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(54) **DYNAMIC WORK ASSIGNMENT STRATEGIES BASED ON MULTIPLE ASPECTS OF AGENT PROFICIENCY**

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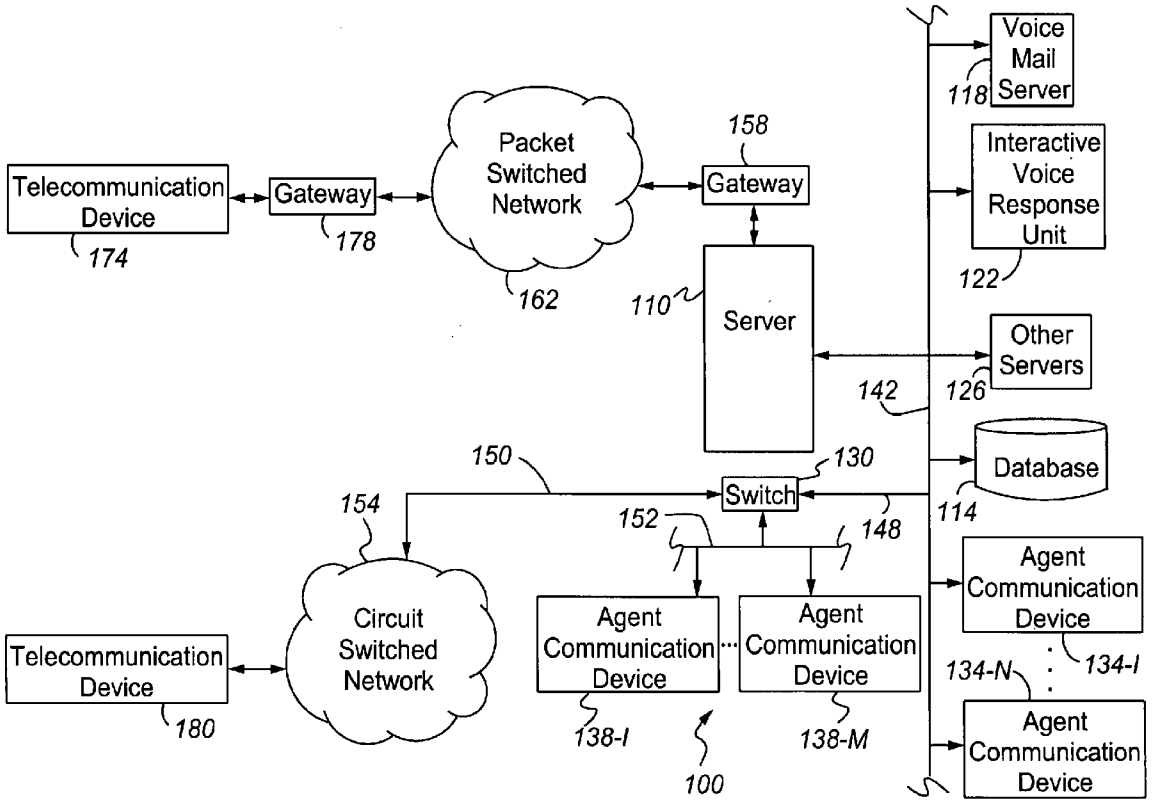
(57) **ABSTRACT**

A contact center having a plurality of performance goals is provided. The contact center includes a routing agent operable, when a work item is to be routed to a servicing destination, determine, for each performance goal, a status of goal realization and a corresponding set of selection criteria for the determined statuses of goal realization and a destination selector operable to select the servicing destination based, at least in part, on the set of selection criteria.



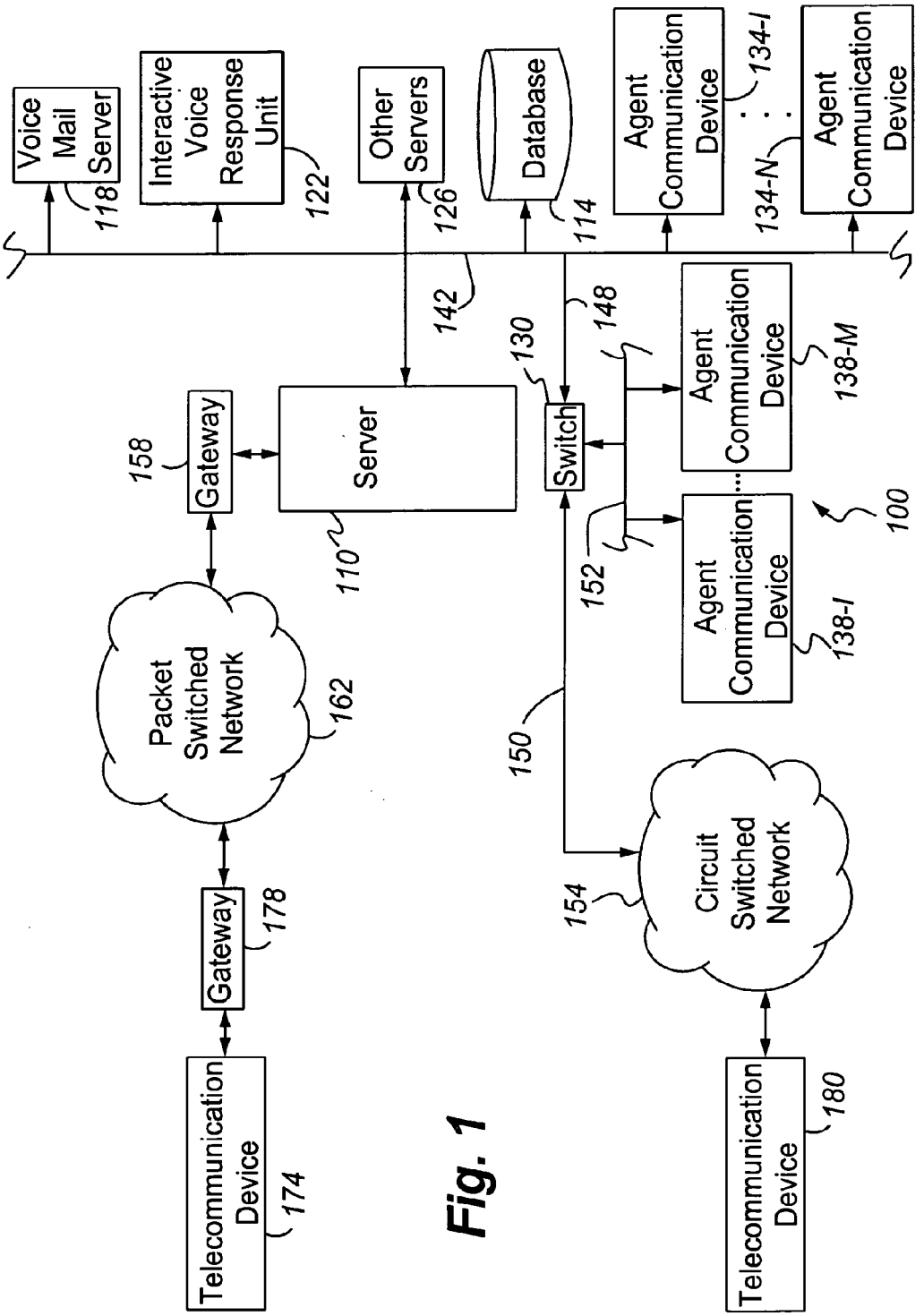

Voice Mail Server
118
Interactive Voice Response Unit
122
Other Servers
126
Database
114
Agent Communication Device
134-1
134-N
Agent Communication Device
142
148
130
158
Gateway
Server
110
Switch
Agent Communication Device
138-M
Agent Communication Device
138-1
100
152
Packet Switched Network
162
150
Gateway
178
154
Circuit Switched Network
Telecommunication Device
174
Telecommunication Device
180

