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(54) DYNAMIC LOAD BALANCING BETWEEN MULTIPLE LOCATIONS WITH DIFFERENT TELEPHONY SYSTEM

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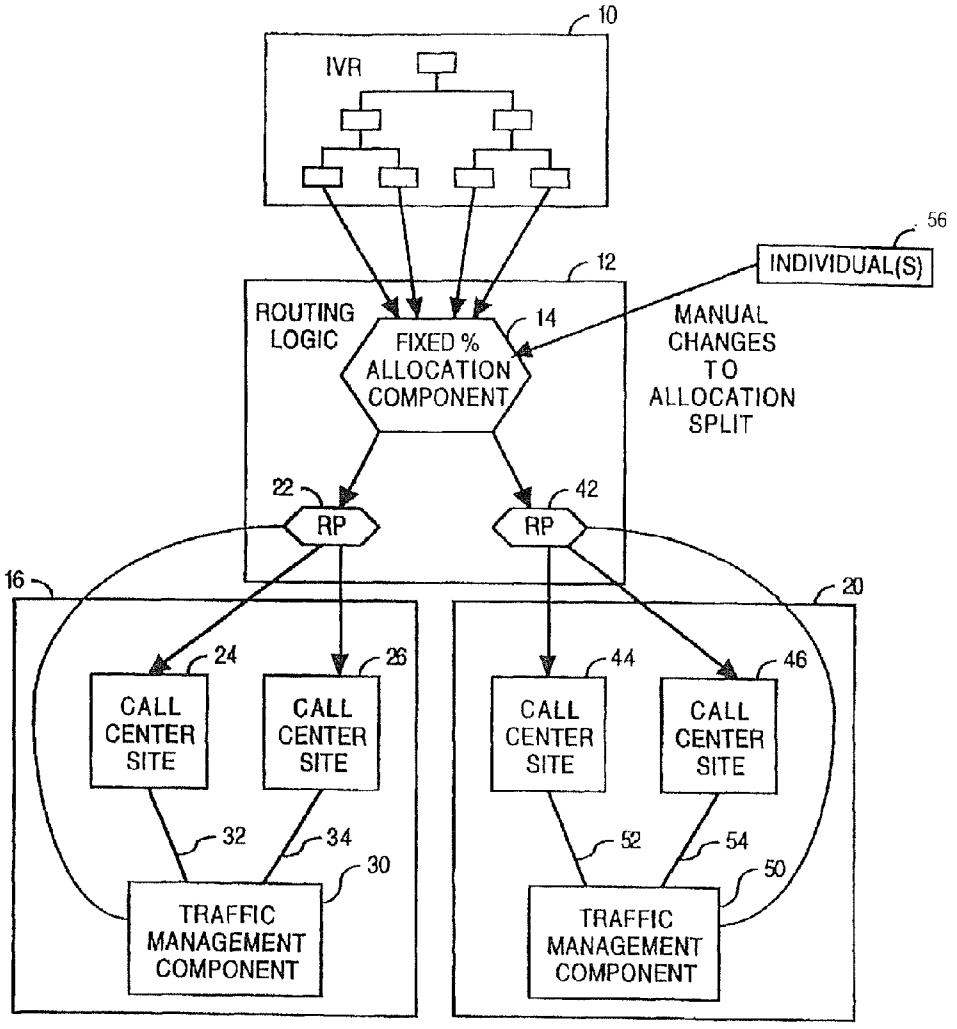
(57) **ABSTRACT**

A method includes receiving a call from a primary interactive voice response (IVR) system at a load-balancing IVR system. The primary IVR system routes a first percentage of calls to routing logic and a second percentage of calls to the load-balancing IVR system. A telephony system is selected from among a plurality of telephony systems based on agent availability data associated with call center sites of the plurality of telephony systems. The method includes routing the call to a routing protocol component of the routing logic, where the routing protocol component routes the call to a call center of the selected telephony system.



