

US00RE46153E

(19) **United States**  
(12) **Reissued Patent**  
**Makagon et al.**

(10) **Patent Number: US RE46,153 E**  
(45) **Date of Reissued Patent: Sep. 20, 2016**

(54) **METHOD AND APPARATUS ENABLING VOICE-BASED MANAGEMENT OF STATE AND INTERACTION OF A REMOTE KNOWLEDGE WORKER IN A CONTACT CENTER ENVIRONMENT**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

3,914,559 A 10/1975 Knollman  
4,048,452 A 9/1977 Oehring et al.

(Continued)

**FOREIGN PATENT DOCUMENTS**

AT 270486 7/2004  
AT 281039 11/2004

(Continued)

**OTHER PUBLICATIONS**

“Competitive Gateway Product,” Nikkei Communications, Japan, No. 257, Nov. 1997, 18 pages.

(Continued)

(71) Applicant: **Genesys Telecommunications Laboratories, Inc.**, Daly City, CA (US)

(72) Inventors: **Petr Makagon**, San Francisco, CA (US); **Andriy Ryabchun**, Mill Valley, CA (US); **Nikolay Anisimov**, Concord, CA (US)

(73) Assignee: **GENESYS TELECOMMUNICATIONS LABORATORIES, INC.**, Daly City, CA (US)

(21) Appl. No.: **14/578,149**

(22) Filed: **Dec. 19, 2014**

**Related U.S. Patent Documents**

Reissue of:

(64) Patent No.: **7,222,301**  
Issued: **May 22, 2007**  
Appl. No.: **10/406,511**  
Filed: **Apr. 2, 2003**

U.S. Applications:

(63) Continuation-in-part of application No. 10/269,124, filed on Oct. 10, 2002, now Pat. No. 6,985,943.

(51) **Int. Cl.**  
**G06Q 10/06** (2012.01)  
**H04M 3/42** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **G06Q 10/06** (2013.01); **H04M 3/42323** (2013.01)

(58) **Field of Classification Search**  
CPC ..... **G06Q 10/06**; **H04M 3/42323**  
USPC ..... **715/727, 728; 709/203, 220, 224, 227**  
See application file for complete search history.

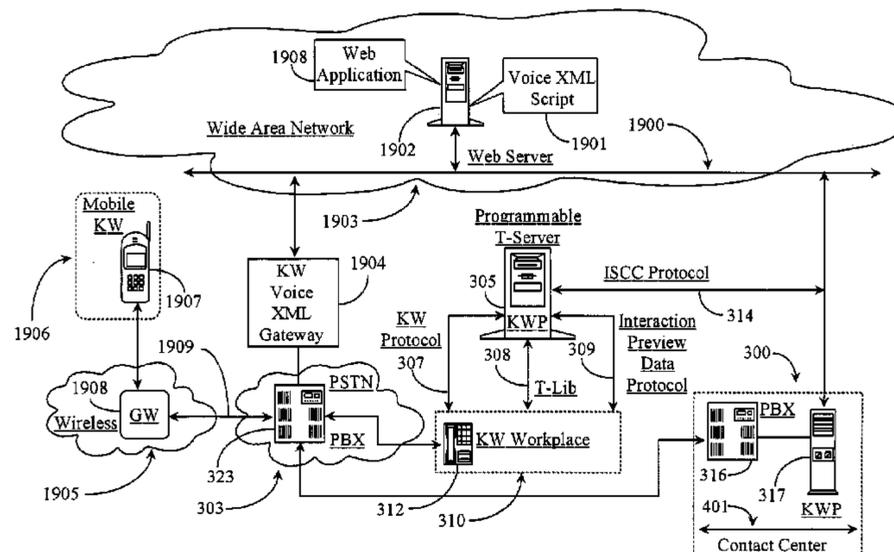
*Primary Examiner* — Fred Ferris, III

(74) *Attorney, Agent, or Firm* — Lewis Roca Rothgerber Christie LLP

(57) **ABSTRACT**

A network system for enabling voice interaction between communications-center applications and human agents remote from the center has a primary server connected to the network the server controlling at least one routing point used by the center, a secondary server connected to the network the secondary server for generating and serving voice extensible markup language, a voice gateway associated with the secondary server, the gateway for executing voice extensible markup language and recognizing speech input, and a software platform based in the primary server and distributed in part as a server application to the secondary server, the software suite functioning as a data transformation interface between the center applications and the gateway. In a preferred use agents and applications communicate bi-directionally using VXML.

**32 Claims, 24 Drawing Sheets**



(56)

## References Cited

## U.S. PATENT DOCUMENTS

4,056,683 A	11/1977	Suehiro	5,117,225 A	5/1992	Wang
4,290,141 A	9/1981	Anderson et al.	5,136,633 A	8/1992	Tejada et al.
4,320,256 A	3/1982	Freeman	5,155,761 A	10/1992	Hammond
4,345,315 A	8/1982	Cadotte et al.	5,164,983 A	11/1992	Brown et al.
4,355,207 A	10/1982	Curtin	5,168,515 A	12/1992	Gechter et al.
4,355,372 A	10/1982	Johnson et al.	5,175,800 A	12/1992	Galis et al.
4,400,587 A	8/1983	Taylor et al.	5,179,589 A	1/1993	Syu
4,439,636 A	3/1984	Newkirk et al.	5,181,236 A	1/1993	LaVallee et al.
4,451,700 A	5/1984	Kempner et al.	5,181,239 A	1/1993	Jolissaint
4,489,438 A	12/1984	Hughes	5,185,782 A	2/1993	Srinivasan
4,512,011 A	4/1985	Turner	5,202,828 A	4/1993	Vertelney et al.
4,517,410 A	5/1985	Williams et al.	5,206,903 A	4/1993	Kohler et al.
4,521,643 A	6/1985	Dupuis et al.	5,208,745 A	5/1993	Quentin et al.
4,523,055 A	6/1985	Hohl et al.	5,212,727 A	5/1993	Ramkumar
4,528,643 A	7/1985	Freeny, Jr.	5,214,688 A	5/1993	Szlam et al.
4,539,435 A	9/1985	Eckmann	5,231,670 A	7/1993	Goldhor et al.
4,555,903 A	12/1985	Heaton	5,247,569 A	9/1993	Cave
4,558,180 A	12/1985	Scordo	5,249,223 A	9/1993	Vanacore
4,559,415 A	12/1985	Bernard et al.	5,253,288 A	10/1993	Frey et al.
4,566,030 A	1/1986	Nickerson et al.	5,256,863 A	10/1993	Ferguson et al.
4,567,323 A	1/1986	Lottes et al.	5,261,096 A	11/1993	Howarth
4,577,062 A	3/1986	Hilleary et al.	5,261,096 A	11/1993	Howarth
4,577,067 A	3/1986	Levy et al.	5,271,058 A	12/1993	Andrews et al.
4,578,700 A	3/1986	Roberts et al.	5,274,635 A	12/1993	Rahman et al.
4,580,012 A	4/1986	Matthews et al.	5,274,700 A	12/1993	Gechter et al.
4,584,602 A	4/1986	Nakagawa	5,274,782 A	12/1993	Chalasanani et al.
4,587,379 A	5/1986	Masuda	5,278,898 A	1/1994	Cambray et al.
4,598,367 A	7/1986	DeFrancesco et al.	5,278,977 A	1/1994	Spencer et al.
4,603,232 A	7/1986	Kurland et al.	5,280,625 A	1/1994	Howarter et al.
4,611,094 A	9/1986	Asmuth et al.	5,283,638 A	2/1994	Engberg et al.
4,625,276 A	11/1986	Benton et al.	5,283,856 A	2/1994	Gross et al.
4,630,200 A	12/1986	Ohmae et al.	5,285,494 A	2/1994	Sprecher et al.
4,630,201 A	12/1986	White	5,288,147 A	2/1994	Schaefer et al.
4,634,809 A	1/1987	Paulsson et al.	5,291,550 A	3/1994	Levy et al.
4,649,563 A	3/1987	Riskin	5,291,551 A	3/1994	Conn et al.
4,654,482 A	3/1987	DeAngelis	5,291,552 A	3/1994	Kerrigan et al.
4,667,287 A	5/1987	Allen et al.	5,299,259 A	3/1994	Otto
4,674,044 A	6/1987	Kalmus et al.	5,299,260 A	3/1994	Shaio
4,679,189 A	7/1987	Olson et al.	5,301,320 A	4/1994	McAtee et al.
4,696,029 A	9/1987	Cohen	5,309,505 A	5/1994	Szlam et al.
4,697,282 A	9/1987	Winter et al.	5,311,574 A	5/1994	Livanos
4,737,983 A	4/1988	Frauenthal et al.	5,311,583 A	5/1994	Friedes et al.
4,756,020 A	7/1988	Fodale	5,315,709 A	5/1994	Alston, Jr. et al.
4,757,267 A	7/1988	Riskin	5,327,486 A	7/1994	Wolff et al.
4,763,191 A	8/1988	Gordon et al.	5,329,583 A	7/1994	Jurgensen et al.
4,763,317 A	8/1988	Lehman et al.	5,333,266 A	7/1994	Boaz et al.
4,763,353 A	8/1988	Canale et al.	5,335,268 A	8/1994	Kelly, Jr. et al.
4,771,425 A	9/1988	Baran et al.	5,335,269 A	8/1994	Steinlicht
4,785,408 A	11/1988	Britton et al.	5,343,477 A	8/1994	Yamada
4,788,715 A	11/1988	Lee	5,343,518 A	8/1994	Kneipp
4,811,382 A	3/1989	Sleevi	5,355,474 A	10/1994	Thuraisingham et al.
4,812,843 A	3/1989	Champion, III et al.	5,359,649 A	10/1994	Rosu et al.
4,829,563 A	5/1989	Crockett et al.	5,363,507 A	11/1994	Nakayama et al.
4,831,518 A	5/1989	Yu et al.	5,367,329 A	11/1994	Nakagaki et al.
4,852,001 A	7/1989	Tsushima et al.	5,369,695 A	11/1994	Chakravarti et al.
4,866,756 A	9/1989	Crane et al.	5,384,766 A	1/1995	Yamato et al.
4,881,261 A	11/1989	Oliphant et al.	5,384,771 A	1/1995	Isidoro et al.
4,893,328 A	1/1990	Peacock	5,384,829 A	1/1995	Heileman, Jr. et al.
4,896,345 A	1/1990	Thorne	5,384,841 A	1/1995	Adams et al.
4,897,866 A	1/1990	Majmudar et al.	5,392,277 A	2/1995	Bernstein
4,908,850 A	3/1990	Masson et al.	5,392,328 A	2/1995	Schmidt et al.
4,924,488 A	5/1990	Kosich	5,392,345 A	2/1995	Otto
4,943,995 A	7/1990	Daudelin et al.	5,392,400 A	2/1995	Berkowitz et al.
4,953,204 A	8/1990	Cuschleg, Jr. et al.	5,402,474 A	3/1995	Miller et al.
4,972,461 A	11/1990	Brown et al.	5,414,762 A	5/1995	Flisik et al.
4,994,985 A	2/1991	Cree et al.	5,422,813 A	6/1995	Schuchman et al.
5,001,710 A	3/1991	Gawrys et al.	5,425,091 A	6/1995	Josephs
5,008,930 A	4/1991	Gawrys et al.	5,425,093 A	6/1995	Trefzger
5,017,917 A	5/1991	Fisher et al.	5,426,594 A	6/1995	Wright et al.
5,020,095 A	5/1991	Morganstein et al.	5,428,608 A	6/1995	Freeman et al.
5,036,535 A	7/1991	Gechter et al.	5,436,965 A	7/1995	Grossman et al.
5,058,152 A	10/1991	Solomon et al.	5,436,967 A	7/1995	Hanson
5,062,103 A	10/1991	Davidson et al.	5,440,719 A	8/1995	Hanes et al.
5,073,890 A	12/1991	Danielsen	5,444,767 A	8/1995	Goetcheus et al.
5,095,504 A	3/1992	Nishikawa et al.	5,444,774 A	8/1995	Friedes
			5,444,823 A	8/1995	Nguyen
			5,450,482 A	9/1995	Chen et al.
			5,450,483 A	9/1995	Williams
			5,452,350 A	9/1995	Reynolds et al.
			5,455,903 A	10/1995	Jolissaint et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