Fig. 1

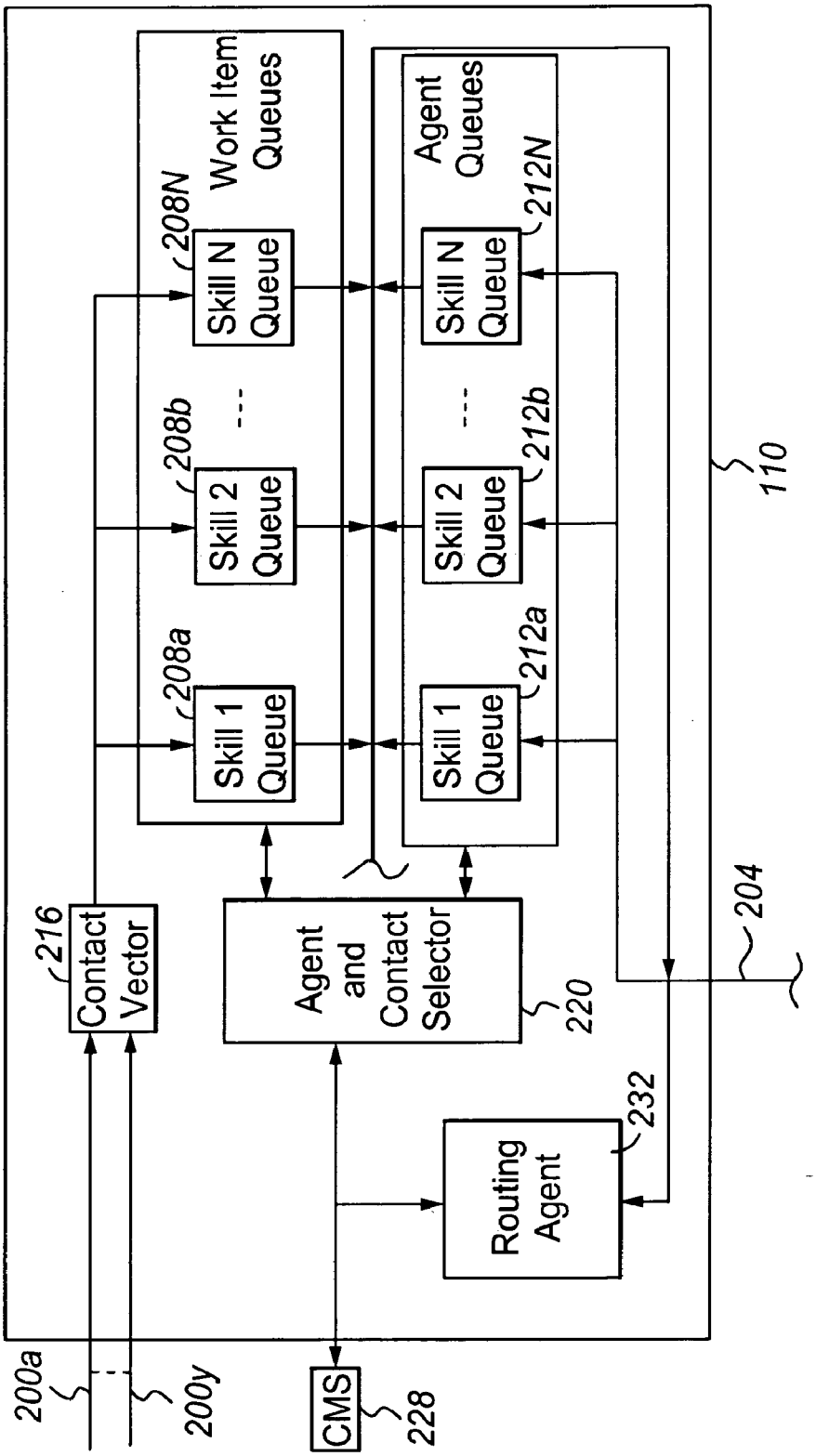

Work Item Queues
Agent Queues
208N
Skill N Queue
212N
Skill N Queue
208b
Skill 2 Queue
212b
Skill 2 Queue
208a
Skill 1 Queue
212a
Skill 1 Queue
110
216
Contact Vector
Agent and Contact Selector
220
204
232
Routing Agent
200a
200y
CMS
228

Fig. 2

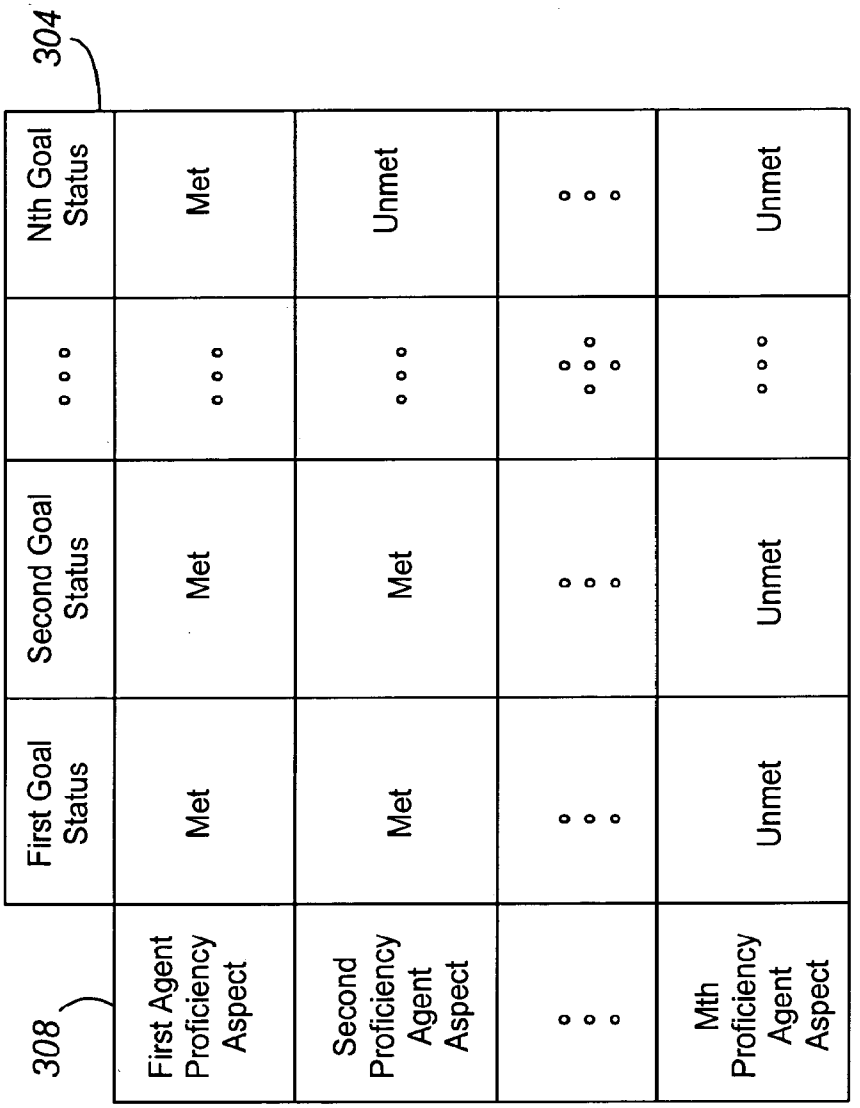

304
308
First Goal Status
Second Goal Status
Nth Goal Status
First Agent Proficiency Aspect
Met
Met
Met
Second Proficiency Agent Aspect
Met
Met
Unmet
Mth Proficiency Agent Aspect
Unmet
Unmet
Unmet
300