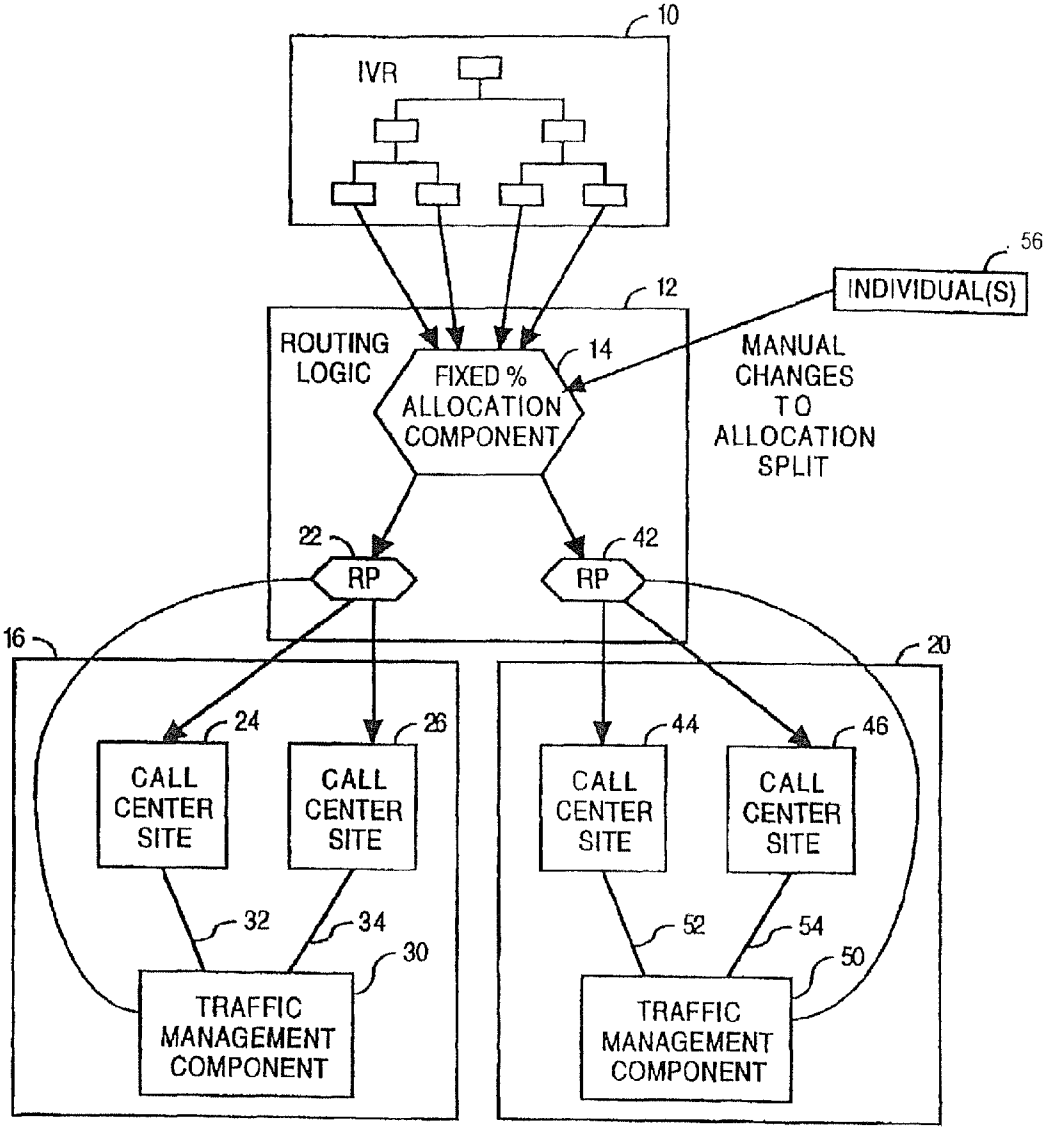

10
IVR
56
INDIVIDUAL(S)
12
ROUTING LOGIC
14
FIXED % ALLOCATION COMPONENT
MANUAL CHANGES TO ALLOCATION SPLIT
22
RP
42
RP
16
20
24
CALL CENTER SITE
26
CALL CENTER SITE
44
CALL CENTER SITE
46
CALL CENTER SITE
32
34
30
TRAFFIC MANAGEMENT COMPONENT
52
54
50
TRAFFIC MANAGEMENT COMPONENT