5,459,780 A	10/1995	Sand	5,617,570 A	4/1997	Russell et al.
5,463,685 A	10/1995	Gaechter et al.	5,619,183 A	4/1997	Ziegra et al.
5,465,286 A	11/1995	Clare et al.	5,619,557 A	4/1997	Van Berkum
5,467,391 A	11/1995	Donaghue, Jr. et al.	5,619,648 A	4/1997	Canale et al.
5,469,504 A	11/1995	Blaha	5,621,789 A	4/1997	McCalmont et al.
5,473,680 A	12/1995	Porter	5,621,790 A	4/1997	Grossman et al.
5,475,813 A	12/1995	Cieslak et al.	5,623,600 A	4/1997	Ji et al.
5,479,487 A	12/1995	Hammond	5,624,265 A	4/1997	Redford et al.
5,481,616 A	1/1996	Freadman	5,625,404 A	4/1997	Grady et al.
5,488,648 A	1/1996	Womble	5,625,676 A	4/1997	Greco et al.
5,491,783 A	2/1996	Douglas et al.	5,625,682 A	4/1997	Gray et al.
5,493,564 A	2/1996	Mullan	5,627,764 A	5/1997	Schutzman et al.
5,495,522 A	2/1996	Allen et al.	5,627,884 A	5/1997	Williams et al.
5,495,523 A	2/1996	Stent et al.	5,630,127 A	5/1997	Moore et al.
5,496,392 A	3/1996	Sims et al.	5,632,011 A	5/1997	Landfield et al.
5,497,317 A	3/1996	Hawkins et al.	5,633,920 A	5/1997	Kikinis et al.
5,497,371 A	3/1996	Ellis et al.	5,633,924 A	5/1997	Kaish et al.
5,497,373 A	3/1996	Hulen et al.	5,635,918 A	6/1997	Tett
5,500,891 A	3/1996	Harrington et al.	5,640,445 A	6/1997	David
5,506,898 A	4/1996	Costantini et al.	5,642,411 A	6/1997	Theis
5,509,062 A	4/1996	Carlsen	5,642,477 A	6/1997	de Carmo et al.
5,510,829 A	4/1996	Sugiyama et al.	5,642,511 A	6/1997	Chow et al.
5,511,117 A	4/1996	Zazzera	5,644,720 A	7/1997	Boll et al.
5,517,620 A	5/1996	Hashimoto et al.	5,646,981 A	7/1997	Klein
5,519,773 A	5/1996	Dumas et al.	5,649,105 A	7/1997	Aldred et al.
5,524,047 A	6/1996	Brown et al.	5,652,785 A	7/1997	Richardson, Jr. et al.
5,524,147 A	6/1996	Bean	5,652,789 A	7/1997	Miner et al.
5,526,353 A	6/1996	Henley et al.	5,652,791 A	7/1997	Sunderman et al.
5,528,678 A	6/1996	Kaplan	5,654,961 A	8/1997	Araujo et al.
5,530,740 A	6/1996	Iribarren et al.	5,655,015 A	8/1997	Walsh et al.
5,530,744 A	6/1996	Charalambous et al.	5,657,383 A	8/1997	Gerber et al.
5,533,103 A	7/1996	Peavey et al.	5,659,542 A	8/1997	Bell et al.
5,533,107 A	7/1996	Irwin et al.	5,659,604 A	8/1997	Beckmann
5,533,108 A	7/1996	Harris et al.	5,659,746 A	8/1997	Bankert et al.
5,533,110 A	7/1996	Pinard et al.	5,673,304 A	9/1997	Connor et al.
5,533,115 A	7/1996	Hollenbach et al.	5,673,311 A	9/1997	Andruska et al.
5,535,211 A	7/1996	Yano	5,673,322 A	9/1997	Pepe et al.
5,535,256 A	7/1996	Maloney et al.	5,675,637 A	10/1997	Szlam et al.
5,535,323 A	7/1996	Miller et al.	5,684,870 A	11/1997	Maloney et al.
5,537,470 A	7/1996	Lee	5,689,229 A	11/1997	Chaco et al.
5,537,630 A	7/1996	Berry et al.	5,692,033 A	11/1997	Farris
5,539,811 A	7/1996	Nakamura et al.	5,696,809 A	12/1997	Voit
5,544,220 A	8/1996	Trefzger	5,696,811 A	12/1997	Maloney et al.
5,546,452 A	8/1996	Andrews et al.	5,701,400 A	12/1997	Amado
5,550,816 A	8/1996	Hardwick et al.	5,703,943 A	12/1997	Otto
5,553,133 A	9/1996	Perkins	5,706,453 A	1/1998	Cheng et al.
5,555,299 A	9/1996	Maloney et al.	5,708,702 A	1/1998	De Paul et al.
5,555,426 A	9/1996	Johnson et al.	5,712,901 A	1/1998	Meermans
5,557,667 A	9/1996	Bruno et al.	5,715,306 A	2/1998	Sunderman et al.
5,559,868 A	9/1996	Blonder	5,715,307 A	2/1998	Zazzera
5,559,877 A	9/1996	Ash et al.	5,715,432 A	2/1998	Xu et al.
5,559,878 A	9/1996	Keys et al.	5,717,747 A	2/1998	Boyle, III et al.
5,561,711 A	10/1996	Muller	5,721,770 A	2/1998	Kohler
5,561,841 A	10/1996	Markus	5,724,412 A	3/1998	Srinivasan
5,563,805 A	10/1996	Arbuckle et al.	5,724,418 A	3/1998	Brady
5,563,937 A	10/1996	Bruno et al.	5,726,984 A	3/1998	Kubler et al.
5,566,294 A	10/1996	Kojima et al.	5,727,159 A	3/1998	Kikinis
5,570,419 A	10/1996	Cave et al.	5,729,594 A	3/1998	Klingman
5,570,420 A	10/1996	Bress et al.	5,732,078 A	3/1998	Arango
5,572,579 A	11/1996	Orriss et al.	5,734,981 A	3/1998	Kennedy, III et al.
5,572,643 A	11/1996	Judson	5,737,495 A	4/1998	Adams et al.
5,577,100 A	11/1996	McGregor et al.	5,737,595 A	4/1998	Cohen et al.
5,577,105 A	11/1996	Baum et al.	5,737,726 A	4/1998	Cameron et al.
5,583,862 A	12/1996	Callon	5,737,727 A	4/1998	Lehmann et al.
5,583,922 A	12/1996	Davis et al.	5,740,238 A	4/1998	Flockhart et al.
5,590,188 A	12/1996	Crockett	5,740,240 A	4/1998	Jolissaint
5,592,542 A	1/1997	Honda et al.	5,742,668 A	4/1998	Pepe et al.
5,592,543 A	1/1997	Smith et al.	5,742,670 A	4/1998	Bennett
5,594,791 A	1/1997	Szlam et al.	5,742,675 A	4/1998	Kilander et al.
5,598,532 A	1/1997	Liron	5,742,905 A	4/1998	Pepe et al.
5,604,737 A	2/1997	Iwami et al.	5,745,687 A	4/1998	Randell
5,606,602 A	2/1997	Johnson et al.	5,745,878 A	4/1998	Hashimoto et al.
5,608,778 A	3/1997	Partridge, III	5,748,884 A	5/1998	Royce et al.
5,608,786 A	3/1997	Gordon	5,748,907 A	5/1998	Crane
5,610,910 A	3/1997	Focsaneanu et al.	5,751,706 A	5/1998	Land et al.
			5,751,707 A	5/1998	Voit et al.
			5,751,795 A	5/1998	Hassler et al.
			5,752,059 A	5/1998	Holleran et al.
			5,752,244 A	5/1998	Rose et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

5,752,246 A	5/1998	Rogers et al.	5,847,484 A	12/1998	Kuyama et al.
5,754,111 A	5/1998	Garcia	5,848,131 A	12/1998	Shaffer et al.
5,754,636 A	5/1998	Bayless et al.	5,848,143 A	12/1998	Andrews et al.
5,754,639 A	5/1998	Flockhart et al.	5,850,433 A	12/1998	Rondeau
5,754,655 A	5/1998	Hughes et al.	5,852,814 A	12/1998	Allen
5,757,904 A	5/1998	Anderson	5,857,184 A	1/1999	Lynch
5,760,823 A	6/1998	Brunson et al.	5,862,134 A	1/1999	Deng
5,761,289 A	6/1998	Keshav	5,862,211 A	1/1999	Roush
5,764,736 A	6/1998	Shachar et al.	5,862,223 A	1/1999	Walker et al.
5,764,898 A	6/1998	Tsuji et al.	5,864,616 A	1/1999	Hartmeier
5,765,033 A	6/1998	Miloslavsky	5,864,848 A	1/1999	Horvitz et al.
5,768,360 A	6/1998	Reynolds et al.	5,867,484 A	2/1999	Shaunfield
5,768,527 A	6/1998	Zhu et al.	5,867,494 A	2/1999	Krishnaswamy et al.
5,774,583 A	6/1998	Sasaki et al.	5,867,495 A	2/1999	Elliott et al.
5,778,060 A	7/1998	Otto	5,867,559 A	2/1999	Jorgensen et al.
5,778,178 A	7/1998	Arunachalam	5,867,562 A	2/1999	Scherer
5,778,377 A	7/1998	Marlin et al.	5,867,822 A	2/1999	Sankar
5,784,438 A	7/1998	Martinez	5,870,464 A	2/1999	Brewster et al.
5,784,451 A	7/1998	Smith, Jr.	5,870,549 A	2/1999	Bobo, II
5,784,452 A	7/1998	Carney	5,872,841 A	2/1999	King et al.
5,787,160 A	7/1998	Chaney et al.	5,872,926 A	2/1999	Levac et al.
5,787,163 A	7/1998	Taylor et al.	5,873,032 A	2/1999	Cox et al.
5,790,635 A	8/1998	Dezonne	5,873,040 A	2/1999	Dunn et al.
5,790,650 A	8/1998	Dunn et al.	5,873,076 A	2/1999	Barr et al.
5,790,789 A	8/1998	Suarez	5,878,126 A	3/1999	Velamuri et al.
5,790,798 A	8/1998	Beckett, II et al.	5,878,130 A	3/1999	Andrews et al.
5,793,857 A	8/1998	Barnes et al.	5,878,230 A	3/1999	Weber et al.
5,793,861 A	8/1998	Haigh	5,881,146 A	3/1999	Hamilton
5,794,039 A	8/1998	Guck	5,883,891 A	3/1999	Williams et al.
5,796,398 A	8/1998	Zimmer	5,884,032 A	3/1999	Bateman et al.
5,796,729 A	8/1998	Greaney et al.	5,884,262 A	3/1999	Wise et al.
5,796,791 A	8/1998	Polcyn	5,887,173 A	3/1999	Ogawa et al.
5,796,813 A	8/1998	Sonnenberg	5,889,474 A	3/1999	LaDue
5,799,067 A	8/1998	Kikinis et al.	5,889,774 A	3/1999	Mirashrafi et al.
5,799,297 A	8/1998	Goodridge et al.	5,889,799 A	3/1999	Grossman et al.
5,802,163 A	9/1998	Miloslavsky	5,889,863 A	3/1999	Weber
5,802,253 A	9/1998	Gross et al.	5,892,764 A	4/1999	Riemann et al.
5,802,283 A	9/1998	Grady et al.	5,892,822 A	4/1999	Gottlieb et al.
5,802,314 A	9/1998	Tullis et al.	5,893,912 A	4/1999	Freund et al.
5,802,316 A	9/1998	Ito et al.	5,894,512 A	4/1999	Zenner
5,802,493 A	9/1998	Sheflott et al.	5,896,444 A	4/1999	Perlman et al.
5,802,526 A	9/1998	Fawcett et al.	5,897,635 A	4/1999	Torres et al.
5,805,587 A	9/1998	Norris et al.	5,901,138 A	5/1999	Bader et al.
5,806,061 A	9/1998	Chaudhuri et al.	5,901,203 A	5/1999	Morganstein et al.
5,809,128 A	9/1998	McMullin	5,901,209 A *	5/1999	Tannenbaum ..... G07B 17/0008 379/111
5,809,282 A	9/1998	Cooper et al.	5,903,631 A	5/1999	Smith et al.
5,809,512 A	9/1998	Kato	5,903,877 A	5/1999	Berkowitz et al.
5,812,795 A	9/1998	Horovitz et al.	5,905,495 A	5/1999	Tanaka et al.
5,813,014 A	9/1998	Gustman	5,905,792 A	5/1999	Miloslavsky
5,815,566 A	9/1998	Ramot et al.	5,905,793 A	5/1999	Flockhart et al.
5,818,935 A	10/1998	Maa	5,905,863 A	5/1999	Knowles et al.
5,822,306 A	10/1998	Catchpole	5,907,547 A	5/1999	Foladare et al.
5,822,400 A	10/1998	Smith	5,911,134 A	6/1999	Castonguay et al.
5,822,404 A	10/1998	Cave	5,911,776 A	6/1999	Guck
5,822,526 A	10/1998	Waskiewicz	5,914,941 A	6/1999	Janky
5,825,775 A	10/1998	Chin et al.	5,915,001 A	6/1999	Uppaluru
5,825,862 A	10/1998	Voit et al.	5,915,008 A	6/1999	Dulman
5,825,869 A	10/1998	Brooks et al.	5,915,011 A	6/1999	Miloslavsky
5,825,870 A	10/1998	Miloslavsky	5,915,012 A	6/1999	Miloslavsky
5,826,040 A	10/1998	Fargher et al.	5,916,302 A	6/1999	Dunn et al.
5,826,269 A	10/1998	Hussey	5,917,817 A	6/1999	Dunn et al.
5,828,747 A	10/1998	Fisher et al.	5,917,898 A	6/1999	Bassa et al.
5,828,839 A	10/1998	Moncreiff	5,918,213 A	6/1999	Bernard et al.
5,831,611 A	11/1998	Kennedy et al.	5,920,621 A	7/1999	Gottlieb
5,832,196 A	11/1998	Croslin et al.	5,920,719 A	7/1999	Sutton et al.
5,835,090 A	11/1998	Clark et al.	5,920,865 A	7/1999	Ariga
5,835,583 A	11/1998	Hetz et al.	5,923,745 A	7/1999	Hurd
5,838,682 A	11/1998	Dekelbaum et al.	5,923,879 A	7/1999	Sasmazel et al.
5,838,768 A	11/1998	Sumar et al.	5,926,535 A	7/1999	Reynolds
5,838,773 A	11/1998	Eisner et al.	5,926,538 A	7/1999	Deryugin et al.
5,838,774 A	11/1998	Weisser, Jr.	5,926,539 A	7/1999	Shtivelman
5,841,854 A	11/1998	Schumacher et al.	5,933,492 A	8/1999	Turovski
5,842,131 A	11/1998	Yamane	5,937,051 A	8/1999	Hurd et al.
5,844,980 A	12/1998	Patel et al.	5,937,057 A	8/1999	Bell et al.
5,844,982 A	12/1998	Knitl	5,937,162 A	8/1999	Funk et al.
			5,937,388 A	8/1999	Davis et al.
			5,938,725 A	8/1999	Hara
			5,940,075 A	8/1999	Mutschler, III et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