Fig. 3

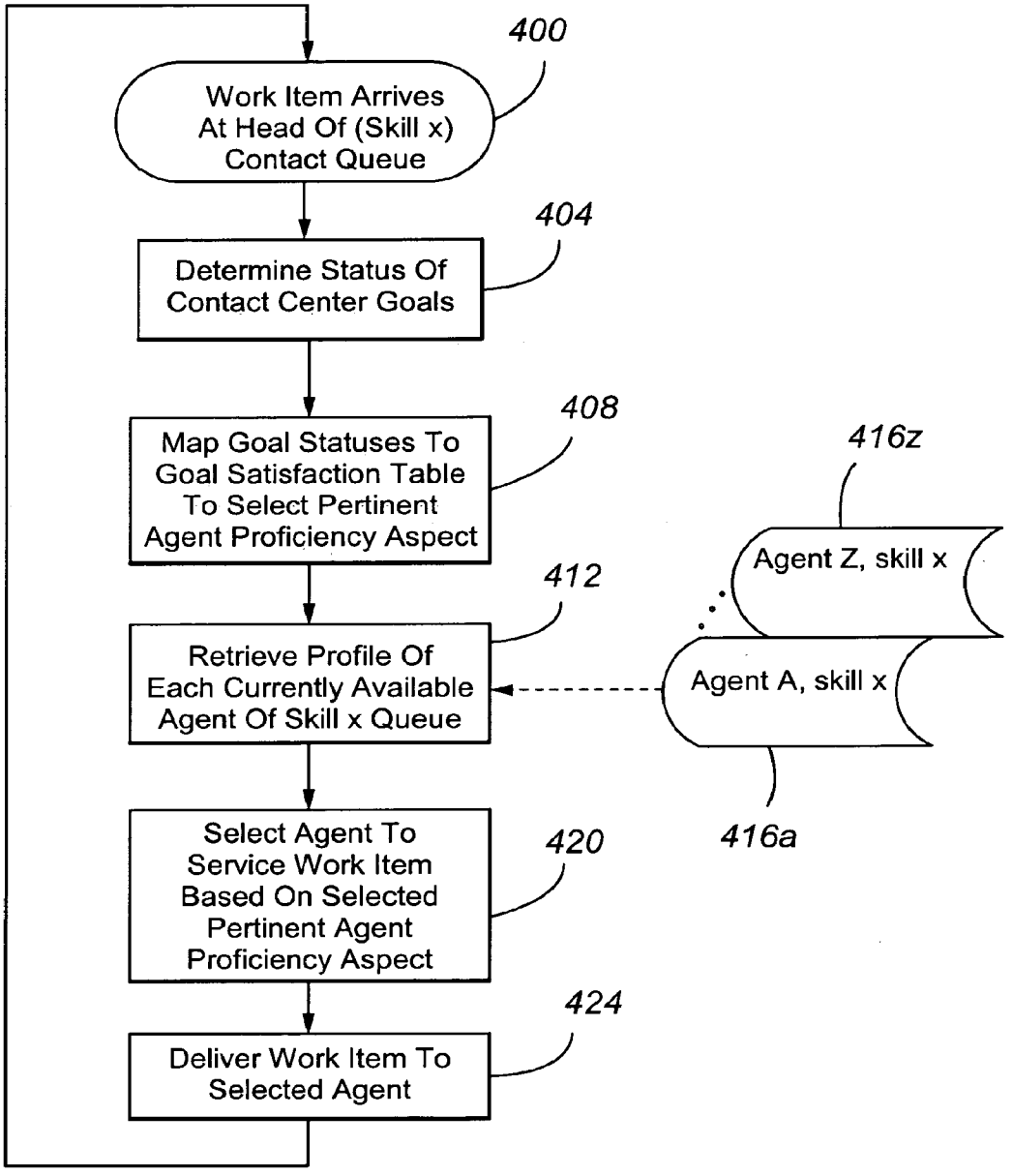

400
Work Item Arrives At Head Of (Skill x) Contact Queue
404
Determine Status Of Contact Center Goals
408
Map Goal Statuses To Goal Satisfaction Table To Select Pertinent Agent Proficiency Aspect
412
Retrieve Profile Of Each Currently Available Agent Of Skill x Queue
420
Select Agent To Service Work Item Based On Selected Pertinent Agent Proficiency Aspect
424
Deliver Work Item To Selected Agent
416z
Agent Z, skill x
Agent A, skill x
416a

Fig. 4

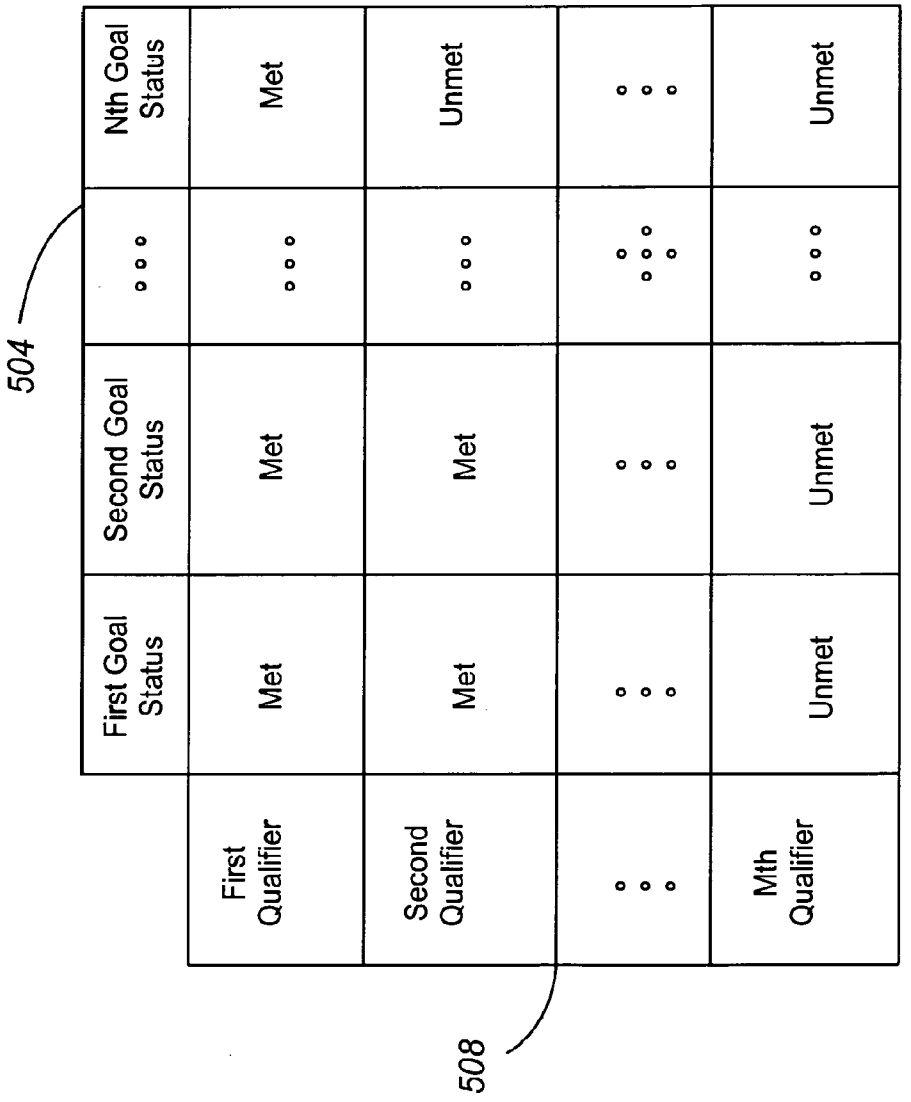

504
First Goal Status
Second Goal Status
Nth Goal Status
First Qualifier
Met
Met
Met
Second Qualifier
Met
Met
Unmet
Mth Qualifier
Unmet
Unmet
Unmet
508
500