FIG. 1

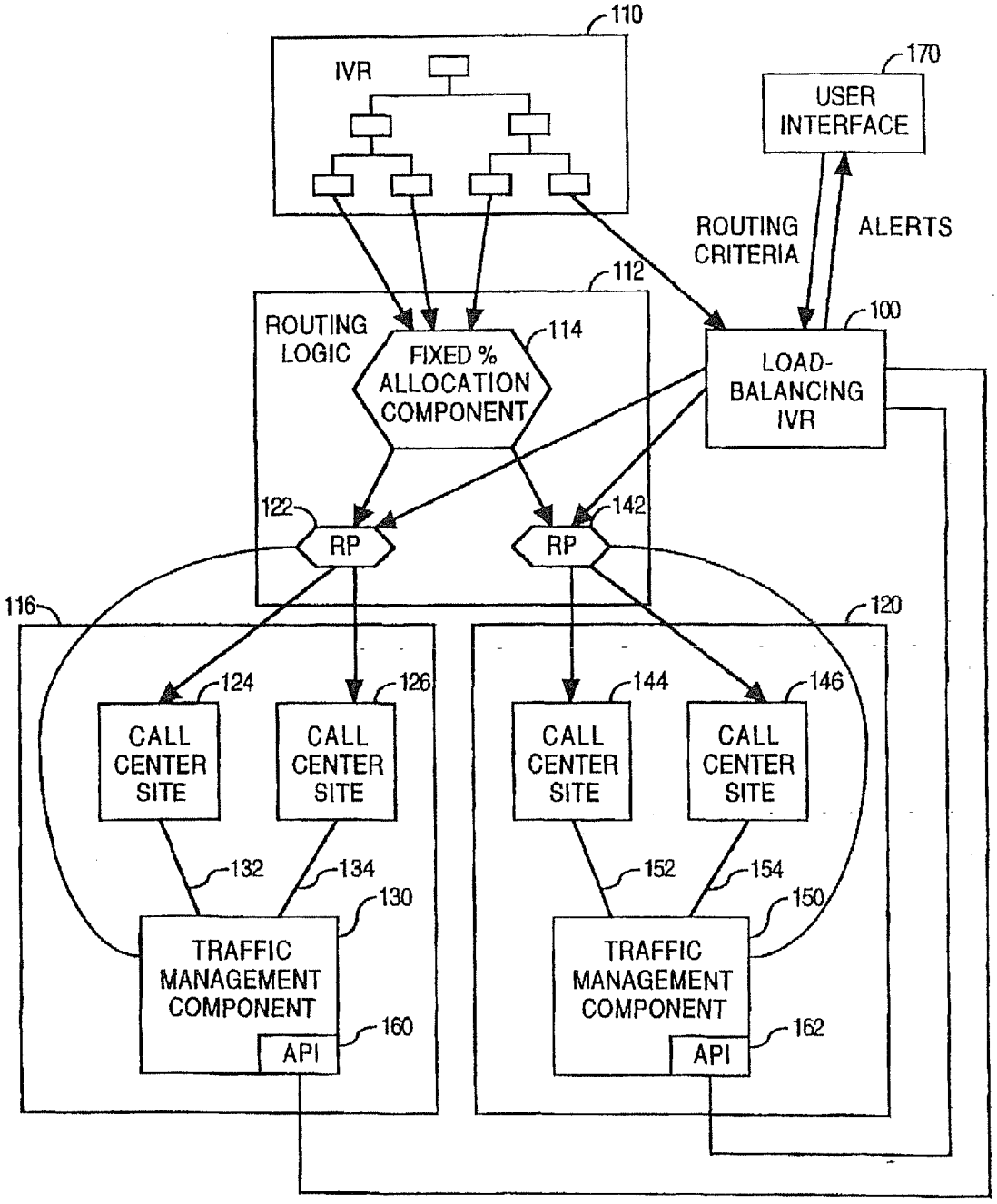

110
IVR
170
USER INTERFACE
ROUTING CRITERIA
ALERTS
112
ROUTING LOGIC
114
FIXED % ALLOCATION COMPONENT
100
LOAD-BALANCING IVR
122
RP
142
RP
116
120
124
CALL CENTER SITE
126
CALL CENTER SITE
144
CALL CENTER SITE
146
CALL CENTER SITE
132
134
130
TRAFFIC MANAGEMENT COMPONENT
API
160
152
154
150
TRAFFIC MANAGEMENT COMPONENT
API
162