5,940,478 A	8/1999	Vaudreuil et al.	6,012,152 A	1/2000	Douik et al.
5,940,479 A	8/1999	Guy et al.	6,014,137 A	1/2000	Burns
5,940,488 A	8/1999	DeGrazia et al.	6,014,138 A	1/2000	Cain et al.
5,940,495 A	8/1999	Bondarenko et al.	6,014,379 A	1/2000	White et al.
5,940,496 A	8/1999	Gisby et al.	6,014,437 A	1/2000	Acker et al.
5,940,497 A	8/1999	Miloslavsky	6,014,647 A	1/2000	Nizzari et al.
5,940,598 A	8/1999	Strauss et al.	6,018,578 A	1/2000	Bondarenko et al.
5,940,823 A	8/1999	Schreiber et al.	6,018,579 A	1/2000	Petrunka
5,943,416 A	8/1999	Gisby	6,018,761 A	1/2000	Uomini
5,946,375 A	8/1999	Pattison et al.	6,021,262 A	2/2000	Cote et al.
5,946,386 A	8/1999	Rogers et al.	6,021,411 A	2/2000	Brophy et al.
5,946,387 A	8/1999	Miloslavsky	6,021,428 A	2/2000	Miloslavsky
5,948,054 A	9/1999	Nielsen	6,023,684 A	2/2000	Pearson
5,949,988 A	9/1999	Feisullin et al.	6,023,723 A	2/2000	McCormick et al.
5,953,332 A	9/1999	Miloslavsky	6,026,087 A	2/2000	Mirashrafi et al.
5,953,405 A	9/1999	Miloslavsky	6,026,375 A	2/2000	Hall et al.
5,953,406 A	9/1999	LaRue et al.	6,028,917 A	2/2000	Creamer et al.
5,956,482 A	9/1999	Agraharam et al.	6,029,195 A	2/2000	Herz
5,956,729 A	9/1999	Goetz et al.	6,038,293 A	3/2000	McNerney et al.
5,958,014 A	9/1999	Cave	6,038,537 A	3/2000	Matsuoka
5,958,016 A	9/1999	Chang et al.	6,041,116 A	3/2000	Meyers
5,958,064 A	9/1999	Judd et al.	6,044,142 A	3/2000	Hammarstrom et al.
5,959,982 A	9/1999	Federkins et al.	6,044,144 A	3/2000	Becker et al.
5,960,073 A	9/1999	Kikinis et al.	6,044,146 A	3/2000	Gisby et al.
5,960,411 A	9/1999	Hartman et al.	6,044,368 A	3/2000	Powers
5,963,632 A	10/1999	Miloslavsky	6,046,762 A	4/2000	Sonesh et al.
5,963,635 A	10/1999	Szlam et al.	6,047,060 A	4/2000	Fedorov et al.
5,966,427 A	10/1999	Shaffer et al.	6,049,272 A	4/2000	Lee et al.
5,966,695 A	10/1999	Melchione et al.	6,049,547 A	4/2000	Fisher et al.
5,970,065 A	10/1999	Miloslavsky	6,049,779 A	4/2000	Berkson
5,970,134 A	10/1999	Highland et al.	6,052,514 A	4/2000	Gill et al.
5,974,135 A	10/1999	Breneman et al.	6,055,307 A	4/2000	Behnke et al.
5,974,414 A	10/1999	Stanczak et al.	6,055,308 A	4/2000	Miloslavsky et al.
5,974,444 A	10/1999	Konrad	6,055,513 A	4/2000	Katz et al.
5,974,448 A	10/1999	Yamauchi et al.	6,058,163 A	5/2000	Pattison et al.
RE36,416 E	11/1999	Szlam et al.	6,058,389 A	5/2000	Chandra et al.
5,978,465 A	11/1999	Corduroy et al.	6,058,435 A	5/2000	Sassin et al.
5,978,467 A	11/1999	Walker et al.	6,061,054 A	5/2000	Jolly
5,978,672 A	11/1999	Hartmaier et al.	6,064,667 A	5/2000	Gisby et al.
5,978,836 A	11/1999	Ouchi	6,064,722 A	5/2000	Clise et al.
5,982,774 A	11/1999	Foladare et al.	6,064,723 A	5/2000	Cohn et al.
5,982,870 A	11/1999	Pershan et al.	6,064,730 A	5/2000	Ginsberg
5,982,873 A	11/1999	Flockhart et al.	6,064,973 A	5/2000	Smith et al.
5,983,218 A	11/1999	Syeda-Mahmood	6,067,357 A	5/2000	Kishinsky et al.
5,987,102 A	11/1999	Elliott et al.	6,069,890 A	5/2000	White et al.
5,987,117 A	11/1999	McNeil et al.	6,070,142 A	5/2000	McDonough et al.
5,987,118 A	11/1999	Dickerman et al.	6,070,144 A	5/2000	Ginsberg et al.
5,987,423 A	11/1999	Arnold et al.	6,072,864 A	6/2000	Shtivelman et al.
5,987,446 A	11/1999	Corey et al.	6,073,013 A	6/2000	Agre et al.
5,991,365 A	11/1999	Pizano et al.	6,073,105 A	6/2000	Sutcliffe et al.
5,991,390 A	11/1999	Booton	6,073,109 A	6/2000	Flores et al.
5,991,391 A	11/1999	Miloslavsky	6,073,124 A	6/2000	Krishnan et al.
5,991,392 A	11/1999	Miloslavsky	6,075,783 A	6/2000	Voit
5,991,393 A	11/1999	Kamen	6,075,843 A	6/2000	Cave
5,991,394 A	11/1999	Dezonno et al.	6,076,101 A	6/2000	Kamakura et al.
5,991,395 A	11/1999	Miloslavsky	6,076,105 A	6/2000	Wolff et al.
5,995,606 A	11/1999	Civanlar et al.	6,076,109 A *	6/2000	Kikinis ..... H04L 29/06 707/E17.121
5,995,610 A	11/1999	Smidt et al.	6,078,581 A	6/2000	Shtivelman et al.
5,995,614 A	11/1999	Miloslavsky	6,078,583 A	6/2000	Takahara et al.
5,995,615 A	11/1999	Miloslavsky	6,081,591 A	6/2000	Skoog
5,996,000 A	11/1999	Shuster	6,081,592 A	6/2000	Battle
5,999,525 A	12/1999	Krishnaswamy et al.	6,085,097 A	7/2000	Savery et al.
5,999,609 A	12/1999	Nishimura	6,085,201 A	7/2000	Tso
5,999,965 A	12/1999	Kelly	6,088,340 A	7/2000	Buchholz et al.
6,002,396 A	12/1999	Davies	6,088,696 A	7/2000	Moon et al.
6,002,760 A	12/1999	Gisby	6,088,717 A	7/2000	Reed et al.
6,003,034 A	12/1999	Tuli	6,094,479 A	7/2000	Lindeberg et al.
6,005,845 A	12/1999	Svennesson et al.	6,094,673 A	7/2000	Dilip et al.
6,005,920 A	12/1999	Fuller et al.	6,097,792 A	8/2000	Thornton
6,005,931 A	12/1999	Neyman et al.	6,097,804 A	8/2000	Gilbert et al.
6,009,163 A	12/1999	Nabkel et al.	6,097,938 A	8/2000	Paxson
6,009,469 A	12/1999	Mattaway et al.	6,098,065 A	8/2000	Skillen et al.
6,011,792 A	1/2000	Miloslavsky	6,104,711 A	8/2000	Voit
6,011,844 A	1/2000	Uppaluru et al.	6,104,800 A	8/2000	Benson
6,011,974 A	1/2000	Cedervall et al.	6,104,801 A	8/2000	Miloslavsky
			6,104,802 A	8/2000	Perlmutter
			6,108,688 A	8/2000	Nielsen
			6,108,704 A	8/2000	Hutton et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

6,108,711	A	8/2000	Beck et al.	6,236,857	B1	5/2001	Calabrese et al.
6,112,085	A	8/2000	Garner et al.	6,240,285	B1	5/2001	Blum et al.
6,115,596	A	9/2000	Raith et al.	6,243,092	B1	6/2001	Okita et al.
6,115,742	A	9/2000	Franklin et al.	6,243,373	B1	6/2001	Turock
6,118,865	A	9/2000	Gisby	6,243,375	B1	6/2001	Speicher
6,119,155	A	9/2000	Rossmann et al.	6,243,379	B1	6/2001	Veerina et al.
6,119,167	A	9/2000	Boyle et al.	6,243,713	B1	6/2001	Nelson et al.
6,122,360	A	9/2000	Neyman et al.	6,249,807	B1	6/2001	Shaw et al.
6,122,364	A	9/2000	Petrunka et al.	6,253,129	B1	6/2001	Jenkins et al.
6,122,365	A	9/2000	Yegoshin	6,256,489	B1	7/2001	Lichter et al.
6,122,632	A	9/2000	Botts et al.	6,256,503	B1	7/2001	Stephens
6,125,113	A	9/2000	Farris et al.	6,259,692	B1	7/2001	Shtivelman et al.
6,125,126	A	9/2000	Hallenstå	6,259,774	B1	7/2001	Miloslavsky
6,128,379	A	10/2000	Smyk	6,259,786	B1	7/2001	Gisby
6,128,482	A	10/2000	Nixon et al.	6,263,049	B1	7/2001	Kuhn
6,128,603	A	10/2000	Dent et al.	6,263,065	B1	7/2001	Durinovic-Johri et al.
6,128,646	A	10/2000	Miloslavsky	6,263,066	B1	7/2001	Shtivelman et al.
6,130,933	A	10/2000	Miloslavsky	6,263,359	B1	7/2001	Fong et al.
6,134,217	A	10/2000	Stiliadis et al.	6,275,693	B1	8/2001	Lin et al.
6,134,235	A	10/2000	Goldman et al.	6,278,976	B1	8/2001	Kochian
6,134,315	A	10/2000	Galvin	6,278,996	B1	8/2001	Richardson et al.
6,134,318	A	10/2000	O'Neil	6,282,429	B1	8/2001	Baiyor et al.
6,134,530	A	10/2000	Bunting et al.	6,282,565	B1	8/2001	Shaw et al.
6,137,870	A	10/2000	Scherer	6,285,316	B1	9/2001	Nir et al.
6,138,139	A	10/2000	Beck et al.	6,285,364	B1	9/2001	Giordano, III et al.
6,141,345	A	10/2000	Goeddel et al.	6,286,033	B1	9/2001	Kishinsky et al.
6,148,074	A	11/2000	Miloslavsky et al.	6,286,084	B1	9/2001	Wexler et al.
6,157,653	A	12/2000	Kline et al.	6,286,129	B1	9/2001	Agarwal et al.
6,157,655	A	12/2000	Shtivelman	6,289,094	B1	9/2001	Miloslavsky
6,157,924	A	12/2000	Austin	6,292,181	B1	9/2001	Banerjee et al.
6,166,735	A	12/2000	Dom et al.	6,292,553	B1	9/2001	Fellingham et al.
6,167,255	A	12/2000	Kennedy, III et al.	6,295,353	B1	9/2001	Flockhart et al.
6,167,395	A	12/2000	Beck et al.	6,295,530	B1	9/2001	Ritchie et al.
6,167,404	A	12/2000	Morcos et al.	6,298,041	B1	10/2001	Packer
6,170,011	B1	1/2001	Macleod Beck et al.	6,301,480	B1	10/2001	Kennedy, III et al.
6,173,052	B1	1/2001	Brady	6,304,898	B1	10/2001	Shiigi
6,173,316	B1	1/2001	De Boor et al.	6,314,089	B1	11/2001	Szlam et al.
6,175,562	B1	1/2001	Cave	6,314,430	B1	11/2001	Chang
6,175,563	B1	1/2001	Miloslavsky	6,320,857	B1	11/2001	Tonnby et al.
6,175,564	B1	1/2001	Miloslavsky et al.	6,320,951	B1	11/2001	Shtivelman et al.
6,175,620	B1	1/2001	Rouge et al.	6,324,276	B1	11/2001	Uppaluru et al.
6,175,842	B1	1/2001	Kirk et al.	6,330,323	B1	12/2001	Gottlieb et al.
6,178,239	B1	1/2001	Kishinsky et al.	6,330,426	B2	12/2001	Brown et al.
6,181,336	B1	1/2001	Chiu et al.	6,332,022	B1	12/2001	Martinez
6,181,736	B1	1/2001	McLaughlin et al.	6,332,154	B2	12/2001	Beck et al.
6,181,788	B1	1/2001	Miloslavsky	6,332,163	B1	12/2001	Bowman-Amuah
6,182,059	B1	1/2001	Angotti et al.	6,333,980	B1	12/2001	Hollatz et al.
6,182,249	B1	1/2001	Wookey et al.	6,335,927	B1	1/2002	Elliott et al.
6,185,184	B1	2/2001	Mattaway et al.	6,337,904	B1	1/2002	Gisby
6,185,287	B1	2/2001	Miloslavsky	6,339,593	B1	1/2002	Kikinis
6,185,291	B1	2/2001	Miloslavsky	6,341,128	B1	1/2002	Svedberg
6,185,292	B1	2/2001	Miloslavsky	6,343,281	B1	1/2002	Kato
6,185,427	B1	2/2001	Krasner et al.	6,345,290	B2	2/2002	Okada et al.
6,185,535	B1	2/2001	Hedin et al.	6,345,300	B1	2/2002	Bakshi et al.
6,188,688	B1	2/2001	Buskirk, Jr.	6,345,305	B1	2/2002	Beck et al.
6,188,762	B1	2/2001	Shooster	6,346,952	B1	2/2002	Shtivelman
6,192,250	B1	2/2001	Buskens et al.	6,347,085	B2	2/2002	Kelly
6,195,357	B1	2/2001	Polcyn	6,353,608	B1	3/2002	Cullers et al.
6,198,738	B1	3/2001	Chang et al.	6,353,667	B1	3/2002	Foster et al.
6,198,739	B1	3/2001	Neyman et al.	6,359,981	B1	3/2002	Neyman et al.
6,201,804	B1	3/2001	Kikinis	6,362,838	B1	3/2002	Szlam et al.
6,201,863	B1	3/2001	Miloslavsky	6,363,411	B1	3/2002	Dugan et al.
6,205,135	B1	3/2001	Chinni et al.	6,366,575	B1	4/2002	Barkan et al.
6,205,412	B1	3/2001	Barskiy et al.	6,366,586	B1	4/2002	Christie
6,212,178	B1	4/2001	Beck et al.	6,366,651	B1	4/2002	Griffith et al.
6,215,783	B1	4/2001	Neyman	6,366,658	B1	4/2002	Bjornberg et al.
6,219,045	B1	4/2001	Leahy et al.	6,366,663	B1	4/2002	Bauer et al.
6,219,413	B1	4/2001	Burg	6,366,925	B1	4/2002	Meltzer et al.
6,222,919	B1	4/2001	Hollatz et al.	6,370,238	B1	4/2002	Sansone et al.
6,226,285	B1	5/2001	Kozdon et al.	6,370,508	B2	4/2002	Beck et al.
6,229,524	B1	5/2001	Chernock et al.	6,370,567	B1	4/2002	Ouchi
6,229,888	B1	5/2001	Miloslavsky	6,373,836	B1	4/2002	Deryugin et al.
6,230,197	B1	5/2001	Beck et al.	6,373,937	B1	4/2002	Yegoshin
6,233,234	B1	5/2001	Curry et al.	6,377,568	B1	4/2002	Kelly
6,233,616	B1	5/2001	Reid	6,377,583	B1	4/2002	Lyles et al.
				6,377,944	B1	4/2002	Busey et al.
				6,377,975	B1	4/2002	Florman
				6,381,640	B1	4/2002	Beck et al.
				6,385,191	B1	5/2002	Coffman et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