Fig. 5

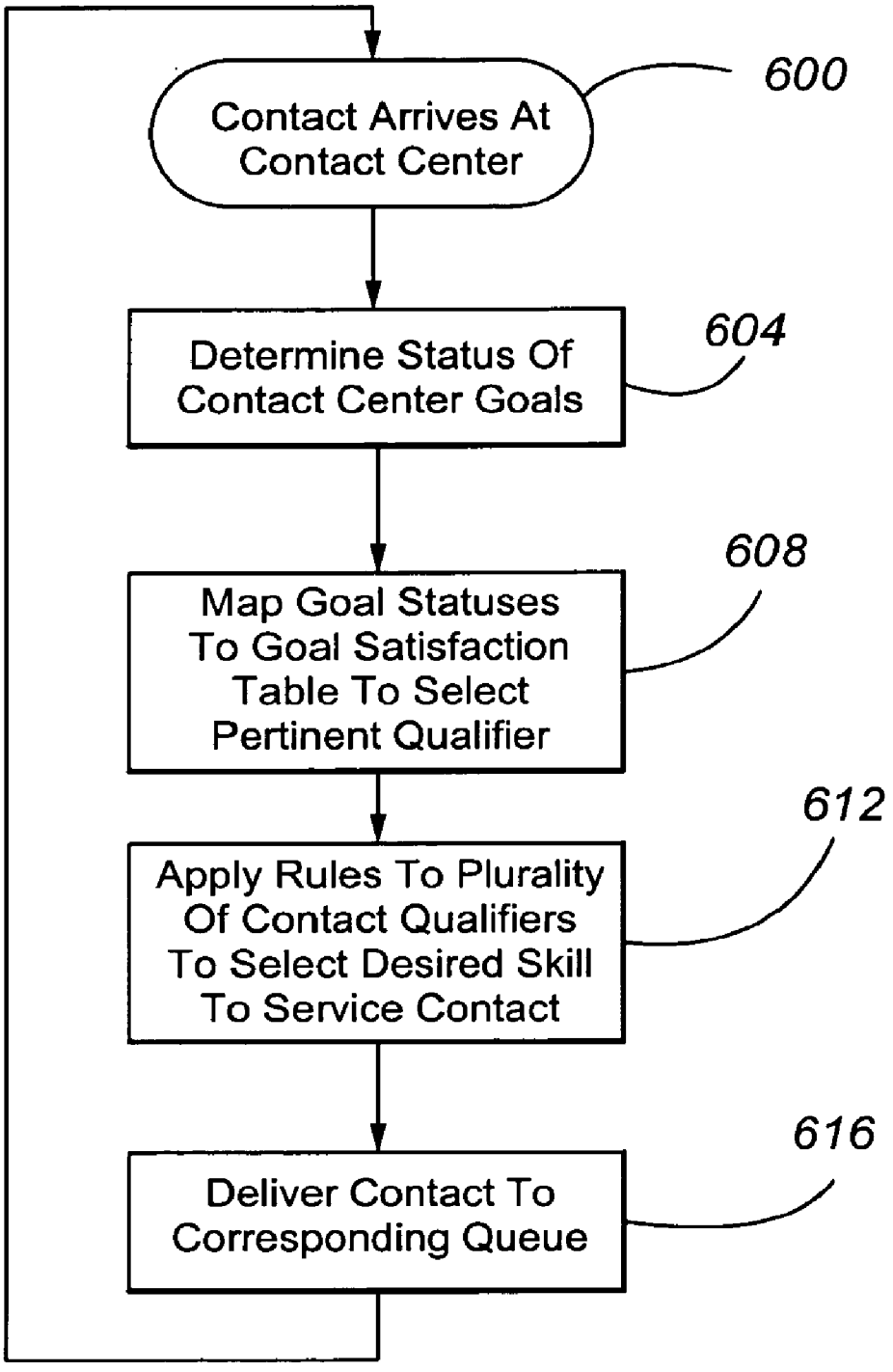

600
Contact Arrives At Contact Center
604
Determine Status Of Contact Center Goals
608
Map Goal Statuses To Goal Satisfaction Table To Select Pertinent Qualifier
612
Apply Rules To Plurality Of Contact Qualifiers To Select Desired Skill To Service Contact
616
Deliver Contact To Corresponding Queue

Fig. 6

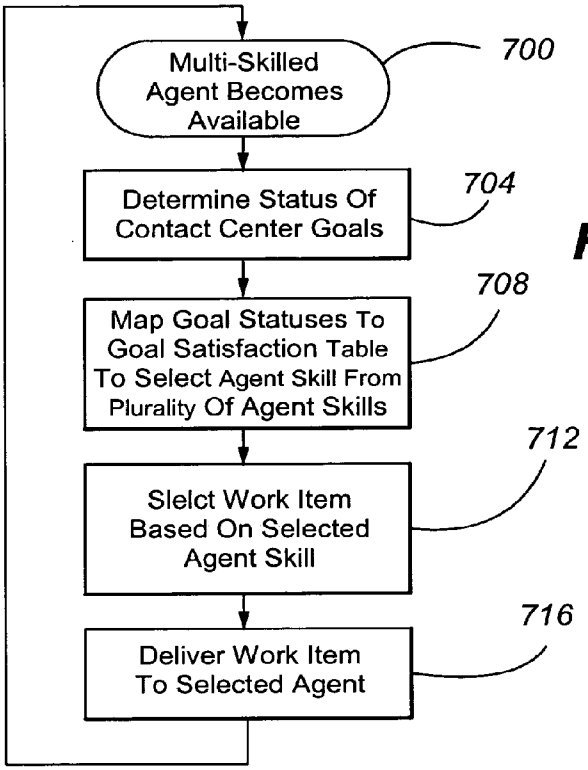


Fig. 7

Fig. 8

804

	First Goal Status	Second Goal Status	∘ ∘ ∘	Nth Goal Status
First Agent Skill	Met	Met	∘ ∘ ∘	Met
Second Agent Skill	Met	Met	∘ ∘ ∘	Unmet
∘ ∘ ∘	∘ ∘ ∘	∘ ∘ ∘	∘ ∘ ∘ ∘	∘ ∘ ∘
Mth Agent Skill	Unmet	Unmet	∘ ∘ ∘	Unmet

808

800

DYNAMIC WORK ASSIGNMENT STRATEGIES BASED ON MULTIPLE ASPECTS OF AGENT PROFICIENCY

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a divisional of U.S. patent application Ser. No. 11/064,367, filed Feb. 22, 2005, which claims the benefit of U.S. Provisional Patent Application Ser. No. 60/613,994, filed Sep. 27, 2004, the entire disclosures of which are hereby incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention is directed generally to servicing a contactor in a contact center and specifically to allocating work items among contact center resources.

BACKGROUND OF THE INVENTION

[0003] Contact centers, such as Automatic Call Distribution or ACD systems, are employed by many enterprises to service customer contacts. A typical contact center includes a switch and/or server to receive and route incoming packet-switched and/or circuit-switched contacts and one or more resources, such as human agents and automated resources (e.g., Interactive Voice Response (IVR) units), to service the incoming contacts. Contact centers distribute contacts, whether inbound or outbound, for servicing to any suitable resource according to predefined criteria. In many existing systems, the criteria for servicing the contact from the moment that the contact center becomes aware of the contact until the contact is connected to an agent are customer-specifiable (i.e., programmable by the operator of the contact center), via a capability called vectoring. Normally in present-day ACDs when the ACD system's controller detects that an agent has become available to handle a contact, the controller identifies all predefined contact-handling skills of the agent (usually in some order of priority) and delivers to the agent the highest-priority oldest contact that matches the agent's highest-priority skill. Agents with a higher skill are normally preferred over agents with lower skill levels when assigning an agent to a contact. When agents have multiple skills, the controller is more likely to select a contact for which the agent has a high skill level over a contact for which the agent has a lesser skill level. Generally, the only condition that results in a contact not being delivered to an available agent is that there are no contacts waiting to be handled.

[0004] Contact-distribution algorithms ultimately seek to maximize contact center performance and profitability. That may involve minimizing cost, maximizing contact throughput, and/or maximizing revenue, among others. Skills-based routing, which allows each agent to be slotted into a number of agent groups based on the agent's skill types and levels, is an attempt to maximize contact center performance and profitability. Skills-based routing systems have been further modified by introducing, as criterion in assigning work items to available agents, the service level associated with each work item. Service level refers to the proportion of work item transactions meeting specified objectives or goals. Service level is typically measured over some period of time or over some number of transactions. Examples of service levels are the percentage of customer problems resolved without further activity (one-and-done), the proportion of telephone calls handled by a qualified representative without requiring a transfer or referral to another agent, the proportion of telephone calls that can be connected to a server without delay, the proportion of email requests that are answered within 24 hours, the proportion of transactions handled not resulting in a customer complaint, the proportion of preferred customer calls handled by fully qualified agents, the percentage of Spanish customers handled by an agent fluent in Spanish, the percentage of telephone calls not abandoned by the customer before connection to an agent, the percentage of customer inquiry telephone calls that are not blocked at the central office switch, the percentage of customer sessions with the self-service World Wide Web pages that are not aborted while waiting for a display, the percentage of customer requests via telephone that can be completed immediately while on the phone, and the percentage of priority telephone calls answered within **8** seconds and handled properly by a qualified server, to name but a few.