FIG. 2

DYNAMIC LOAD BALANCING BETWEEN MULTIPLE LOCATIONS WITH DIFFERENT TELEPHONY SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of and claims priority from U.S. patent application Ser. No. 11/705,482, filed on Feb. 12, 2007 and entitled "DYNAMIC LOAD BALANCING BETWEEN MULTIPLE LOCATIONS WITH DIFFERENT TELEPHONY SYSTEM," which is a continuation of and claims priority to U.S. patent application Ser. No. 10/958,632, now U.S. Pat. No. 7,197,130, filed on Oct. 5, 2004 and entitled "DYNAMIC LOAD BALANCING BETWEEN MULTIPLE LOCATIONS WITH DIFFERENT TELEPHONY SYSTEM," both of which are hereby incorporated by reference.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to systems for distributing calls to call centers.

BACKGROUND

[0003] Multiple vendors provide telephone system equipment for distributing calls to different call centers in different locations. Each vendor's telephony system typically uses one of the common standards for its equipment to manage traffic across the various call centers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The present invention is pointed out with particularity in the appended claims. However, other features are described in the following detailed description in conjunction with the accompanying drawings in which:

[0005] FIG. **1** is a schematic diagram of a first embodiment of a pre-ICM load balancing system; and

[0006] FIG. **2** is a schematic diagram of a second embodiment of a pre-ICM load balancing system which comprises a load-balancing IVR.

DETAILED DESCRIPTION

[0007] In some cases, two or more different telephony systems (e.g. from two or more different vendors) may receive the same call types from a single Interactive Voice Response (IVR) or Voice Response Unit (VRU). The allocation of calls between the two or more different telephony systems needs to be varied due to staffing issues at the multiple call centers and the unpredictable nature of call traffic.

[0008] Embodiments of the present invention use a secondary Interactive Voice Response (IVR) application to facilitate dynamic load balancing between two or more call centers that use different systems to manage their own traffic. Traffic is balanced prior to committing a call to a particular vendor's traffic management component, such as an Intelligent Call Management (ICM) component or another vendor's component, to provide a pre-ICM load-balancing approach. The application corrects service level shifts and provides real-time alerts and statistics to one or more businesses associated with the call centers.

[0009] FIG. **1** is a schematic diagram of a first embodiment of a pre-ICM load balancing system that is absent the aforementioned IVR application. This embodiment is described to contrast with FIG. **2**, which shows a particular preferred embodiment that includes the secondary IVR application.

[0010] A primary IVR **10** receives calls that are processed by routing logic **12**. The routing logic **12** includes an allocation component **14** to allocate a first percentage of the calls for a first telephony system **16** and a second percentage of the calls for a second telephony system **20**. In the case of the two telephony systems **16** and **20**, the sum of the first percentage and the second percentage is 100%. Those having ordinary skill will appreciate that the routing logic **12** may support more than two telephony systems in general.

[0011] The first telephony system **16** and the second telephony system **20** may be different types of telephony systems provided by different vendors. Examples of the different vendors include, but are not limited to, CISCO Systems, Inc. and GENESYS.

[0012] The routing logic **12** comprises a first routing protocol (RP) component **22** to route each of the calls allocated to the first telephony system **16** to a corresponding one of multiple call centers **24** and **26**. The call centers **24** and **26** typically are disposed at different geographical locations. Agents at the call centers **24** and **26** receive the calls and service the calling parties. A first traffic management component **30** is in communication with the call centers **24** and **26** via peripheral gateway lines **32** and **34**, respectively. The first traffic management component **30** determines call center information such as agent availability and service levels at the call centers **24** and **26**. The first RP component **22** is responsive to the call center information from the first traffic management component **30** to vary how subsequent calls are to be allocated between the call centers **24** and **26**

[0013] The routing logic **12** further comprises a second routing protocol (RP) component **42** to route each of the calls allocated to the second telephony system **20** to a corresponding one of multiple call centers **44** and **46**. The call centers **44** and **46** typically are disposed at different geographical locations. Agents at the call centers **44** and **46** receive the calls and service the calling parties. A second traffic management component **50** is in communication with the call centers **44** and **46** via peripheral gateway lines **52** and **54**, respectively. The second traffic management component **50** determines call center information such as agent availability and service levels at the call centers **44** and **46**. The second RP component **42** is responsive to the call center information from the second traffic management component **50** to vary how subsequent calls are to be allocated between the call centers **44** and **46**.

