information from one or more of the target proxy servers, each target proxy server being associated with the cloud-based network; and
  - a first endpoint operatively connected to the first edge proxy server, the first endpoint being configured for voice communications with a second endpoint over the cloud-based network, wherein the voice communications are facilitated by the first edge proxy server using the received resource information.
2. The system of claim 1, wherein the first edge proxy server identifies network resources in the cloud-based network using the received resource information, the first edge proxy server facilitating voice communications between the first and second endpoints using the identified network resources.
3. The system of claim 2, wherein the first edge proxy server communicates to the first endpoint information about the identified network resources.
4. The system of claim 3, wherein the voice communications between the first and second endpoints are established using the identified network resources.
5. The system of claim 1, further comprising:
  - a second edge proxy server operatively connected to at least one of the plurality of target proxy servers; and
  - the second endpoint operatively connected to the second edge proxy server, wherein the voice communications are further facilitated by the second edge proxy server.

6. The system of claim 5, wherein the first and second edge proxy servers identify network resources for the voice communications.

7. A method for establishing a VoIP over a cloud-based network, said method comprising the steps of:

receiving, by a first edge proxy server, resource information from one or more target proxy servers associated with a cloud-based network, wherein the first edge proxy server is registered with a first endpoint; and

based at least in part on the received resource information, facilitating, by the first edge proxy server, voice communications with a second endpoint over the cloud-based network.

8. The method of claim 7, further comprising:

identifying, by the first edge proxy server, network resources in the cloud-based network using the received resource information, wherein the first edge proxy server facilitates voice communications between the first and second endpoints using the identified network resources.

9. The method of claim 8, further comprising:

sending, by the first edge proxy server, information about the identified network resources to the first endpoint.

10. The method of claim 9, further comprising:

based at least in part on the identified network resources, establishing voice communications between the first and second endpoints.

11. The method of claim 7, further comprising:

receiving, at a second edge proxy server, resource information; and facilitating, by the second edge proxy server, the voice communications, wherein the second edge proxy server is operatively connected to the second endpoint.

12. The method of claim 11, further comprising:

identifying, by the first and second edge proxy servers, network resources for the voice communications.

13. The method of claim 7, further comprising monitoring a resource list.
14. The method of claim 7, further comprising relinquishing overloaded resources.
15. A computer-implemented method of establishing a VoIP over a cloud-based network, said method comprising the steps of:
  - receiving, by a first edge proxy server, resource information from one or more target proxy servers associated with a cloud-based network, wherein the first edge proxy server is registered with a first endpoint; and
  - based at least in part on the received resource information, facilitating, by the first edge proxy server, voice communications with a second endpoint over the cloud-based network.
16. The method of claim 15, further comprising:
  - identifying, by the first edge proxy server, network resources in the cloud-based network using the received resource information, wherein the first edge proxy server facilitates voice communications between the first and second endpoints using the identified network resources.
17. The method of claim 16, further comprising:
  - sending, by the first edge proxy server, information about the identified network resources to the first endpoint.
18. The method of claim 17, further comprising:
  - based at least in part on the identified network resources, establishing voice communications between the first and second endpoints.
19. The method of claim 15, further comprising:
  - receiving, at a second edge proxy server, resource information, facilitating, by the second edge proxy server, the voice communications, wherein the second edge proxy server is operatively connected to the second endpoint.
20. The method of claim 19, further comprising:

identifying, by the first and second edge proxy servers, network resources for the voice communications.

21. The method of claim 15, further comprising monitoring a resource list.
22. The method of claim 15, further comprising relinquishing overloaded resources.