6,385,202 B1	5/2002	Katseff et al.	6,597,685 B2	7/2003	Miloslavsky et al.
6,385,646 B1	5/2002	Brown et al.	6,600,733 B2	7/2003	Deng
6,389,007 B1	5/2002	Shenkman et al.	6,600,822 B2	7/2003	Kamen
6,389,133 B1	5/2002	Kamen	6,603,762 B1	8/2003	Kikinis
6,393,018 B2	5/2002	Miloslavsky	6,603,854 B1	8/2003	Judkins et al.
6,393,122 B1	5/2002	Belzile	6,611,498 B1	8/2003	Baker et al.
6,393,278 B1	5/2002	Buchanan et al.	6,611,590 B1	8/2003	Lu et al.
6,393,481 B1	5/2002	Deo et al.	6,614,780 B2	9/2003	Hakim et al.
6,396,834 B1	5/2002	Bonomi et al.	6,614,781 B1	9/2003	Elliott et al.
6,396,919 B1	5/2002	Shimada et al.	6,625,139 B2	9/2003	Miloslavsky et al.
6,400,725 B1	6/2002	Ross	6,628,666 B1	9/2003	Pickering et al.
6,401,066 B1	6/2002	McIntosh	6,631,399 B1	10/2003	Stanczak et al.
6,401,094 B1	6/2002	Stemp et al.	6,633,910 B1	10/2003	Rajan et al.
6,405,033 B1	6/2002	Kennedy, III et al.	6,650,747 B1	11/2003	Bala et al.
6,407,996 B1	6/2002	Witchalls	6,651,085 B1	11/2003	Woods
6,407,999 B1	6/2002	Olkkonen et al.	6,661,882 B1 *	12/2003	Muir ..... H04M 3/493 379/127.01
6,408,064 B1	6/2002	Fedorov et al.	6,668,286 B2	12/2003	Noble et al.
6,411,806 B1	6/2002	Garner et al.	6,678,718 B1	1/2004	Khoury et al.
6,418,146 B1	7/2002	Miloslavsky	6,681,010 B1	1/2004	Anderson et al.
6,418,199 B1	7/2002	Perrone	6,687,241 B1	2/2004	Goss
6,424,709 B1	7/2002	Doyle et al.	6,690,788 B1	2/2004	Bauer et al.
6,427,002 B2	7/2002	Campbell et al.	6,693,893 B1	2/2004	Ehlinger
6,430,174 B1	8/2002	Jennings et al.	6,704,409 B1	3/2004	Dilip et al.
6,430,282 B1	8/2002	Bannister et al.	6,704,410 B1	3/2004	McFarlane et al.
6,434,231 B2	8/2002	Neyman et al.	6,704,411 B1	3/2004	Nishidate
6,434,530 B1	8/2002	Sloane et al.	6,707,903 B2	3/2004	Burok et al.
6,434,549 B1	8/2002	Linetsky et al.	6,711,249 B2	3/2004	Weissman et al.
6,442,242 B1	8/2002	McAllister et al.	6,711,611 B2	3/2004	Hanhan
6,442,247 B1	8/2002	Garcia	6,714,643 B1	3/2004	Gargeya et al.
6,445,788 B1	9/2002	Torba	6,718,032 B1	4/2004	Vrenjak et al.
6,449,260 B1	9/2002	Sassin et al.	6,718,366 B2	4/2004	Beck et al.
6,449,270 B1	9/2002	Miloslavsky	6,721,306 B1	4/2004	Farris et al.
6,449,358 B1	9/2002	Anisimov et al.	6,731,626 B1	5/2004	Neyman
6,449,646 B1	9/2002	Sikora et al.	6,735,298 B2	5/2004	Neyman et al.
6,452,609 B1	9/2002	Katinsky et al.	6,744,877 B1	6/2004	Edwards
6,453,038 B1	9/2002	McFarlane et al.	6,744,878 B1	6/2004	Komissarchik et al.
6,453,341 B1	9/2002	Miloslavsky	6,748,211 B1	6/2004	Isaac et al.
6,456,615 B1	9/2002	Kikinis	6,751,210 B1	6/2004	Shaffer et al.
6,456,619 B1	9/2002	Sassin et al.	6,753,784 B1	6/2004	Sznaider et al.
6,459,697 B1	10/2002	Neyman	6,754,181 B1	6/2004	Elliott et al.
6,463,148 B1	10/2002	Brady	6,760,322 B1	7/2004	Fukuda et al.
6,470,010 B1	10/2002	Szviatovszki et al.	6,760,324 B1	7/2004	Scott et al.
6,470,080 B2	10/2002	Perlmutter	6,760,428 B2	7/2004	Foster
6,473,787 B2	10/2002	Miloslavsky	6,760,727 B1	7/2004	Schroeder et al.
6,480,600 B1	11/2002	Neyman et al.	6,763,104 B1	7/2004	Judkins et al.
6,487,663 B1	11/2002	Jaisimha et al.	6,763,369 B1	7/2004	Ytuarte et al.
6,489,954 B1	12/2002	Powlette	6,771,765 B1	8/2004	Crowther et al.
6,490,350 B2	12/2002	McDuff et al.	6,778,527 B1	8/2004	Amin
6,493,353 B2	12/2002	Kelly et al.	6,785,375 B1	8/2004	Beddus et al.
6,493,433 B2	12/2002	Clabaugh et al.	6,785,710 B2	8/2004	Kikinis
6,493,447 B1	12/2002	Goss et al.	6,785,740 B1	8/2004	Yoneda et al.
6,496,567 B1	12/2002	Bjornberg et al.	6,788,779 B2	9/2004	Ostapchuck
6,496,702 B1	12/2002	Lockhart	6,798,771 B1	9/2004	Low et al.
6,496,981 B1	12/2002	Wistendahl et al.	6,801,520 B2	10/2004	Philonenko
6,498,897 B1	12/2002	Nelson et al.	6,801,928 B2	10/2004	Nuestro
6,499,088 B1	12/2002	Wexler et al.	6,804,346 B1	10/2004	Mewhinney
6,512,825 B1	1/2003	Lindholm et al.	6,816,871 B2	11/2004	Lee
6,515,996 B1	2/2003	Tonnby et al.	6,816,878 B1	11/2004	Zimmers et al.
6,519,246 B1	2/2003	Strahs	6,845,154 B1	1/2005	Cave et al.
6,519,617 B1	2/2003	Wanderski et al.	6,847,715 B1	1/2005	Swartz
6,532,493 B1	3/2003	Aviani, Jr. et al.	6,847,825 B1	1/2005	Duvall et al.
6,535,492 B2	3/2003	Shtivelman	6,850,602 B1	2/2005	Chou
6,536,043 B1	3/2003	Guedalia	6,850,614 B1 *	2/2005	Collins ..... H04M 3/5166 379/265.02
6,539,419 B2	3/2003	Beck et al.	6,859,529 B2	2/2005	Duncan et al.
6,546,405 B2	4/2003	Gupta et al.	6,865,267 B2	3/2005	Dezonne
6,549,539 B1	4/2003	Neyman	6,868,391 B1	3/2005	Hultgren
6,553,114 B1	4/2003	Fisher et al.	6,874,119 B2	3/2005	Macleod Beck et al.
6,554,183 B1	4/2003	Sticha et al.	6,876,632 B1	4/2005	Takeda
6,560,328 B1	5/2003	Bondarenko et al.	6,879,586 B2	4/2005	Miloslavsky et al.
6,560,329 B1	5/2003	Vicars et al.	6,882,996 B2	4/2005	Preisig et al.
6,560,607 B1	5/2003	Lassenen	6,898,190 B2	5/2005	Shtivelman et al.
6,563,788 B1	5/2003	Torba et al.	6,903,685 B1	6/2005	Arndt et al.
6,567,854 B1	5/2003	Olshansky et al.	6,907,455 B1	6/2005	Wolfe et al.
6,581,105 B2	6/2003	Miloslavsky et al.	6,910,072 B2	6/2005	Macleod Beck et al.
6,594,269 B1	7/2003	Polcyn	6,912,272 B2	6/2005	Kirk et al.
			6,922,411 B1	7/2005	Taylor
			6,922,689 B2	7/2005	Shtivelman

(56)