[0014] The allocation split between the first telephony system **16** and the second telephony system **20** produced by the allocation component **14** is manually changed by individual (s) **56** managing the system. The allocation of calls between the telephony systems **16** and **20** needs to be varied from initial percentages due to changes in staffing at the call centers **24**, **26**, **44** and **46** and the unpredictable nature of call traffic received by the primary IVR **10**. The manual changes performed by the individual(s) **56** are reactive in nature and typically take minutes or hours of time to occur. Undesirable service levels and additional expenses may result using the manual approach.

[0015] FIG. **2** is a schematic diagram of a second embodiment of a pre-ICM load balancing system that includes a load-balancing IVR system **100**. A first percentage of calls received by a primary IVR **110** is routed to routing logic **112**, and a second percentage of the calls received by the primary IVR **110** is routed to the load-balancing IVR **100**. In general,

the second percentage is about equal to or otherwise based on a maximum shift in allocation percentages between a first telephony system **116** and a second telephony system **120** which would occur if the manual approach in FIG. **1** was used. Thus, depending on the capacity and performance of call centers in the telephony systems **116** and **120**, the first/second percentages may be 95%/5% or 90%/10% or 85%/15% or 80%/20%, for example. Preferably, the first percentage is greater than the second percentage so that most of the traffic is routed through the most inexpensive path possible while a small percentage of the traffic is routed through the load-balancing IVR **100** to dynamically balance telephony system loads. In practice, the load-balancing IVR **100** can initially receive 100% of the calls, and make a recommendation based on a sample of calls as to where to set the first/second percentage split. The recommendation can be outputted to a user via a user interface or an alert message such as an e-mail message.

[0016] The routing logic **112** includes an allocation component **114** to allocate a first percentage of its calls for the first telephony system **116** and a second percentage of its calls for the second telephony system **120**. In the case of the two telephony systems **116** and **120**, the sum of the first percentage and the second percentage is 100%. These percentages may be substantially fixed percentages. Those having ordinary skill will appreciate that the routing logic **112** may support more than two telephony systems in general.

[0017] The first telephony system **116** and the second telephony system **120** may be different types of telephony systems provided by different vendors. Examples of the different vendors include, but are not limited to, CISCO Systems, Inc. and GENESYS.

[0018] The load-balancing IVR **100** dynamically distributes its calls between the first and second telephony systems **116** and **120** based on agent availability data. A full description of the dynamic distribution follows a recitation of other components in the system.

[0019] The routing logic **112** comprises a first routing protocol (RP) component **122** to route each of the calls allocated to the first telephony system **116** to a corresponding one of multiple call centers **124** and **126**. The call centers **124** and **126** typically are disposed at different geographical locations. Agents at the call centers **124** and **126** receive the calls and service the calling parties.

[0020] A first traffic management component **130** is in communication with the call centers **124** and **126** via peripheral gateway lines **132** and **134**, respectively. The first traffic management component **130** determines call center information which includes first agent availability data for the call centers **124** and **126** of the first telephony system **116**. The call center information may further comprise one or more Automatic Call Distribution (ACD) statistics such as a number of calls in queue, a service level, Average Holding Time (AHT), and/or Average Speed of Answer (ASA). The first RP component **122** is responsive to the call center information from the first traffic management component **130** to vary how subsequent calls are to be allocated between the call centers **124** and **126**.

[0021] The routing logic **112** further comprises a second routing protocol (RP) component **142** to route each of the calls allocated to the second telephony system **116** to a corresponding one of multiple call centers **144** and **146**. The call centers **144** and **146** typically are disposed at different geographical locations. Agents at the call centers **144** and **146** receive the calls and service the calling parties.