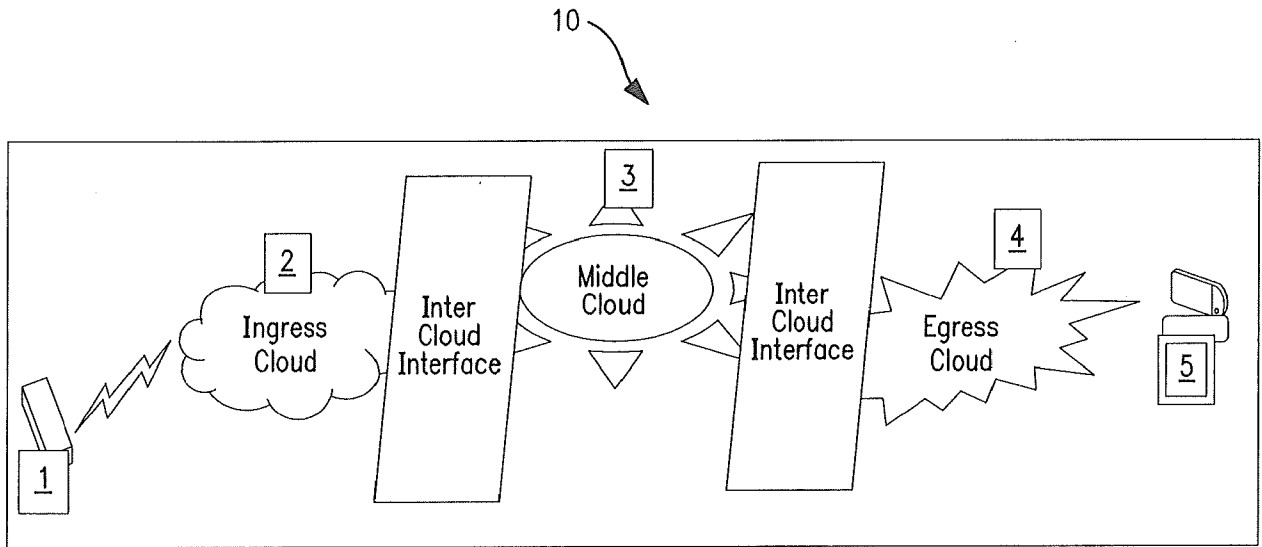


FIG. 1

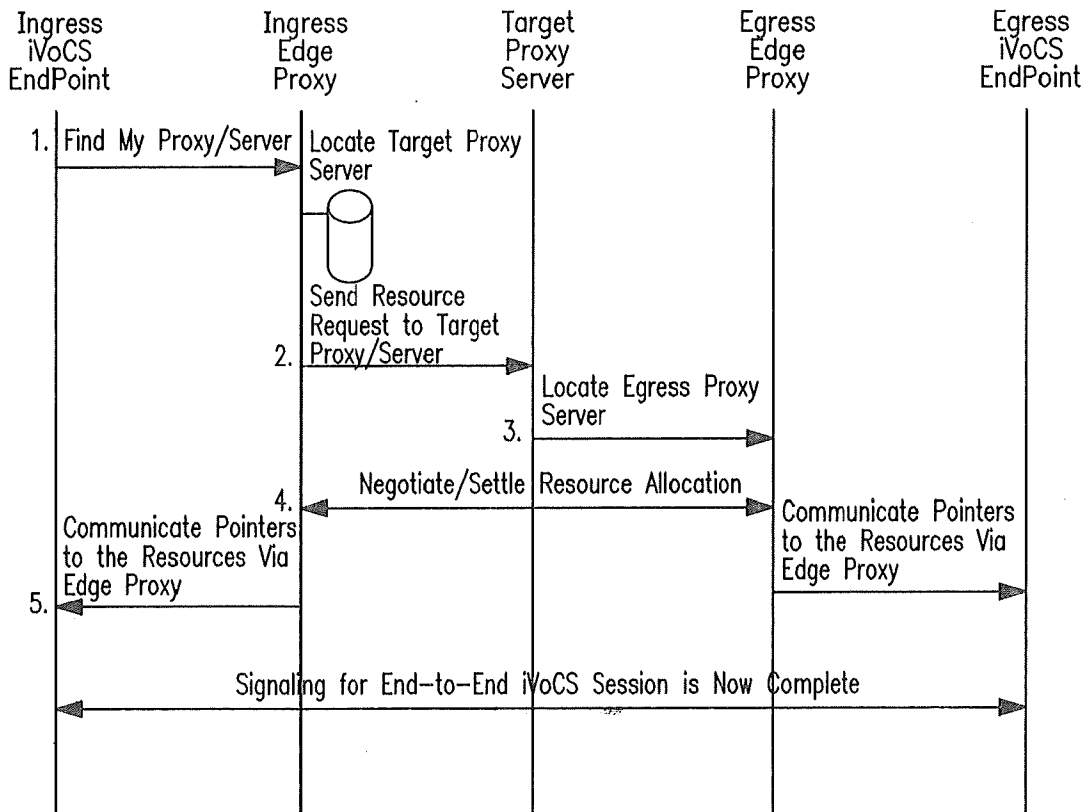


FIG. 2