References Cited

U.S. PATENT DOCUMENTS

6,934,379 B2	8/2005	Falcon et al.	7,565,428 B2	7/2009	Deryugin et al.
6,934,381 B1	8/2005	Klein et al.	7,609,829 B2	10/2009	Wang et al.
6,944,272 B1	9/2005	Thomas	7,610,347 B2	10/2009	Petrovykh
6,958,994 B2	10/2005	Zhakov et al.	7,619,996 B2	11/2009	Miloslavsky et al.
6,965,914 B2	11/2005	Dowling	7,669,182 B2	2/2010	Garcia
6,970,844 B1	11/2005	Bierenbaum	7,672,998 B1	3/2010	Haskins et al.
6,977,740 B1	12/2005	Mandalia	7,706,520 B1	4/2010	Waterson et al.
6,981,020 B2	12/2005	Miloslavsky et al.	7,715,332 B2	5/2010	Miloslavsky et al.
6,985,478 B2	1/2006	Pogossiants et al.	7,716,292 B2	5/2010	Kikinis
6,985,943 B2	1/2006	Deryugin et al.	7,739,325 B1	6/2010	Okita et al.
6,987,977 B2	1/2006	Lockhart	7,764,231 B1	7/2010	Karr et al.
6,996,603 B1	2/2006	Srinivasan	7,769,161 B1	8/2010	Hession et al.
7,006,614 B2	2/2006	Feinberg et al.	7,779,067 B2	8/2010	Beck et al.
7,020,264 B1	3/2006	Neyman et al.	7,792,773 B2	9/2010	McCord et al.
7,031,442 B1	4/2006	Neyman et al.	7,808,977 B2	10/2010	Kikinis
7,036,128 B1	4/2006	Julia et al.	7,823,167 B2	10/2010	Makagon et al.
7,039,176 B2	5/2006	Borodow et al.	7,853,717 B2	12/2010	Petrovykh
7,039,857 B2	5/2006	Beck et al.	7,856,095 B2	12/2010	Brown
7,076,048 B2	7/2006	Lee et al.	7,903,807 B2	3/2011	Neyman et al.
7,079,641 B2	7/2006	Ostapchuck	7,907,598 B2	3/2011	Anisimov et al.
7,080,092 B2	7/2006	Upton	7,929,978 B2	4/2011	Lockhart
7,088,814 B1	8/2006	Shaffer et al.	7,957,401 B2	6/2011	Zalenski et al.
7,092,509 B1 *	8/2006	Mears ..... H04M 3/5233 379/265.02	8,009,821 B1	8/2011	Apparao et al.
7,106,850 B2	9/2006	Campbell et al.	8,018,921 B2	9/2011	Pogossiants et al.
7,110,523 B2	9/2006	Gagle et al.	8,024,401 B1 *	9/2011	Gurbani ..... G06Q 10/10 379/265.01
7,110,525 B1	9/2006	Heller et al.	8,031,698 B2	10/2011	Neyman
7,117,244 B2	10/2006	Florman et al.	8,036,214 B2	10/2011	Elliott et al.
7,120,700 B2	10/2006	Macleod Beck et al.	8,059,812 B1	11/2011	Bundy
7,127,400 B2	10/2006	Koch	8,068,598 B1	11/2011	Russi et al.
7,133,830 B1	11/2006	Hoban et al.	8,085,761 B2	12/2011	Elliott et al.
7,136,475 B1	11/2006	Rogers et al.	8,089,958 B2	1/2012	Elliott et al.
7,155,496 B2	12/2006	Froyd et al.	8,126,133 B1	2/2012	Everingham et al.
7,155,512 B2	12/2006	Lean et al.	8,130,749 B2	3/2012	Kikinis
7,159,224 B2	1/2007	Sharma et al.	8,180,662 B2	5/2012	Minert et al.
7,167,924 B1	1/2007	Symonds et al.	8,180,666 B2	5/2012	Minert et al.
7,184,747 B2	2/2007	Bogat	8,199,891 B2	6/2012	Brown et al.
7,216,350 B2	5/2007	Martin et al.	8,209,207 B2	6/2012	Minert et al.
7,221,377 B1	5/2007	Okita et al.	8,209,209 B2	6/2012	Minert et al.
7,222,301 B2	5/2007	Makagon et al.	8,223,948 B2	7/2012	Minert et al.
7,231,032 B2	6/2007	Nevman et al.	8,226,477 B1	7/2012	Machado et al.
7,236,486 B2	6/2007	Baker et al.	8,254,404 B2	8/2012	Rabenko et al.
7,236,584 B2	6/2007	Torba	8,254,558 B2	8/2012	Minert et al.
7,242,760 B2	7/2007	Shires	8,270,421 B2	9/2012	Elliott et al.
7,245,711 B2	7/2007	Margolis	8,275,111 B2	9/2012	Golitsin et al.
7,246,009 B2	7/2007	Hamblen et al.	8,345,856 B1	1/2013	Anisimov et al.
7,254,219 B1	8/2007	Hansen et al.	8,351,595 B2	1/2013	Peterson et al.
7,254,641 B2	8/2007	Broughton et al.	8,358,769 B2	1/2013	Neyman et al.
7,263,372 B2	8/2007	Lockhart	8,395,994 B2	3/2013	Stevenson et al.
7,263,671 B2	8/2007	Hull et al.	8,396,205 B1	3/2013	Lowry et al.
7,269,263 B2	9/2007	Dedieu et al.	8,411,844 B1	4/2013	Anisimov et al.
7,272,627 B2	9/2007	Petrovykh	8,693,347 B2	4/2014	Elliott et al.
7,277,424 B1	10/2007	Dowling	9,002,920 B2	4/2015	Deryugin et al.
7,277,536 B2	10/2007	Ostapchuk	RE45,583 E	6/2015	Lockhart
7,277,916 B2	10/2007	Nuestro	9,118,781 B1	8/2015	Kavulak et al.
7,283,519 B2	10/2007	Girard	9,241,258 B2	1/2016	Ku et al.
7,336,649 B1	2/2008	Huang	2001/0000458 A1	4/2001	Shtivelman et al.
7,363,228 B2	4/2008	Wyss et al.	2001/0001150 A1	5/2001	Miloslavsky
7,372,956 B1	5/2008	Kikinis et al.	2001/0005382 A1	6/2001	Cave et al.
7,373,405 B2	5/2008	Deryugin et al.	2001/0011366 A1	8/2001	Beck et al.
7,373,410 B2	5/2008	Monza et al.	2001/0013041 A1	8/2001	Macleod Beck et al.
7,376,227 B2	5/2008	Anisimov et al.	2001/0014604 A1	8/2001	Kingdon et al.
7,376,431 B2	5/2008	Niedermeyer	2001/0023430 A1	9/2001	Srinivasan
7,401,112 B1	7/2008	Matz et al.	2001/0023448 A1	9/2001	Hanhan
7,415,009 B2	8/2008	Neyman	2001/0024497 A1	9/2001	Campbell et al.
7,418,094 B2	8/2008	Golitsin et al.	2001/0025309 A1	9/2001	Macleod Beck et al.
7,428,303 B2	9/2008	Campbell et al.	2001/0028649 A1	10/2001	Pogossiants et al.
7,434,204 B1	10/2008	Everingham et al.	2001/0029519 A1	10/2001	Hallinan et al.
7,457,279 B1	11/2008	Scott et al.	2001/0037316 A1	11/2001	Shiloh
7,460,496 B2	12/2008	Miloslavsky et al.	2001/0038624 A1	11/2001	Greenberg et al.
7,496,640 B2	2/2009	Hanhan	2001/0040887 A1	11/2001	Shtivelman et al.
7,535,479 B2	5/2009	Okita et al.	2001/0042095 A1	11/2001	Kim et al.
7,558,383 B2	7/2009	Shtivelman et al.	2001/0043586 A1	11/2001	Miloslavsky
7,561,887 B2	7/2009	Lockhart	2001/0043589 A1	11/2001	Kikinis
7,564,840 B2	7/2009	Elliott et al.	2001/0044676 A1	11/2001	Macleod Beck et al.
			2001/0044828 A1	11/2001	Kikinis
			2001/0054064 A1	12/2001	Kannan
			2002/0001300 A1	1/2002	Miloslavsky et al.
			2002/0012428 A1	1/2002	Neyman et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

2002/0013150	A1	1/2002	McKenna et al.	2004/0064348	A1	4/2004	Humenansky et al.
2002/0019844	A1	2/2002	Kurowski et al.	2004/0081183	A1	4/2004	Monza et al.
2002/0019846	A1	2/2002	Miloslavsky et al.	2004/0083195	A1	4/2004	McCord et al.
2002/0025819	A1	2/2002	Cetusic et al.	2004/0083281	A1	4/2004	Makagon et al.
2002/0035647	A1	3/2002	Brown et al.	2004/0083479	A1	4/2004	Bondarenko et al.
2002/0037076	A1	3/2002	Perlmutter	2004/0083482	A1	4/2004	Makagon et al.
2002/0041674	A1	4/2002	Kamen	2004/0102977	A1	5/2004	Metzler et al.
2002/0054579	A1	5/2002	Miloslavsky	2004/0107025	A1	6/2004	Ransom et al.
2002/0055853	A1	5/2002	Macleod Beck et al.	2004/0111269	A1	6/2004	Koch
2002/0056000	A1	5/2002	Albert Coussement	2004/0120502	A1	6/2004	Strathmeyer et al.
2002/0057671	A1	5/2002	Kikinis	2004/0169675	A1	9/2004	Beck et al.
2002/0059164	A1	5/2002	Shtivelman	2004/0179516	A1	9/2004	Neyman
2002/0059374	A1	5/2002	Nuestro	2004/0181574	A1	9/2004	Hanhan
2002/0060988	A1	5/2002	Shtivelman	2004/0199580	A1	10/2004	Zhakov et al.
2002/0062385	A1	5/2002	Dowling	2004/0208134	A1	10/2004	Neyman et al.
2002/0064149	A1	5/2002	Elliott et al.	2004/0208309	A1	10/2004	Miloslavsky
2002/0071529	A1	6/2002	Nelkenbaum	2004/0213400	A1	10/2004	Golitsin et al.
2002/0076031	A1	6/2002	Falcon et al.	2004/0223490	A1	11/2004	Donovan et al.
2002/0078150	A1	6/2002	Thompson et al.	2004/0264678	A1	12/2004	Ostapchuck
2002/0087648	A1	7/2002	Petrovykh	2004/0267892	A1	12/2004	Kikinis
2002/0091726	A1	7/2002	Macleod Beck et al.	2005/0013417	A1	1/2005	Zimmers et al.
2002/0095462	A1	7/2002	Beck et al.	2005/0033851	A1	2/2005	Kikinis
2002/0097708	A1	7/2002	Deng	2005/0041678	A1	2/2005	Nuestro
2002/0099738	A1	7/2002	Grant	2005/0128961	A1	6/2005	Miloslavsky et al.
2002/0101866	A1	8/2002	Miloslavsky et al.	2005/0147090	A1	7/2005	MacLeod Beck et al.
2002/0101880	A1	8/2002	Kim	2005/0154792	A1	7/2005	Deryugin et al.
2002/0103998	A1	8/2002	DeBruine	2005/0207559	A1	9/2005	Shtivelman et al.
2002/0105957	A1	8/2002	Bondarenko et al.	2006/0029206	A1	2/2006	Anisimov et al.
2002/0114278	A1	8/2002	Coussement	2006/0034262	A1	2/2006	Pogossiants et al.
2002/0114441	A1	8/2002	Coussement	2006/0079250	A1	4/2006	Lockhart
2002/0120719	A1	8/2002	Lee et al.	2006/0080107	A1	4/2006	Hill et al.
2002/0123899	A1	9/2002	Hall et al.	2006/0095568	A1	5/2006	Makagon et al.
2002/0126678	A1	9/2002	Kelly et al.	2006/0109976	A1	5/2006	Sundaram et al.
2002/0126828	A1	9/2002	Kamen	2006/0133594	A1	6/2006	Neyman et al.
2002/0131399	A1	9/2002	Philonenko	2006/0153173	A1	7/2006	Beck et al.
2002/0136167	A1	9/2002	Steele et al.	2006/0209797	A1	9/2006	Anisimov et al.
2002/0150311	A1	10/2002	Lynn	2006/0210047	A1	9/2006	Neyman et al.
2002/0169834	A1	11/2002	Miloslavsky et al.	2006/0245421	A1	11/2006	Ostapchuk
2002/0176404	A1	11/2002	Girard	2007/0002744	A1	1/2007	Mewhinney et al.
2003/0002479	A1	1/2003	Vortman et al.	2007/0041525	A1	2/2007	Tingley et al.
2003/0002652	A1	1/2003	Neyman et al.	2007/0041567	A1	2/2007	Anisimov et al.
2003/0002654	A1	1/2003	Torba	2007/0071224	A1	3/2007	Shtivelman et al.
2003/0007621	A1	1/2003	Graves et al.	2007/0110043	A1	5/2007	Girard
2003/0009530	A1	1/2003	Philonenko et al.	2007/0127707	A1	6/2007	Koser et al.
2003/0018702	A1	1/2003	Broughton et al.	2007/0143301	A1	6/2007	Tran
2003/0018729	A1	1/2003	Miloslavsky	2007/0195940	A1	8/2007	Miloslavsky et al.
2003/0021259	A1	1/2003	Miloslavsky et al.	2007/0213073	A1	9/2007	Lockhart
2003/0021406	A1	1/2003	Ostapchuck	2007/0274495	A1	11/2007	Youd et al.
2003/0026414	A1	2/2003	Baker et al.	2008/0002822	A1	1/2008	Petrovykh
2003/0037113	A1	2/2003	Petrovykh	2008/0013531	A1	1/2008	Elliott et al.
2003/0043832	A1	3/2003	Anisimov et al.	2008/0025295	A1	1/2008	Elliott et al.
2003/0051037	A1	3/2003	Sundaram et al.	2008/0043728	A1	2/2008	Miloslavsky et al.
2003/0055884	A1*	3/2003	Yuen et al. .... 709/203	2008/0043955	A1	2/2008	Shtivelman et al.
2003/0058884	A1	3/2003	Kallner et al.	2008/0043975	A1	2/2008	Miloslavsky et al.
2003/0084128	A1	5/2003	Anderson et al.	2008/0043977	A1	2/2008	Neyman et al.
2003/0084349	A1*	5/2003	Friedrichs et al. .... 713/201	2008/0046504	A1	2/2008	Deryugin et al.
2003/0088421	A1	5/2003	Maes et al.	2008/0046531	A1	2/2008	Shtivelman et al.
2003/0097457	A1	5/2003	Saran et al.	2008/0049731	A1	2/2008	Kikinis
2003/0099343	A1	5/2003	Dezonno	2008/0049737	A1	2/2008	Neyman
2003/0115353	A1	6/2003	Deryugin et al.	2008/0049928	A1	2/2008	Miloslavsky et al.
2003/0125048	A1	7/2003	Lockhart	2008/0049929	A1	2/2008	Miloslavsky et al.
2003/0135592	A1*	7/2003	Vetter et al. .... 709/220	2008/0062971	A1	3/2008	Kikinis
2003/0161296	A1	8/2003	Butler et al.	2008/0130844	A1	6/2008	Hubbard et al.
2003/0161448	A1*	8/2003	Parolkar et al. .... 379/88.17	2008/0205378	A1	8/2008	Wyss et al.
2003/0179729	A1	9/2003	MacLeod Beck et al.	2008/0222240	A1	9/2008	Deryugin et al.
2003/0212558	A1*	11/2003	Matula .... 704/260	2008/0285739	A1	11/2008	Golitsin et al.
2003/0216923	A1	11/2003	Gilmore et al.	2009/0089136	A1	4/2009	Minert et al.
2003/0219029	A1	11/2003	Pickett	2009/0089451	A1	4/2009	Petrovykh
2003/0220875	A1	11/2003	Lam et al.	2009/0227267	A1	9/2009	Lockhart
2003/0229529	A1	12/2003	Mui et al.	2009/0240346	A1	9/2009	Cadigan, Jr. et al.
2004/0006739	A1	1/2004	Mulligan	2010/0106710	A1	4/2010	Nishizawa et al.
2004/0017797	A1	1/2004	Chen et al.	2010/0157979	A1	6/2010	Anisimov et al.
2004/0019638	A1	1/2004	Makagon et al.	2010/0198930	A1	8/2010	Kikinis
2004/0030557	A1	2/2004	Culy et al.	2011/0099602	A1	4/2011	Apparao et al.
2004/0047302	A1	3/2004	Dezonno et al.	2011/0110363	A1	5/2011	Anandani
				2011/0178946	A1	7/2011	Minert et al.
				2011/0179304	A1	7/2011	Peterson
				2011/0179398	A1	7/2011	Peterson
				2011/0182418	A1	7/2011	Anisimov et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