[0022] A second traffic management component **150** is in communication with the call centers **144** and **146** via peripheral gateway lines **152** and **154**, respectively. The second traffic management component **150** determines call center information which includes second agent availability data for the call centers **144** and **146** of the second telephony system **120**. The call center information may further comprise one or more ACD statistics such as a number of calls in queue, a service level, AHT, and/or ASA. The second RP component **142** is responsive to the call center information from the second traffic management component **150** to vary how subsequent calls are to be allocated between the call centers **144** and **146**.

[0023] Each of the first and the second traffic management components **130** and **150** makes its call center information accessible to the load-balancing IVR **100**. In one embodiment, the first traffic management component **130** comprises a Web-accessible application program interface (API) **160** to provide remote visibility of the first call center information, including first agent availability data, to the load-balancing IVR **100**. Similarly, the second traffic management component **150** comprises a Web-accessible application program interface (API) **162** to provide remote visibility of the second call center information, including first agent availability data, to the load-balancing IVR **100**.

[0024] In one embodiment, a call received by the primary IVR **110** and routed to the load-balancing IVR **100** is processed as follows. The load-balancing IVR **100** determines which of the telephony systems has a highest overall agent availability, and routes the received call to the telephony system having the highest overall agent availability.

[0025] To determine which telephony system the call is to be routed to, the load-balancing IVR **100** requests and receives the first call center information, including the first agent availability data, from the API **160** of the first traffic management component **130** and the second call center information, including the second agent availability data, from the API **162** of the second traffic management component **150**. Additional first and second call center information that may be passed to the load-balancing IVR **100** includes the number of calls in queue, the service level, AHT, ASA, and/or other ACD statistics. The first and second call center information is communicated from the traffic management components **130** and **150** to the load-balancing IVR **100** over Web-based hook via a computer network using a communication protocol such as hypertext transfer protocol (HTTP). Although HTTP is preferred for purposes of portability and flexibility, alternatives such as dedicated frame relay or virtual private network (VPN) may be used.

[0026] Optionally, while determining which of the telephony systems has the highest overall agent availability, the load-balancing IVR **100** plays a message to the calling party within the call. The message may have a duration of about five to ten seconds, for example. The message may include a script advising the caller of an estimated hold time or his/her place in the queue based on the responses from the APIs **160** and **162**.

[0027] Beneficially, the load-balancing IVR **100** can be remotely used by any other IVR over a standard voice path (e.g. a dedicated voice path or a plain old telephone service voice path). Thus, no data integration to other IVRs in the call centers **124**, **126**, **144** or **146** is required by the load-balancing

IVR **100**. In one embodiment, the load-balancing IVR **100** routes the call by performing a Dual Tone Multiple Frequency (DTMF) release transfer using a routing configuration of the telephony system having the highest overall agent availability. Any carrier's DTMF transfer function can be used, keeping inbound capacity requirements and call durations at or near a minimum.

[0028] In general, the scope of this disclosure is broadly inclusive of alternative criteria used by the load-balancing IVR **100** to determine which telephony system is to receive the call. Optionally, a graphical user interface **170** or another user interface receives user-specified routing criteria. The load-balancing IVR **100** processes its received calls based on the user-specified routing criteria. For example, the user-specified routing criteria may cause the load-balancing IVR **100** to favor a particular vendor's telephony system.

[0029] The load-balancing IVR **100** may be operative to generate an alert signal based on a trend or a surge defined by the agent availability data or other call center information received from the traffic management components **130** and **150**. A particular business that offers the call centers to its customers may define its own alert conditions using the graphical user interface **170** or another user interface.

[0030] The acts performed by each of the herein-disclosed components can be directed by respective computer program code embodied in a computer-readable form on a computer-readable medium. Each of the herein-disclosed components may comprise a respective computer processor responsive to the computer program code to perform the acts.

[0031] It will be apparent to those skilled in the art that the disclosed embodiments may be modified in numerous ways and may assume many embodiments other than the particular forms specifically set out and described herein.

[0032] The above disclosed subject matter is to be considered illustrative, and not restrictive, and the appended claims are intended to cover all such modifications, enhancements, and other embodiments which fall within the true spirit and scope of the present invention. Thus, to the maximum extent allowed by law, the scope of the present invention is to be determined by the broadest permissible interpretation of the following claims and their equivalents, and shall not be restricted or limited by the foregoing detailed description.