[0005] A contact center's goal for a service level is a particular desired value of the service level. The goal is said to be satisfied or attained if the attained or measured service level is at least as high as the desired service level for the goal. Conversely, the goal is said to be not satisfied or unattained if the realized service level is less than the desired service level. For example, the goal of at least 85% of telephone calls from preferred customers each day being answered within 12 seconds would be attained if, among the telephone calls from preferred customers during the current day, 87% were answered within 12 seconds; inversely, if only 84% of such calls are answered within 12 seconds, the goal would be unattained.

[0006] In existing skills-based contact routing algorithms using service levels as part of the work item routing determination, the skill level is normally a simple integer assigned to each skill that the agent can perform and is a composite of all of the various and numerous aspects of agent proficiency or expertise. One example of such a contact routing algorithm is described in U.S. Pat. No. 6,173,053 ("the '053 patent"). The algorithm described in the '053 patent uses agent profiles to identify a best agent to service an incoming contact. Each agent has a service profile for each contact type or skill that they handle. As will be appreciated, a "contact type" is determined by segmentation using suitable criteria, such as language, intent, geography, channel, and the like. A service profile includes present values of a number of service metrics, such as agent proficiency, profitability, customer satisfaction, and agent satisfaction. When a contact of a particular type is available for servicing, the present values of the service metrics of the service profile of each agent who is available to handle the contact are combined into a score according to one of a number of formulas, which correspond to that contact type, and the agent with the best score is assigned to the contact. When the assigned agent finishes handling the contact, his or her performance is evaluated based on the service metrics, and the valuations are used to revise the present values of the service metrics of that agent's service profile. The revision process gives more weight to valuations of more-recently-handled contacts to reflect both long-term and short-term agent performance trends and variations.

[0007] These contact allocation algorithms can have drawbacks. By focusing solely on a composite score they ignore other aspects of agent proficiency. Such aspects include agent effectiveness, speed, efficiency, experience, cross-sell ability, and the like. They also fail to consider the interplay between contact center goals and aspects of agent proficiency. When

different sets of goals are unmet in the contact center, it may advantageous to focus on different aspects of agent proficiency to address the unmet goal sets. By way of illustration, when there is limited work and a surplus of available agents the optimal strategy may be to focus on the agent aspect of effectiveness and assign what work there is to the most effective agents. When work queues are excessively long, the optimal strategy may be to focus on the agent aspect of speed and assign work to the fastest agents.

SUMMARY OF THE INVENTION

[0008] These and other needs are addressed by the various embodiments and configurations of the present invention. The present invention is directed generally to a resource allocation system and method that dynamically and automatically applies different work item destination routing algorithms under different contact center conditions.

[0009] In a first embodiment, a method for servicing work items in a contact center is provided. The contact center has a number (or set) of performance goals. Exemplary contact center objectives or goals include, in addition to the goal examples noted above, a maximum wait time in a work item queue, minimum agent staffing level in an agent queue, minimum revenue realized per serviced work item, a minimum customer satisfaction level, maximum time for an agent to a work item, a minimum number of contacts to be serviced by a set of agents during a selected time period, and/or a specified degree of compliance therewith. The steps of the method include:

[0010] (a) selecting a work item for routing to a servicing destination;

[0011] (b) determining, for each performance goal, a status of goal realization; and

[0012] (c) selecting the servicing destination based, at least in part, on the statuses of the performance goals. Differing sets of goal statuses commonly result in differing sets of servicing destination selection criteria and/or different work item routing algorithms.

[0013] The work item can be any item of work for a contact center resource, such as a human or robotic agent. Typically, a work item is a contact, such as a voice call, an email, a facsimile, a voice message, an instant message, and Web chat.

[0014] The servicing destination can be a contact center resource, such as a human agent, an automated attendant, an Interactive Voice Recognition unit or IVR, and a class of service, such as a work item queue.

[0015] The status of goal realization can take many different forms. The status can be based on a simple binary system; that is, the goal is either attained or not attained based on the service level measured for the goal. The status can be based on meeting various selected service levels for a corresponding goal and/or levels of compliance with the goal. For example, the goal is satisfied for only Y % of contacts, is X % out of compliance, and the like. The status can be a combination of the foregoing.

[0016] When the servicing destination is an agent, the agent selection criterion is one or more aspects of agent proficiency. Exemplary aspects of agent proficiency include agent effectiveness, revenue generating proficiency, customer satisfaction level, speed, efficiency, experience, cross-sell ability, personal satisfaction, proficiency at closing the sale, and occupancy.

[0017] When the servicing destination is a class of service or work item queue, the selection criterion is typically one or more qualifiers.

[0018] In one configuration, a goal satisfaction table is maintained to facilitate determination of the appropriate selection criteria. The goal satisfaction table maps the differing sets of outcomes for the various goals against the desired selection criteria.

[0019] The present invention can have a number of advantages relative to the prior art. For example, the present invention does not use a composite score and thereby ignore other aspects of agent proficiency. It can dynamically consider the various agent proficiency aspects based on the conditions of the contact center to achieve the best results under the current conditions. By using different selection criteria or selection algorithms for different sets of goal statuses, the present invention can dynamically consider the complex interplay between, often conflicting, contact center goals, such as revenue generation and customer satisfaction. As will be appreciated, the priorities of the goals typically vary depending on the contact center state.

[0020] These and other advantages will be apparent from the disclosure of the invention(s) contained herein.

[0021] The above-described embodiments and configurations are neither complete nor exhaustive. As will be appreciated, other embodiments of the invention are possible utilizing, alone or in combination, one or more of the features set forth above or described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. **1** is a block diagram depicting a contact center according to an embodiment of the present invention;

[0023] FIG. **2** is a block diagram of a server according to an embodiment of the present invention;

[0024] FIG. **3** is a goal satisfaction table mapping goal status against desired agent proficiency aspect for an embodiment of the present invention;

[0025] FIG. **4** is a flow chart depicting an operational embodiment of the routing agent according to an embodiment of the present invention;

[0026] FIG. **5** is a goal satisfaction table mapping goal status against desired agent proficiency aspect for another embodiment of the present invention;

[0027] FIG. **6** is a flow chart depicting an operational embodiment of the routing agent according to yet another embodiment of the present invention;

[0028] FIG. **7** is a flow chart depicting an operational embodiment of the routing agent and agent in contact selector according to an embodiment of the present invention; and

[0029] FIG. **8** is a goal satisfaction table mapping agent skill against goal status for an embodiment of the present invention.

DETAILED DESCRIPTION

[0030] The invention will be illustrated below in conjunction with an exemplary communication system. Although well suited for use with, e.g., a system having an ACD or other similar contact processing switch, the invention is not limited to use with any particular type of communication system switch or configuration of system elements. Those skilled in the art will recognize that the disclosed techniques may be used in any communication application in which it is desirable to provide improved contact processing.

[0031] FIG. **1** shows an illustrative embodiment of the present invention. A contact center **100** comprises a central server **110**, a set of data stores or databases **114** containing contact or customer related information and other information that can enhance the value and efficiency of the contact, and a plurality of servers, namely a voice mail server **118**, an Interactive Voice Response unit or IVR **122**, and other servers **126**, a switch **130**, a plurality of working agents (not shown) operating packet-switched (first) telecommunication devices **134-1** to N (such as computer work stations or personal computers), and/or circuit-switched (second) telecommunication devices **138-1** to M, all interconnected by a local area network LAN (or wide area network WAN) **142**. The servers can be connected via optional communication lines **146** to the switch **130**. As will be appreciated, the other servers **126** can also include a scanner (which is normally not connected to the switch **130** or Web server), VoIP software, video contact software, voice messaging software, an IP voice server, a fax server, a web server, and an email server) and the like. The switch **130** is connected via a plurality of trunks **150** to the Public Switch Telecommunication Network or PSTN **154** and via link(s) **152** to the second telecommunication devices **138-1** to M. A gateway **158** is positioned between the server **110** and the packet-switched network **162** to process communications passing between the server **110** and the network **162**.