2012/0047266 A1 2/2012 Minert  
 2012/0066016 A1 3/2012 Minert et al.  
 2012/0177195 A1 7/2012 Elliott et al.  
 2012/0195415 A1 8/2012 Wyss et al.  
 2012/0250849 A1 10/2012 Liu et al.  
 2013/0016115 A1 1/2013 Minert et al.  
 2013/0070757 A1 3/2013 Elliott et al.  
 2013/0129067 A1 5/2013 Neyman et al.  
 2013/0230160 A1 9/2013 Neyman et al.  
 2014/0376708 A1 12/2014 Deryugin et al.  
 2014/0379936 A1 12/2014 Anisimov et al.  
 2015/0201021 A1 7/2015 Beck et al.  
 2015/0244870 A1 8/2015 Neyman et al.

## FOREIGN PATENT DOCUMENTS

AT 316736 2/2006  
 AT 317621 2/2006  
 AT 318048 3/2006  
 AT 337678 9/2006  
 AT 379921 12/2007  
 AT 380434 12/2007  
 AT 384398 2/2008  
 AT 388578 3/2008  
 AT 401736 8/2008  
 AT 413059 11/2008  
 AT 424090 3/2009  
 AT 465451 5/2010  
 AT 474415 7/2010  
 AU 2604797 10/1997  
 AU 718233 B2 3/1998  
 AU 5274398 3/1998  
 AU 6023598 8/1998  
 AU 6034698 8/1998  
 AU 6167398 8/1998  
 AU 6319498 8/1998  
 AU 6655298 9/1998  
 AU 6655398 9/1998  
 AU 7099298 10/1998  
 AU 735134 B2 3/1999  
 AU 736449 B2 4/1999  
 AU 737483 B2 4/1999  
 AU 743217 B2 4/1999  
 AU 745404 B2 4/1999  
 AU 748636 B2 4/1999  
 AU 9225198 4/1999  
 AU 9228098 4/1999  
 AU 9381998 4/1999  
 AU 9479298 4/1999  
 AU 743880 B2 5/1999  
 AU 1118899 5/1999  
 AU 740090 B2 6/1999  
 AU 743737 B2 6/1999  
 AU 744340 B2 6/1999  
 AU 1120099 6/1999  
 AU 1276799 6/1999  
 AU 1286299 6/1999  
 AU 741437 B2 8/1999  
 AU 758713 B2 8/1999  
 AU 2595499 8/1999  
 AU 2595599 8/1999  
 AU 2667299 8/1999  
 AU 2674899 8/1999  
 AU 739979 B2 9/1999  
 AU 2674799 9/1999  
 AU 749023 B2 12/1999  
 AU 4427299 12/1999  
 AU 4819499 12/1999  
 AU 746085 B2 1/2000  
 AU 4426799 1/2000  
 AU 750215 B2 4/2000  
 AU 754238 B2 4/2000  
 AU 755234 B2 4/2000  
 AU 5807099 4/2000  
 AU 5810599 4/2000

AU 5813699 4/2000  
 AU 748456 B2 5/2000  
 AU 751143 B2 5/2000  
 AU 751232 B2 5/2000  
 AU 751269 B2 5/2000  
 AU 751301 B2 5/2000  
 AU 755138 B2 5/2000  
 AU 1233800 5/2000  
 AU 1327200 5/2000  
 AU 1328200 5/2000  
 AU 1328300 5/2000  
 AU 1454700 5/2000  
 AU 1717700 5/2000  
 AU 1718600 5/2000  
 AU 2045900 6/2000  
 AU 748447 B2 7/2000  
 AU 3113800 7/2000  
 AU 2964900 9/2000  
 AU 3470800 9/2000  
 AU 4507700 2/2001  
 AU 6798300 4/2001  
 AU 1077201 6/2001  
 AU 1077301 6/2001  
 AU 8006800 6/2001  
 AU 4732501 10/2001  
 AU 5384201 10/2001  
 AU 5724801 11/2001  
 AU 756656 B2 1/2003  
 BR 9913621 A 5/2001  
 BR 9913622 A 5/2001  
 CA 2178705 A1 3/1997  
 CA 2391428 A1 3/1997  
 CA 2259912 C 1/1998  
 CA 2280002 A1 8/1998  
 CA 2289193 A1 12/1998  
 CA 2289198 A1 12/1998  
 CA 2302397 A1 3/1999  
 CA 2302488 A1 3/1999  
 CA 2302674 A1 3/1999  
 CA 2302680 A1 3/1999  
 CA 2302704 A1 3/1999  
 CA 2302678 A1 4/1999  
 CA 2308590 A1 5/1999  
 CA 2309185 A1 5/1999  
 CA 2309186 A1 5/1999  
 CA 2309183 A1 6/1999  
 CA 2320978 A1 8/1999  
 CA 2320979 A1 8/1999  
 CA 2320989 A1 8/1999  
 CA 2330608 A1 12/1999  
 CA 2334513 A1 12/1999  
 CA 2343286 A1 3/2000  
 CA 2343288 A1 3/2000  
 CA 2343756 A1 3/2000  
 CA 2347721 A1 5/2000  
 CA 2348567 A1 5/2000  
 CA 2348574 A1 5/2000  
 CA 2348575 C 5/2000  
 CA 2348994 A1 5/2000  
 CA 2348999 A1 5/2000  
 CA 2350515 A1 5/2000  
 CA 2352973 A1 6/2000  
 CA 2362172 A1 8/2000  
 CA 2313596 A1 2/2001  
 CN 1282484 A 1/2001  
 CN 1282485 A 1/2001  
 CN 1285990 A 2/2001  
 CN 1285991 A 2/2001  
 CN 1293798 A 5/2001  
 CN 1293858 A 5/2001  
 CN 1298590 A 6/2001  
 CN 1309861 A 8/2001  
 CN 1310822 A 8/2001  
 CN 1323418 A 11/2001  
 CN 1323421 A 11/2001  
 CN 1354942 A 6/2002  
 CN 1130061 C 12/2003  
 CN 1132399 C 12/2003  
 CN 1145314 C 4/2004

(56)

## References Cited

## FOREIGN PATENT DOCUMENTS

CN	1149521	C	5/2004	EP	1088277	A1	4/2001
CN	1152549	C	6/2004	EP	1092313	A1	4/2001
CN	1512724	A	7/2004	EP	1107555	A2	6/2001
CN	1520197	A	8/2004	EP	1114543	A1	7/2001
CN	1197336	C	4/2005	EP	1125214	A1	8/2001
CN	1200548	C	5/2005	EP	1133677	A2	9/2001
CN	1662025	A	8/2005	EP	1133736	A1	9/2001
CN	1232077	C	12/2005	EP	1133742	A1	9/2001
CN	1756280	A	4/2006	EP	1145153	A1	10/2001
CN	100477702	C	4/2009	EP	1145154	A1	10/2001
CN	100547568	C	10/2009	EP	1163564	A2	12/2001
CN	102257789	A	11/2011	EP	1 193 961		4/2002
CN	101635775	B	12/2011	EP	1193961	A2	4/2002
DE	60011863	T2	12/2004	EP	1227635	A2	7/2002
DE	69730498	T2	9/2005	EP	1248447	A2	10/2002
DE	60015236	T2	2/2006	EP	1290861	A1	3/2003
DE	69832275	T2	8/2006	EP	1292901	A1	3/2003
DE	69833285	T2	9/2006	EP	1292939	A1	3/2003
DE	69833394	T2	10/2006	EP	1328121	A1	7/2003
DE	69833462	T2	10/2006	EP	1 408 678		4/2004
DE	69833935	T2	11/2006	EP	0873642	B1	4/2004
DE	60214191	T2	12/2006	EP	1413954	A2	4/2004
DE	69834184	T2	3/2007	EP	1107615	B1	6/2004
DE	69838795	T2	10/2008	EP	1033024	A4	9/2004
DE	69838814	T2	11/2008	EP	1129545	A1	9/2004
DE	69839022	T2	1/2009	EP	1061723	B1	10/2004
DE	69839222	T2	3/2009	EP	1465397	A1	10/2004
EP	0193961	A2	9/1986	EP	1469663	A1	10/2004
EP	0236013	A2	9/1987	EP	1484903	A2	12/2004
EP	0376517	A2	7/1990	EP	1566949	A1	8/2005
EP	0420779	A2	4/1991	EP	0985308	B1	11/2005
EP	0424015	A2	4/1991	EP	1359735	B1	1/2006
EP	0425161	A2	5/1991	EP	1357729	B1	2/2006
EP	0425163	A2	5/1991	EP	1377001	B1	2/2006
EP	0515068	A2	11/1992	EP	0954922	B1	3/2006
EP	0528732	A1	2/1993	EP	0986875	B1	4/2006
EP	0532972	A1	3/1993	EP	1410614	B1	8/2006
EP	0539105	A2	4/1993	EP	1774760	A2	4/2007
EP	0559979	A2	9/1993	EP	1021905	B1	11/2007
EP	0568770	A2	11/1993	EP	1031232	B1	12/2007
EP	0610625	A2	8/1994	EP	1865697	A3	12/2007
EP	0647050	A2	4/1995	EP	1040638	B1	1/2008
EP	0647051	A1	4/1995	EP	1048162	B1	3/2008
EP	0660573	A2	6/1995	EP	1157509	B1	7/2008
EP	0701358	A1	3/1996	EP	1337079	B1	9/2008
EP	0705017	A2	4/1996	EP	1326415	B1	10/2008
EP	0721268	A2	7/1996	EP	1013054	B1	2/2009
EP	0725526	A2	8/1996	EP	1333653	B1	4/2009
EP	0734187	A2	9/1996	EP	0983676	B1	6/2009
EP	0740450	A2	10/1996	EP	1125208	B1	4/2010
EP	0748102	A2	12/1996	EP	1142284	B1	7/2010
EP	0753956	A2	1/1997	EP	2380323	A1	10/2011
EP	0755146	A2	1/1997	EP	1408678	B1	11/2011
EP	0758175	A1	2/1997	EP	1057301	B1	8/2013
EP	0771095	A2	5/1997	EP	1131728	B1	1/2014
EP	0792076	A2	8/1997	EP	1625460	B1	5/2014
EP	0806858	A2	11/1997	ES	2231120	T3	5/2005
EP	0817455	A2	1/1998	ES	2255657	T3	7/2006
EP	0856980	A2	8/1998	ES	2256666	T3	7/2006
EP	0863651	A2	9/1998	ES	2257639	T3	8/2006
EP	0866407	A1	9/1998	FR	2671252	A1	7/1992
EP	0869639	A2	10/1998	GB	2273225	A	6/1994
EP	0883306	A2	12/1998	GB	2306853	A	5/1997
EP	0908047	A1	4/1999	GB	2315190	A	1/1998
EP	0958560	A1	11/1999	GB	2324627	A	10/1998
EP	0962087	A1	12/1999	GB	2369263	A	5/2002
EP	1006706	A2	6/2000	JP	61-51247		3/1986
EP	1013062	A1	6/2000	JP	62-200956		9/1987
EP	1013066	A1	6/2000	JP	63-149955		6/1988
EP	1016280	A1	7/2000	JP	64-7460		1/1989
EP	1044553	A1	10/2000	JP	64-77265		3/1989
EP	1064630	A1	1/2001	JP	02-170756		7/1990
EP	1066712	A1	1/2001	JP	02-298154		12/1990
EP	1075153	A2	2/2001	JP	03-052443		3/1991
EP	1087597	A2	3/2001	JP	03-160865		7/1991
				JP	03-177144		8/1991
				JP	04-40723		2/1992
				JP	4-66858		6/1992
				JP	04-265049		9/1992



(56)