What is claimed is:

1. A non-transitory computer-readable medium comprising instructions that, when executed by a computer, cause the computer to:

receive a call from a primary interactive voice response system at a load-balancing interactive voice response system, wherein the primary interactive voice response system is configured to route a first percentage of a plurality of calls to routing logic and to route a second percentage of the plurality of calls to the load-balancing interactive voice response system;

select a telephony system from among a plurality of telephony systems based on agent availability data associated with call center sites of the plurality telephony systems; and

route the call to a routing protocol component of the routing logic, wherein the routing protocol component routes the call to a call center of the selected telephony system.

2. The non-transitory computer-readable medium of claim **1**, further comprising instructions that, when executed by the computer, cause the computer to determine which of the plurality of telephony systems has a highest overall agent availability, and to select the telephony system having the highest overall agent availability.

3. The non-transitory computer-readable medium of claim **1**, further comprising instructions that, when executed by the computer, cause the computer to perform a dual tone multiple frequency release transfer using a routing configuration of the selected telephony system.

4. The non-transitory computer-readable medium of claim **1**, further comprising instructions that, when executed by the computer, cause the computer to receive a voice call without transfer of other data.

5. The non-transitory computer-readable medium of claim **1**, further comprising instructions that, when executed by the computer, cause the computer to receive user-specified routing criteria, wherein the telephony system is selected based at least partially on the user-specified routing criteria.

6. The non-transitory computer-readable medium of claim **1**, further comprising instructions that, when executed by the computer, cause the computer to determine a recommendation of the second percentage of calls.

7. The non-transitory computer-readable medium of claim **1**, further comprising instructions that, when executed by the computer, cause the computer to receive the agent availability data via a web-accessible application program interface.

8. The non-transitory computer-readable medium of claim **1**, further comprising instructions that, when executed by the computer, cause the computer to generate an alert signal based on a trend or a surge indicated by the agent availability data.

9. A non-transitory computer-readable medium comprising instructions that, when executed by a computer, cause the computer to:

receive, at routing logic, a call directed to a primary interactive voice response system, wherein the primary interactive voice response system is configured to route a first percentage of received calls to the routing logic and to route a second percentage of the received calls to a load-balancing interactive voice response system, wherein the first percentage of received calls is based at least partially on routing criteria;

receive agent availability data associated with a plurality of telephony systems; and

dynamically route the call based at least partially on the agent availability data.

10. The non-transitory computer-readable medium of claim **9**, further comprising instructions that, when executed by the computer, cause the computer to send the call to a routing protocol component of the routing logic that is associated with at least one telephony system, wherein the routing protocol component allocates the call to a call center site of the at least one telephony system.

11. The non-transitory computer-readable medium of claim **9**, further comprising instructions that, when executed by the computer, cause the computer to set the routing criteria based on the agent availability data.

12. The non-transitory computer-readable medium of claim **9**, wherein the percentage is adjustable.

13. A system comprising:

a processor; and

a memory storing instructions executable by the processor to generate a user interface configured to:

receive user-specified routing criteria; and

send the user-specified routing criteria to a load-balancing interactive voice response system that receives calls from a primary interactive voice response system, wherein the user-specified criteria is usable by the load-balancing interactive voice response system to determine which of a plurality of telephony systems to route a received call to.

14. The system of claim **13**, wherein the user interface is further configured to receive an alert signal from the load-balancing interactive voice response system.

15. The system of claim **14**, wherein the alert signal is based on a trend in agent availability data associated with at least one of the plurality of telephony systems.

16. The system of claim **13**, wherein user interface is further configured to receive a definition of an alert signal from a user.

17. The system of claim **13**, wherein the received call is routed further based on agent availability data associated with call center sites of the plurality of telephony systems.

18. The system of claim **17**, wherein the received call is routed to a telephony system having a highest overall agent availability.

19. The system of claim **13**, wherein the plurality of telephony systems includes a first telephony system associated with a first vendor and a second telephony system associated with a second vendor.

20. The system of claim **13**, wherein the user-specified routing criteria favors the first vendor over the second vendor.

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