[0032] The term "switch" or "server" as used herein should be understood to include a PBX, an ACD, an enterprise switch, an enterprise server, or other type of telecommunications system switch or server, as well as other types of processor-based communication control devices such as media servers, computers, adjuncts, etc.

[0033] Referring to FIG. **2**, one possible configuration of the server **110** is depicted. The server **110** is in communication with a plurality of customer communication lines **200***a-y* (which can be one or more trunks, phone lines, etc.) and agent communication line **204** (which can be a voice-and-data transmission line such as LAN **142** and/or a circuit switched voice line **140**). The server **110** can include Avaya Inc.'s an Operational Analyst™ with On-Line Analytical Processing or OLAP technology or a Call Management System or CMS **228** that gathers contact records and contact-center statistics for use in generating contact-center reports. OA and CMS will hereinafter be referred to jointly as CMS **228**.

[0034] The switch **130** and/or server **110** can be any architecture for directing contacts to one or more telecommunication devices. Illustratively, the switch and/or server can be a modified form of the subscriber-premises equipment disclosed in U.S. Pat. Nos. 6,192,122; 6,173,053; 6,163,607; 5,982,873; 5,905,793; 5,828,747; and 5,206,903, all of which are incorporated herein by this reference; Avaya Inc.'s Definity™ Private-Branch Exchange (PBX)-based ACD system; MultiVantage™ PBX, CRM Central 2000 Server™, Communication Manager™, S8300™, IP600™ or S8700™ media server, and/or Avaya Interaction Center™. Typically, the switch/server is a stored-program-controlled system that conventionally includes interfaces to external communication links, a communications switching fabric, service circuits (e.g., tone generators, announcement circuits, etc.), memory for storing control programs and data, and a processor (i.e., a computer) for executing the stored control programs to control the interfaces and the fabric and to provide automatic contact-distribution functionality. The switch and/or server typically include a network interface card (not shown) to provide services to the serviced telecommunication devices. Other types of known switches and servers are well known in the art and therefore not described in detail herein.

[0035] Referring to FIG. **2**, included among the data stored in the server **110** is a set of work item queues **208***a-n* and a separate set of agent queues **212***a-n*. Each work item queue **208***a-n* corresponds to a different set of agent skills, as does each agent queue **212***a-n*. Conventionally, work items are prioritized and either are enqueued in individual ones of the work item queues **208***a-n* in their order of priority or are enqueued in different ones of a plurality of work item queues that correspond to a different priority. Likewise, each agent's skills are prioritized according to his or her level of expertise in that skill, and either agents are enqueued in individual ones of agent queues **212***a-n* in their order of expertise level or are enqueued in different ones of a plurality of agent queues **212***a-n* that correspond to a skill and each one of which corresponds to a different expertise level. Included among the control programs in the server **110** is a work item vector **216**. Contacts incoming to the contact center are assigned by work item vector **216** to different work item queues **208***a-n* based upon a number of predetermined criteria, including customer identity, customer needs, contact center needs, current work item center queue lengths, customer value, and the agent skill that is required for the proper handling of the contact. Agents who are available for handling contacts are assigned to agent queues **212***a-n* based upon the skills that they possess. An agent may have multiple skills, and hence may be assigned to multiple agent queues **212***a-n* simultaneously. Furthermore, an agent may have different levels of skill expertise (e.g., skill levels **1**-N in one configuration or merely primary skills and secondary skills in another configuration), and hence may be assigned to different agent queues **212***a-n* at different expertise levels. Call vectoring, one type of work item routing, is described in DEFINITY Communications System Generic 3 Call Vectoring/Expert Agent Selection (EAS) Guide, AT&T publication no. 555-230-520 (Issue 3, Nov. 1993). Skills-based ACD is described in further detail in U.S. Pat. Nos. 6,173,053 and 5,206,903.

[0036] Referring to FIG. **1**, the gateway **158** can be Avaya Inc.'s, G700™, G600™, or MCC/SCC™ media gateway and may be implemented as hardware such as via an adjunct processor (as shown) or as a chip in the server. The first telecommunication devices **134-1**, . . . **134**-N are packet-switched and can include, for example, IP hardphones such as the Avaya Inc.'s, 4600 Series IP Phones™, IP softphones such as Avaya Inc.'s, IP Softphone™, Personal Digital Assistants or PDAs, Personal Computers or PCs, laptops, packet-based H.320 video phones and conferencing units, packet-based voice messaging and response units, and packet-based traditional computer telephony adjuncts.

[0037] The second telecommunication devices **138-1**, . . . **138**-M are circuit-switched. Each of the telecommunication devices **138-1**, . . . **138**-M corresponds to one of a set of internal extensions Ext**1**, . . . ExtM, respectively. These extensions are referred to herein as "internal" in that they are extensions within the premises that are directly serviced by the switch. More particularly, these extensions correspond to conventional telecommunication device endpoints serviced by the switch/server, and the switch/server can direct incoming contacts to and receive outgoing contacts from these extensions in a conventional manner. The second telecommunication devices can include, for example, wired and wireless

telephones, PDAs, H.320 video phones and conferencing units, voice messaging and response units, and traditional computer telephony adjuncts.

[0038] It should be noted that the invention does not require any particular type of information transport medium between switch or server and first and second telecommunication devices, i.e., the invention may be implemented with any desired type of transport medium as well as combinations of different types of transport medium.

[0039] The packet-switched network **162** can be any data and/or distributed processing network, such as the Internet. The network **162** typically includes proxies (not shown), registrars (not shown), and routers (not shown) for managing packet flows.

[0040] The packet-switched network **162** is in communication with an external first telecommunication device **174** via a gateway **178**, and the circuit-switched network **154** with an external second telecommunication device **180**. These telecommunication devices are referred to as "external" in that they are not directly supported as telecommunication device endpoints by the switch or server. The telecommunication devices **174** and **180** are an example of devices more generally referred to herein as "external endpoints."

[0041] In a preferred configuration, the server **110**, network **162**, and first telecommunication devices **134** are Session Initiation Protocol or SIP compatible and can include interfaces for various other protocols such as the Lightweight Directory Access Protocol or LDAP, H.248, H.323, Simple Mail Transfer Protocol or SMTP, IMAP4, ISDN, El/T1, and analog line or trunk.

[0042] It should be emphasized that the configuration of the switch, server, user telecommunication devices, and other elements as shown in FIG. **1** is for purposes of illustration only and should not be construed as limiting the invention to any particular arrangement of elements.

[0043] As will be appreciated, the central server **110** is notified via LAN **142** of an incoming contact by the telecommunications component (e.g., switch **130**, fax server, email server, web server, and/or other server) receiving the incoming contact. The incoming contact is held by the receiving telecommunications component until the server **110** forwards instructions to the component to forward or route the contact to a specific contact center resource, such as the IVR unit **122**, the voice mail server **118**, and/or first or second telecommunication device **134**, **138** associated with a selected agent. The server **110** distributes and connects these contacts to telecommunication devices of available agents based on the predetermined criteria noted above. When the central server **110** forwards a voice contact (or first work item) to an agent, the central server **110** also forwards customer-related information from databases **114** to the agent's computer work station for viewing (such as by a pop-up display) to permit the agent to better serve the customer. Depending on the contact center configuration, the central server may forward a list of work items to an available agent to preview before forwarding the contact itself and the data associated therewith to the agent. The agents process the contacts or work items sent to them by the central server **110**. This embodiment is particularly suited for a Customer Relationship Management (CRM) environment in which customers are permitted to use any media to contact a business. In a CRM environment, both real-time and non-real-time contacts must be handled and distributed with equal efficiency and effectiveness.