## References Cited

## FOREIGN PATENT DOCUMENTS

WO 9723078 A1 6/1997  
 WO 9726749 A1 7/1997  
 WO 9728635 A1 8/1997  
 WO 9729584 A1 8/1997  
 WO 9734401 A1 9/1997  
 WO 9736414 A1 10/1997  
 WO 9737500 A1 10/1997  
 WO 9738389 A2 10/1997  
 WO 9738519 A1 10/1997  
 WO 9750235 A1 12/1997  
 WO 9801987 A1 1/1998  
 WO 9810573 A2 3/1998  
 WO 9813765 A1 4/1998  
 WO 9813974 A1 4/1998  
 WO 9817048 A1 4/1998  
 WO 9827479 A2 6/1998  
 WO 9831130 A1 7/1998  
 WO 9834390 A1 8/1998  
 WO 9835326 A1 8/1998  
 WO 9835509 A2 8/1998  
 WO 9836551 A1 8/1998  
 WO 9837481 A1 8/1998  
 WO 9837677 A2 8/1998  
 WO 9837686 A1 8/1998  
 WO 9837687 A1 8/1998  
 WO 9844699 A1 10/1998  
 WO 9844714 A1 10/1998  
 WO 9848577 A2 10/1998  
 WO 9854877 A2 12/1998  
 WO 9856133 A2 12/1998  
 WO 9856141 A1 12/1998  
 WO 9857501 A2 12/1998  
 WO 9900960 A1 1/1999  
 WO 9900966 A1 1/1999  
 WO 9903247 A2 1/1999  
 WO 9912367 A1 3/1999  
 WO 9913635 A1 3/1999  
 WO 9914919 A1 3/1999  
 WO 9914920 A1 3/1999  
 WO 9914924 A1 3/1999  
 WO 9914951 A1 3/1999  
 WO 9917518 A1 4/1999  
 WO 9923806 A1 5/1999  
 WO 9923807 A1 5/1999  
 WO 9926395 A1 5/1999  
 WO 9926424 A2 5/1999  
 WO 9927698 A1 6/1999  
 WO 9941720 A1 8/1999  
 WO 9941890 A2 8/1999  
 WO 9941891 A1 8/1999  
 WO 9941895 A1 8/1999  
 WO 9943137 A1 8/1999  
 WO 9925117 10/1999  
 WO 9956227 A1 11/1999  
 WO 9956229 A1 11/1999  
 WO 9965214 A1 12/1999  
 WO 9965252 A2 12/1999  
 WO 9967718 A1 12/1999  
 WO 0007332 A2 2/2000  
 WO 0016203 A1 3/2000  
 WO 0016207 A1 3/2000  
 WO 0016523 A1 3/2000  
 WO 0018094 A1 3/2000  
 WO WO 00/16203 3/2000  
 WO 0025238 A1 5/2000  
 WO 0026804 A1 5/2000  
 WO 0026816 A1 5/2000  
 WO 0026817 A1 5/2000  
 WO 0027063 A2 5/2000  
 WO 0028425 A1 5/2000  
 WO 0028702 A1 5/2000  
 WO 0035173 A1 6/2000  
 WO 0038398 A1 6/2000  
 WO 0044159 A1 7/2000  
 WO 0049482 A2 8/2000

WO 0049778 A1 8/2000  
 WO 0113606 A1 2/2001  
 WO 0124025 A1 4/2001  
 WO 0140997 A1 6/2001  
 WO 0141372 A1 6/2001  
 WO 0143410 A1 6/2001  
 WO 0152513 A1 7/2001  
 WO 0180214 A1 10/2001  
 WO 0180540 A1 10/2001  
 WO 0184360 A1 11/2001  
 WO 02065741 A2 8/2002  
 WO 03010948 A1 2/2003  
 WO 04063854 A2 7/2004  
 WO 05036907 A1 4/2005  
 WO 2006055059 A2 5/2006  
 WO 10075151 A1 7/2010

## OTHER PUBLICATIONS

“Guide for the Use of Micro-Researcher II/SGR (Scroll Graph Section),” NEC Corporation, Third Edition, Chapters 1 & 5, Jul. 1995, 2 pages.

“Kana: Customer Messaging System,” Kana Communications Sales Brochure, Palo Alto, CA, 1996, 12 pages.

“Latest Trend in CTI,” Nikkei Communications, No. 248, Jun. 16, 1997, 14 pages.

“Method for Automatic Contextual Transposition Upon Receipt of Item of Specified Criteria,” IBM Technical Disclosure Bulletin, vol. 37, No. 2B, Feb. 1994, 1 page.

“New Telephone Service Changing Computer Telephone Business,” Nikkei Communications, Nov. 11, 1996, 7 pages.

“Single Line Suffices for Internet Telephone,” Nikkei Communications, May 19, 1997, 9 pages.

“Solution Drivers/CTI, CTI Solution Strategy of Seven Computer Vendors, Toward Market Development of Mainly Bank, Insurance and Communications Markets,” Computopia, Computer Age Co., Ltd., Japan, vol. 33, No. 379, 5 pages, Apr. 1998.

Bachmann, David W. et al., “NetMod: A Design Tool for Large-Scale Heterogeneous Campus Networks,” Center for Information Technology Integration (CITI), The University of Michigan, Ann Arbor, MI, Jun. 15, 1990, 34 pages.

Bangun, H. et al., A Network Architecture for Multiuser Networked Games on Demand, International Conference on Information Communications and Signal Processing, ICICS '97, Sep. 9-12, 1997, 5 pages.

Bernett, Howard et al., “Assessing Web-Enabled Call Center Technologies,” IT Pro, May/June 2001, 7 pages.

Bertsekas, Dimitri et al., “Data Networks,” Prentice-Hall, New Jersey, 1987, 5 pages.

Bickley, M. et al., Using Servers to Enhance Control System Capability, 1999 Particle Accelerator Conference, New York, NY, Mar. 29-Apr. 2, 1999, 3 pages.

Bradley, Kirk A. et al., “Detecting Disruptive Routers: A Distributed Network Monitoring Approach,” Department of Computer Science, University of California, Davis, Sep. 1, 1998, 10 pages.

Canadian Office Action for Application No. 2,289,198, dated Jun. 28, 2002, 2 pages.

Canadian Office Action for Application No. 2,302,397, dated Apr. 23, 2002, 2 pages.

Canadian Office Action for Application No. 2,302,678, dated Apr. 23, 2002, 2 pages.

Canadian Office Action for Application No. 2308590, dated Jun. 28, 2002, 2 pages.

Canadian Office Action for Application No. 2309183, dated Jul. 23, 2002, 2 pages.

Canadian Office Action for Application No. 2320978, dated Sep. 26, 2002, 2 pages.

Chan, Kevin F. et al., “Interactive Network Planning and Analysis on a Personal Computer,” Computer Applications in Power, IEEE, vol. 3, No. 1, Jan. 1990, 5 pages.

Chau, Sam et al., “Intelligent Network Routing Using CCS7 and ISDN,” Global Telecommunications Conference, vol. 3, 6 pages, 1990.

(56)

**References Cited**

## OTHER PUBLICATIONS

- Chaudhuri, Surajit et al., "Optimizing Queries over Multimedia Repositories," Hewlett-Packard Laboratories, Stanford, Mar. 1996, 12 pages.
- Chaum, David, "Untraceable Electronic Mail, Return Addresses, and Digital Pseudonyms," *Communications of the ACM*, vol. 24, No. 2, Feb. 1981, 8 pages.
- Chew, T.-S. et al., "Netplan—a Telecommunications Network Planning Support System," *Tencon '92, IEEE Region 10 International Conference*, vol. 2, 7 pages, 1992.
- Chinese Office Action for Application No. 98812258.8 dated Jul. 26, 2002, 5 pages.
- Chiu, H. et al., "Conferencing Metaphor," *IBM Technical Disclosure Bulletin*, vol. 36, No. 2, Feb. 1993, 4 pages.
- Chou, Sheng-Lin., et al., "Computer Telephony Integration and Its Applications," *IEEE Communications Surveys & Tutorials*, vol. 3, No. 1, 2000, 10 pages.
- Cordom, Christopher et al., "Conversant VIS Listens and Talks to Your Customers," *AT&T Technology*, vol. 9, No. 2, 4 pages, 1994.
- Curbera, Francisco et al., "Unraveling the Web Services Web: An Introduction to SOAP, WSDL, and UDDI," *IEEE Internet Computing*, 8 pages, Mar./Apr. 2002.
- D'Hooge, Herman, "The Communicating PC," *IEEE Communications Magazine*, 6 pages, Apr. 1996.
- Durinic-Johri, Sanja et al., "Advanced Routing Solutions for Toll-Free Customers: Algorithm Design and Performance," *Proceedings of the International Teletraffic Congress, ITC-15, 1997*, 12 pages.
- Eren, P. Erhan, et al., "Interactive Object-Based Analysis and Manipulation of Digital Video," *IEEE Workshop on Multimedia Signal Processing, 1998*, 6 pages.
- Esesve, D.R., "Wireless Application Protocol (WAP)," *Vitam College of Engineering*, No Date Available, 16 pages.
- European Office action for Application No. 00123329.5, dated Jun. 17, 2002, 6 pages.
- European Office Action for Application No. 97904087.0, dated Jun. 25, 2002, 5 pages.
- European Office Action for Application No. 97933327.5, dated Aug. 26, 2002, 4 pages.
- European Office Action for Application No. 97933327.5, dated Feb. 7, 2002, 5 pages.
- European Search Report for Application No. 00123329.5, dated Jan. 30, 2002, 2 pages.
- European Search Report for Application No. 97904087.0, dated Nov. 5, 2001, 3 pages.
- European Search Report for Application No. 97933327.5, dated Oct. 11, 2001, 3 pages.
- European Search Report for Application No. 98903471.5, dated Jul. 26, 2002, 4 pages.
- European Search Report for Application No. 98903623.1, dated Apr. 17, 2002, 3 pages.
- European Search Report for Application No. 98907371.3, dated Mar. 28, 2002, 3 pages.
- European Search Report for Application No. 98924821.6, dated Jun. 13, 2002, 2 pages.
- European Search Report for Application No. 98926248, dated Jul. 18, 2002, 3 pages.
- European Search Report for Application No. 98948163.5, dated Aug. 8, 2000, 3 pages.
- Festa, Paul, "Vignette Updates StoryServer Platform," *CNET News.com*, Sep. 16, 1997, 4 pages.
- Foster, Robin Harris, "Advanced Definity Call Centers: Working for You and Your Customers," *AT&T Technology*, vol. 9, No. 2, 1994, 6 pages.
- Francis, Paul et al., "Flexible Routing and Addressing for a Next Generation IP," *SIGCOMM*, 10 pages, 1994.
- Gawrys, G.W., et al., "ISDN: Integrated Network/Premises Solutions for Customer Needs," *ICC*, 6 pages, 1986.
- Gechter, J. et al., "ISDN Service Opportunities in the Intelligent Network," *Proceedings of the National Communications Forum*, Chicago, IL, vol. 43, No. 1, Oct., 1989, 4 pages.
- Harvey, Dean E. et al., "Call Center Solutions," *AT&T Technical Journal*, vol. 70, No. 5, 10 pages, Sep./Oct. 1991.
- Held, Gilbert, "Voice Over Data Networks," *McGraw Hill*, Texas, 1998, 16 pages.
- Henderson, Shane G. et al., "Rostering by Interating Integer Programming and Simulation," *Proceedings of the 1998 Winter Simulation Conference*, Washington D.C., Dec. 13, 1998, 7 pages.
- Hofmann, Peter. et al., "@INGate: Integrating Telephony and Internet," *IEEE Conference on Protocols for Multimedia Systems*, 4 pages, Nov. 1997.
- House, Eric, "How to Munge Outgoing From: Field When Using Mail?," *Google Discussion Group*, Apr. 2, 1997, 1 page.
- Hu, Michael Junke et al., "An Object-Relational Database System for the Interactive Multimedia," *IEEE International Conference on Intelligent Processing Systems*, pp. 1571-1575, Oct. 1997.
- International Preliminary Examination Report for PCT/US01/13313, dated Apr. 22, 2002, 4 pages.
- International Preliminary Examination Report for PCT/US96/16919, dated Feb. 18, 1998, 18 pages.
- International Preliminary Examination Report for PCT/US97/01469, dated Oct. 14, 1998, 8 pages.
- International Preliminary Examination Report for PCT/US97/11881, dated Mar. 27, 1998, 3 pages.
- International Preliminary Examination Report for PCT/US98/00631, dated Sep. 10, 1999, 7 pages.
- International Preliminary Examination Report for PCT/US98/02847, dated Jul. 9, 1999, 5 pages.
- International Preliminary Examination Report for PCT/US98/13644, dated Jan. 12, 2000, 6 pages.
- International Preliminary Examination Report for PCT/US98/18646, dated Oct. 30, 2000, 5 pages.
- International Preliminary Examination Report for PCT/US98/18789, dated Dec. 30, 1999, 6 pages.
- International Preliminary Examination Report for PCT/US98/22527, dated Jun. 30, 2000, 5 pages.
- International Preliminary Examination Report for PCT/US99/12841, dated Jan. 22, 2001, 5 pages.
- International Preliminary Examination Report for PCT/US99/25308, dated Sep. 10, 2000, 3 pages.
- International Preliminary Examination Report for PCT/US99/25309, dated May 8, 2001, 4 pages.
- International Search Report for PCT/US00/00781, dated Apr. 12, 2000, 2 pages.
- International Search Report for PCT/US00/00785, dated Oct. 2, 2000, 2 pages.
- International Search Report for PCT/US00/023066, dated Oct. 30, 2000, 1 page.
- International Search Report for PCT/US00/27982, dated Jan. 31, 2001, 3 pages.
- International Search Report for PCT/US00/27983, dated Mar. 19, 2001, 2 pages.
- International Search Report for PCT/US00/27984, dated Mar. 22, 2001, 1 page.
- International Search Report for PCT/US01/07457, dated Aug. 30, 2001, 1 page.
- International Search Report for PCT/US01/13313, dated Jul. 6, 2001, 1 page.
- International Search Report for PCT/US01/40267, dated Jul. 17, 2001, 1 page.
- International Search Report for PCT/US02/23080, dated Oct. 1, 2002, 1 page.
- International Search Report for PCT/US96/16919, dated Jun. 2, 1997, 3 pages.
- International Search Report for PCT/US97/01469, dated Apr. 14, 1997, 1 page.
- International Search Report for PCT/US97/05457, dated Jun. 24, 1997, 2 pages.
- International Search Report for PCT/US97/11881, dated Oct. 24, 1997, 1 page.