[0044] According to the invention, included among the programs executing on the server **110** are an agent and work item selector **220** and routing agent **232**. The selector **220** and routing agent **232** are stored either in the main memory or in a peripheral memory (e.g., disk, CD ROM, etc.) or some other computer-readable medium of the center **100**. The selector **220** and agent **232** collectively effect an assignment between available contacts and available agents in a way that tends to maximize contact center efficiency for the current contact center state. The selector **220** uses predefined criteria in selecting an appropriate agent to service the contact. The routing agent **232** assists the work item vector **216** in routing the contacts to the appropriate queue **208** and/or the selector **220** in routing a contact to a most desirable agent in the queue **212**. The routing agent **232**, in particular, obtains, for each of a plurality of contact center goals or objectives, status information, or information respecting whether or not a corresponding goal is being met or unmet and/or a level to which the corresponding goal is being met or unmet. For example, exemplary goal levels can be expressed as actual, average or median wait times in each queue **208**, actual, average, or median agent staffing levels in each queue **212**, actual, average, or median revenue (whether gross or net) realized by a designated set of agents (such as the agents in an agent skill queue) per serviced contact, a customer satisfaction level for a set of designated agents determined during or after servicing of each customer's contact, actual, average, or median time for the agents in a set of designated agents to service contacts, and number of contacts to be serviced by a set of designated agents during a selected time period. This information, along with other statistics is typically gathered by the CMS **228**.

[0045] The agent and customer profiles are typically maintained and updated by a profile generator (not shown). Upon the completion of handling a contact, the generator collects selected metrics for the contact. These metrics include the skill involved in servicing the contact, the identifier of the servicing agent, the contact duration, the transaction or contact type (e.g., catalog sale, information request, complaint, etc.), the time-of-day, the result (e.g., the type of sale, the number of units sold, revenue generated, service ticket closure or escalation, the information provided, etc.), a self-rating of the servicing agent respecting the agent's proficiency in handling the contact, the rating of the customer of the agent's proficiency in handling the contact, the rating of another party, such as the agent's supervisor or another observer, of how the contact was serviced, whether the agent requested assistance, and whether the agent's training was completed, and stores the information in the database **114**, such as CMS **228**. The metrics over a selected period of time are typically stored under each agent's profile. Each agent profile typically includes metrics associated with a plurality of contacts serviced by the agent for each agent skill, and each customer profile includes metrics associated with a plurality of contacts by the customer.

[0046] The metrics typically relate to a broad variety of agent proficiency aspects, which can vary by agent skill type (or work item type) for multi-skilled agents. Exemplary proficiency aspects include agent effectiveness (e.g., X % of contacts serviced by agent have a favorable outcome for the customer and/or contact center), agent revenue generating proficiency (e.g., $Y generated by the agent per serviced contact), agent customer satisfaction level (e.g., Z % of contacts serviced by agent received a satisfactory customer sat-

isfaction level rating), the agent speed (e.g., average contact service time for agent is W minutes/contact, U % of contacts are serviced within V minutes), agent efficiency (e.g., T % of contacts serviced by agent are one-and-done), experience (e.g., number of months/years agent has serviced contacts), ability to cross-sell (e.g., S % of contacts serviced by agent result in additional revenue due to cross-selling), personal agent satisfaction (e.g., the agent most prefers serving work items of skill X rather than work items of skill Y), and occupancy (e.g., select the agent who has worked less over a specified period to service a work item). Although only one exemplary metric has been provided for each proficiency aspect, it is to be understood that each aspect can be a composite of multiple different metrics. For example, the effectiveness of an agent can be a function of the percent of contacts having a successful outcome, the average value realized for each contact, and the average customer feedback score. Stated another way, it is possible for one proficiency aspect to be a function, at least in part, of another proficiency aspect.

[0047] The agent **232** dynamically and automatically provides the most relevant proficiency aspect (or metric) to the selector **220** as conditions change within the contact center. As used herein, a "condition" in a contact center is defined as the realization status of a goal and/or the level of satisfaction or dissatisfaction of a goal. In connection with this function, the contact center maintains one or more goal satisfaction tables mapping the goal status against the desired set of agent proficiency aspects to be employed in work item routing. As will be appreciated, many goals are inconsistent or conflicting, and the tables permit the agent **232** to select routing criteria and/or algorithm that addresses a particular goal or set of goals considered most important in view of the particular facts surrounding the performance of the contact center at the time of agent selection.

[0048] FIG. **3** is an example of goal satisfaction table **300**. The horizontal axis **304** provides the status of a selected goal while the vertical axis **308** provides the suitable agent proficiency metric for a unique set of contact center conditions. For example, the first agent proficiency aspect is to be used in work item routing when each of the first, second, . . . Nth goals are met. The second agent proficiency aspect is to be used in work item routing when each of the first and second goals have been met but the Nth goal is unmet. The Mth agent proficiency aspect is to be used in work item routing when each of the first, second, . . . Nth goals are unmet. Stated more simply, when there is a shortage of work the agent **232** could select the available agent having the highest metric for agent effectiveness. When there is surplus of work the agent **232** could select the contact for servicing by the available agent that requires the agent skill having the highest metric for agent efficiency. Although the table **300** is depicted as being two-dimensional, one of ordinary skill in the art will readily appreciate that it can have more than two dimensions, depending on the application. As will be further appreciated, the table is not required to be binary. It can reflect the varying degrees to which a selected goal is being met or not being met (i.e., the first goal has a status of being only X % satisfied) and/or the trend or rate at which the goal is changing (i.e., the first or second mathematical derivative of the function describing the time variation in the goal). As will be further appreciated, not only can there be a different goal satisfaction table for a grouping of agents depending on the time-of-day or day-of-week (e.g., the agent queue **212***a* has a first goal satisfaction table for the business week and a second goal satisfaction table for the weekend to reflect changes in customer expectations/behavior) but also each agent queue **212**, or enterprise department or business segment, can have a different goal satisfaction table (e.g., a sales department versus a service or customer help department).

[0049] The term "stored list" or "table" should be understood to include any ordered set of information or data stored in memory or other storage device accessible to the switch and/or server. The invention does not require that the information be stored in any particular length or format, e.g., a tabular format, a closed- or open-set, and numerous suitable storage formats will be readily apparent to those skilled in the art.

[0050] The selector **220** selects a suitable agent to service a work item at the head of a queue **208** based, at least in part, on the controlling agent proficiency aspect (or set of proficiency aspects) received from the agent **232**. For example, when several agents are currently available or will be available within a selected period of time to service the work item the selector **220** selects the agent from among the group that has the highest metric score for the controlling agent proficiency aspect (or the highest metric scores for the set of proficiency aspects). In another example, when two work items are at the head of different queues **208** and an agent that is currently available or will be available within a selected period of time is in each of the two agent queues **212** servicing the respective work item queues **208** (or the agent is multi-skilled and is therefore in the two relevant agent queues **212**), the work item routed to the agent is the work item that requires the agent proficiency aspect for which the agent has the highest metric or score.

[0051] The collective operation of the agent **232** and selector **220** will now be described with reference to FIG. **4**.

[0052] In step **400**, a contact arrives at the head of a work item queue **208** having skill X.

[0053] In step **404**, the agent **232** determines the status of the various contact center goals. Typically, the agent **232** obtains this information from CMS **228**.

[0054] In step **408**, the agent **232** maps the statuses of the various goals to the goal satisfaction table **300** to select a pertinent controlling agent proficiency aspect or set of controlling agent proficiency aspects. "Mapping" refers broadly to include any technique for determining if a given set of contact center goal statuses has a corresponding entry on a stored list. The agent **232** then provides the set of aspects to the selector **220**.

[0055] In step **412**, the selector **220** retrieves the profile(s) **416** of each currently available agent in the skill X agent queue **212** servicing the skill X work item queue **208**. The profile(s) are typically obtained from the database **114**.

[0056] In step **420**, the selector **220**, based on the controlling set of aspects and each agent's respective scores on each of the aspects, selects the appropriate agent to service the work item.

[0057] In step **424**, the selector **220** delivers the work item to the selected agent.

[0058] The agent **232** then returns to step **400** to repeat the foregoing steps for the next work item reaching the head of the skill X work item queue **208**.

[0059] Another embodiment of the invention will now be discussed. In this embodiment, a multi-skilled agent becomes available to service one of a plurality of different types of available work items (each of which he is skilled to service),

and the agent **232**, based on the condition of the contact center, selects the appropriate skill of the plurality of agent skills to use in selecting the appropriate work item. Stated simply, the specific skill selection criteria depends on the current statuses, outcomes, and/or levels of realization of the various contact center goals.

[0060] FIG. **8** depicts a goal satisfaction table **800** for use by the agent **232** in this embodiment. The horizontal axis **804** maps the status of each goal against the agent skill on the vertical axis **808**. In other words, when the first, second, . . . Nth goals are met the first agent skill is selected as the basis for selecting the appropriate work item from among the queued plurality of different types of work items. Of the queued plurality of work item types, the selected work item is generally the most consistent with the selected skill.

[0061] The collective operation of the agent **232** and selector **220** will now be described with reference to FIG. **7**.

[0062] In step **700**, a multi-skilled agent becomes available for servicing a queued work item, and there are a plurality of queued work items, typically at the heads of different queues, that he or she is skilled to service.

[0063] In step **704**, the agent **232** determines the status of the various contact center goals. Typically, the agent **232** obtains this information from CMS **228**.

[0064] In step **708**, the agent **232** maps the statuses of the various goals to the goal satisfaction table **800** to select a pertinent skill or set of skills of the available agent to use in selecting which of the available work items the agent will service. For example, when there are a few work items in the queues and the goals are met the selector **220** selects the agent skill in which the agent is most effective. Conversely when there is a high volume of work items in the queues and one or more of the goals are not met, the skill is selected for which the agent is faster compared to his or her peers.

[0065] In step **712**, the selector **220**, based on the selected skill or set of skills selects the work item for assignment to the agent.

[0066] In step **716**, the assigned work item is delivered to the agent for servicing.

[0067] The agent **232** then returns to step **700** to await the next agent becoming available.

[0068] Another embodiment of the invention will now be discussed. In this embodiment, the agent **232** selects the appropriate queue **208** (or class of service) for an incoming contact based on the condition of the contact center. In other words, the specific selection criteria (e.g., set of qualifiers) and/or queue selection algorithm used to select the appropriate work item queue **208** for a given contact depends on the current statuses, outcomes, and/or levels of realization of the various contact center goals.

[0069] FIG. **5** depicts a goal satisfaction table **500** for use by the agent **232** in this embodiment. The horizontal axis **504** maps the status of each goal against the qualifier (or set of qualifiers) on the vertical axis **508**. In other words, when the first, second, . . . Nth goals are met the contact is assigned the first qualifier (or first set of qualifiers). As used herein, a qualifier refers to an attribute assigned to a contact that determines, at least in part, to which work item queue **208** the corresponding contact is forwarded (or to which class of service the contact is assigned). Examples of qualifiers include contactor attributes (identity, language, socioeconomic status, value to the contact center, and business history with the enterprise operating the contact center), contact attributes (e.g., communication channel or media), and contactor needs (e.g., type or nature of contact, and purpose of contact). When the first and second goals are met but the Nth goal is unmet, the contact is assigned the second qualifier. When all of the goals are unmet, the contact is assigned the Mth qualifier. For example, when all of the goals (for the contact center and/or gold queue) are being satisfied, a contact from a gold customer is assigned a gold qualifier and sent to the gold queue. When the contact center (and/or the gold queue) is experiencing an extremely high volume of incoming contacts, the contact from the gold customer is assigned a silver qualifier and sent to the silver queue ordinarily reserved for contacts from silver customers.

[0070] The collective operation of the agent **232** and selector **220** will now be described with reference to FIG. **6**.

[0071] In step **600**, an incoming contact arrives at the contact center.

[0072] In step **604**, the agent **232** determines the status of the various contact center goals. Typically, the agent **232** obtains this information from CMS **228**.

[0073] In step **608**, the agent **232** maps the statuses of the various goals to the goal satisfaction table **300** to select a pertinent set of qualifier(s) for the contact. The agent **232** then provides the controlling qualifier(s) and/or queue selection algorithm to the work item vector **216**.

[0074] In step **612**, the work item vector **216** applies rules to the set of contact qualifier(s) received from the agent **232** and any other contact qualifier already assigned to the contact to select a desired skill queue **208** to service the contact. The rules may be those currently used in the art or rules configured specifically for the contact center application.

[0075] In step **616**, the work item vector **216** delivers the contact to the selected queue **208** known techniques. Typically, a pointer to the contact is positioned in the appropriate queue position queue data structure.

[0076] The agent **232** then returns to step **600** to await the next incoming contact.

[0077] A number of variations and modifications of the invention can be used. It would be possible to provide for some features of the invention without providing others.

[0078] For example, the server and/or switch can be a software-controlled system including a processing unit (CPU), microprocessor, or other type of digital data processor executing software or an Application-Specific Integrated Circuit (ASIC) as well as various portions or combinations of such elements. The memory may be a random access memory (RAM), a read-only memory (ROM), or combinations of these and other types of electronic memory devices.

[0079] The present invention, in various embodiments, includes components, methods, processes, systems and/or apparatus substantially as depicted and described herein, including various embodiments, subcombinations, and subsets thereof. Those of skill in the art will understand how to make and use the present invention after understanding the present disclosure. The present invention, in various embodiments, includes providing devices and processes in the absence of items not depicted and/or described herein or in various embodiments hereof, including in the absence of such items as may have been used in previous devices or processes, e.g., for improving performance, achieving ease and\or reducing cost of implementation.

[0080] The foregoing discussion of the invention has been presented for purposes of illustration and description. The foregoing is not intended to limit the invention to the form or forms disclosed herein. In the foregoing Detailed Description

for example, various features of the invention are grouped together in one or more embodiments for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the following claims are hereby incorporated into this Detailed Description, with each claim standing on its own as a separate preferred embodiment of the invention.

[0081] Moreover though the description of the invention has included description of one or more embodiments and certain variations and modifications, other variations and modifications are within the scope of the invention, e.g., as may be within the skill and knowledge of those in the art, after understanding the present disclosure. It is intended to obtain rights which include alternative embodiments to the extent permitted, including alternate, interchangeable and/or equivalent structures, functions, ranges or steps to those claimed, whether or not such alternate, interchangeable and/or equivalent structures, functions, ranges or steps are disclosed herein, and without intending to publicly dedicate any patentable subject matter.

What is claimed is:

1. A goal satisfaction table, comprising:

(a) a plurality of goals, each goal having at least two corresponding goal statuses, to provide a plurality of sets of goal statuses for the plurality of goals; and

(b) a set of at least one of (i) qualifiers and (ii) agent proficiency aspects corresponding to each of the plurality of sets of goal statuses.

2. The table of claim **1**, wherein the at least one of (i) qualifiers and (ii)agent proficiency aspects is the qualifiers.

3. The table of claim **1**, wherein the at least one of (i) qualifiers and (ii) agent proficiency aspects is the agent proficiency aspects.

4. The table of claim **1**, wherein plurality of sets of goal statuses differ from one another and the sets of at least one of (i) qualifiers and (ii) agent proficiency aspects differ from one another.

5. A method for servicing work items in a contact center, the contact center having a plurality of performance goals, comprising:

selecting a multi-skilled agent for servicing one of a plurality of different types of queued work items;

determining, for each performance goal, a status of goal realization;

selecting one of the agent's skills based, at least in part, on the statuses of the performance goals; and

selecting, based on the selected skill, one of the plurality of different types of queued work items for servicing by the multi-skilled agent.

6. The method of claim **5**, wherein the performance goals comprise a plurality of a maximum wait time in a work item queue, minimum agent staffing level in an agent queue, minimum revenue realized per serviced work item, a minimum customer satisfaction level, maximum time for an agent to a work item, and a minimum number of contacts to be serviced by a set of agents during a selected time period.

7. The method of claim **5**, wherein the status of realization of a goal is whether or not the respective goal is met during a selected time period and/or over a selected number of transactions.

8. The method of claim **5**, wherein the status of realization of a goal is a measured service level for the respective goal during a selected time period and/or over a selected number of transactions.

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