(56)

**References Cited**

## OTHER PUBLICATIONS

- International Search Report for PCT/US98/00631, dated Jun. 18, 1998, 1 page.
- International Search Report for PCT/US98/01158, dated Jul. 17, 1998, 1 page.
- International Search Report for PCT/US98/02152, dated Jun. 25, 1998, 1 page.
- International Search Report for PCT/US98/02847, dated Aug. 6, 1998, 1 page.
- International Search Report for PCT/US98/02848, dated Aug. 11, 1998, 1 page.
- International Search Report for PCT/US98/02923, dated Aug. 19, 1998, 1 page.
- International Search Report for PCT/US98/06334, dated Sep. 1, 1998, 2 pages.
- International Search Report for PCT/US98/10357, dated Jan. 14, 1999, 1 page.
- International Search Report for PCT/US98/11442, dated Oct. 21, 1998, 2 pages.
- International Search Report for PCT/US98/13644, dated Apr. 21, 1999, 2 pages.
- International Search Report for PCT/US98/18646, dated Jan. 29, 1999, 2 pages.
- International Search Report for PCT/US98/18789, dated Jan. 29, 1999, 3 pages.
- International Search Report for PCT/US98/18833, dated Nov. 19, 1998, 1 page.
- International Search Report for PCT/US98/18874, dated Jan. 29, 1999, 1 page.
- International Search Report for PCT/US98/18989, dated Jan. 25, 1999, 1 page.
- International Search Report for PCT/US98/22527, dated Apr. 2, 1999, 2 pages.
- International Search Report for PCT/US98/22555, mailed Mar. 3, 1999, 1 page.
- International Search Report for PCT/US98/22600, mailed Jun. 4, 1999, 1 page.
- International Search Report for PCT/US98/22935, mailed Apr. 14, 1999, 1 page.
- International Search Report for PCT/US99/02812, mailed May 11, 1999, 1 page.
- International Search Report for PCT/US99/02814, mailed Jun. 17, 1999, 1 page.
- International Search Report for PCT/US99/02822, mailed Aug. 18, 1999, 1 page.
- International Search Report for PCT/US99/03038, mailed Apr. 23, 1999, 1 page.
- International Search Report for PCT/US99/03039, mailed May 11, 1999, 1 page.
- International Search Report for PCT/US99/12700, mailed Nov. 30, 1999, 1 page.
- International Search Report for PCT/US99/12781, mailed Sep. 9, 1999, 2 pages.
- International Search Report for PCT/US99/12841, mailed Sep. 10, 1999, 2 pages.
- International Search Report for PCT/US99/20259, dated Feb. 15, 2000, 1 page.
- International Search Report for PCT/US99/20387, dated Dec. 7, 1999, 2 pages.
- International Search Report for PCT/US99/20461, dated Dec. 23, 1999, 2 pages.
- International Search Report for PCT/US99/25117, dated Nov. 1, 2000, 2 pages.
- International Search Report for PCT/US99/25265, dated Feb. 18, 2000, 1 page.
- International Search Report for PCT/US99/25308, dated Feb. 3, 2000, 1 page.
- International Search Report for PCT/US99/25309, dated Feb. 10, 2000, 1 page.
- International Search Report for PCT/US99/25310, dated Feb. 10, 2000, 1 page.
- International Search Report for PCT/US99/26619, dated Mar. 17, 2000, 1 page.
- International Search Report for PCT/US99/26659, dated Feb. 4, 2000, 1 page.
- International Search Report for PCT/US99/29043, dated Mar. 20, 2000, 1 page.
- International Search Report for PCT/US99/29044, dated May 11, 2000, 1 page.
- International Written Opinion for PCT/US98/22527, mailed Dec. 27, 1999, 5 pages.
- Japanese Office Action for Application No. 1997-527811, mailed Oct. 10, 2000, 6 pages.
- Japanese Office Action for Application No. 1998-505335, mailed Mar. 5, 2002, 7 pages.
- Japanese Office Action for Application No. 1998-531244, mailed Sep. 10, 2002, 5 pages.
- Japanese Office Action for Application No. 1998-536740, mailed Sep. 3, 2002, 14 pages.
- Japanese Office Action for Application No. 1999-500765, mailed Sep. 3, 2002, 11 pages.
- Japanese Office Action for Application No. 1999-502827, mailed May 28, 2002, 3 pages.
- Japanese Office Action for Application No. 2000-512333, mailed Sep. 3, 2002, 6 pages.
- Japanese Office Action for Application No. 2000-512334, mailed Sep. 10, 2002, 9 pages.
- Japanese Office Action for Application No. 2000-512336, mailed Jul. 23, 2002, 8 pages.
- Japanese Office Action for Application No. 2000-514448, mailed Sep. 3, 2002, 10 pages.
- Japanese Office Action for Application No. 2000-519541, mailed Aug. 20, 2002, 10 pages.
- Japanese Office Action for Application No. 2000-522718, mailed Sep. 10, 2002, 9 pages.
- Japanese Office Action for Application No. 2000-531822, mailed Sep. 24, 2002, 6 pages.
- Japanese Office Action for Application No. 2000-532958, mailed Aug. 20, 2002, 7 pages.
- Japanese Office Action for Application No. 2000-554115, mailed Oct. 1, 2002, 5 pages.
- Japanese Office Action for Application No. 2000-581781, mailed Oct. 8, 2002, 4 pages.
- Katz, Michael, "When CTI Meets the Internet," *Telecommunications*, vol. 31, No. 7, Jul. 1997, 6 pages.
- Kaufman, Harvey, "Call Centers in Cyberspace," *Communications News*, vol. 34, Issue 7, Jul. 1997, 4 pages.
- Kaukonen, S., et al., "Agent-Based Conferencing Using Mobile IP-Telephony," *Proceedings of Multimedia Signal Processing*, 1999, 6 pages.
- Kramer, Brian, "How to Send a File to the Sender of a Message?," *Google Discussion Group*, May 27, 1994, 5 pages.
- Lee, Chien-I, et al., "A New Storage and Retrieval Method to Support Editing Operations in a Multi-Disk-based Video Server," *Fourth International Conference on Parallel and Distributed Information Systems*, IEEE, Miami Beach, FL, Dec. 1996, 10 pages.
- Lin, Yi-Bing et al., "A Flexible Graphical User Interface for Performance Modeling," *Software—Practice and Experience*, vol. 25(2), Feb. 1995, 24 pages.
- Low, Colin, "The Internet Telephony Red Herring," *Global Telecommunications Conference*, May 1996, 9 pages.
- Mackay, Wendy E., et al., "Virtual Video Editing in Interactive Multimedia Applications," *Communications of the ACM*, vol. 32, No. 7, Jul. 1989, 9 pages.
- Malabocchia, Fabio, et al., "Mining Telecommunications Data Bases: An Approach to Support the Business Management," *Network Operations and Management Symposium*, IEEE, vol. 1, Feb. 1998, 9 pages.
- Masashi, Tsuboi et al., "Computer Telephony Integration System," *CTSTAGE*, Oki Electric Research and Development, 174, vol. 64, No. 2, Apr. 1, 1997, 10 pages.

(56)

## References Cited

## OTHER PUBLICATIONS

- Matsumoto, Akihiko, "Bank CTI/Call Center Using Up Customer Information, Analysis of Six Major Manufacturers' Solutions," *Network Computing*, Ric Telecom Corporation, Japan, vol. 10, No. 10, Oct. 1, 1998, 13 pages.
- Matsuo, Yasunori, "Microsoft Project for Windows 95," *Nikkei Personal Computing*, Nikkei Business Publications, Inc., No. 255, Dec. 18, 1995, 2 pages.
- Mattison, Rob, "Data Warehousing and Data Mining for Telecommunications," Artech House, Boston, 1997, 7 pages.
- Metz, Christopher, "IP Routers: New Tool for Gigabit Networking," *on the Wire*, IEEE Internet, Nov./ Dec. 1998, 5 pages.
- Microsoft Dictionary Pages, Microsoft Press, Redmond, WA, 1991, 2 pages.
- Monson-Haefel, Richard, "Enterprise JavaBeans," O'Reilly & Assoc., 2nd Ed., 1999, 7 pages.
- Murayama, Hideki, "Integrated Customer Supporting System View Workshop/CS, OA Business Personal Computer," *NEC Business System*, Denpa Press Co., Ltd., vol. 15, No. 12, Dec. 1997, 6 pages.
- Nariani, Sushil, "Internet Telephony," *Whatis.com*, Oct. 25, 1999, 2 pages.
- Newton's Telecom Dictionary, the Official Dictionary of Telecommunications & the Internet, 16th Edition, Telecom Books, Feb. 2000, 3 pages.
- Newton, Harry, "Newton's Telecom Dictionary," Flatiron Publishing, New York, 1994, 7 pages.
- Orozco-Barbosa, Luis et al., "Design and Performance Evaluation of Intelligent Multimedia Services," *Computer Communications*, vol. 20, 1997, 14 pages.
- Padmanabhan, M., et al. *Speech Recognition Performance on a Voicemail Transcription Task*, IBM T.J. Watson Research Center, Yorktown Height, 4 pages.
- Rangan, P. Venkat, et al., "A Window-Based Editor for Digital Video and Audio," *Proceedings of the 25th Hawaii International Conference on System Sciences*, IEEE, vol. 2, Jan. 1992, 9 pages.
- Recker, Mimi M. et al., "Predicting Document Access in Large, Multimedia Repositories," *ACM Transactions on Computer-Human Interaction*, vol. 3, 1994, 23 pages.
- Rodriguez-Martinez, Manuel et al., "MOCHA: A Self-Extensible Database Middleware System for Distributed Data Sources," *International Conference on Management Data—SIGMOD*, 2000, 12 pages.
- Rosenberg, Arthur M., "Call Center Computer Telephony: Technology Overview," Gartner, Inc., Jan. 1998 (24 pages).
- Schmandt, Chris, "Phoneshell: The Telephone as Computer Terminal," *Proceedings of ACM Multimedia Conference*, 1993, 10 pages.
- Sekine, Shoji et al., "Front Office Oriented Solution for Customer Satisfaction and Profit Expansion," *Hitachi Hyoron Co, Ltd.*, Japan, vol. 80, No. 9, Sep. 1998, 11 pages.
- Semilof, Margie, "Call Centers Go On-Line," *Communications Week*, No Date Available, 2 pages.
- Sevcik, Peter et al., "The Call Center Revolution," *Northeast Consulting Technical Paper*, Jan. 1, 1997, 12 pages.
- Smith, J.D., *An Overview to Computer-Telecommunications Integration (CTI)*, Telecommunications, Conference Publication No. 404, IEEE, Mar. 26-29, 1995, 5 pages.
- Sulkin, Allan, *Building the ACD-LAN Connection*, *Business Communications Review*, Jun. 1996, 4 pages.
- Supplemental European Search Report for Application No. 98908545.1, dated Sep. 5, 2002, 4 pages.
- Szlam, Aleksander et al., "Predictive Dialing Fundamentals," Flatiron Publishing, New York, 1996, 28 pages.
- Tadamura, Katsumi et al., "Synchronizing Computer Graphics Animation and Audio," *IEEE*, 1998, 11 pages.
- Taisei, Mori et al., "Call Center: Promotion of Information Use with a Direct Link to Core Business with Eye on the Internet Customer," *Ric Telecom Corporation*, Japan, vol. 10, No. 8, Aug. 1, 1998, 9 pages.
- Tang, Jingrong et al., "Advanced Service Architecture for H.323 Internet Protocol Telephony," *Computer Communications*, vol. 23, 2000, 14 pages.
- Thio, Fu Wang et al., "Distributed Multimedia Database: A Design and Application Study," *The Fourth International Conference on High Performance Computing in the Asia-Pacific Region*, IEEE, Beijing, China, vol. 2, May 2000, 6 pages.
- Toji, Ryutaro et al., "A Study of Customer Contact Operation System and Functions," *Proceedings of the IECE General Conference*, Comm. 2, Mar. 6, 1997, 3 pages.
- Toji, Ryutaro et al., "OCN Multimedia Customer Contact System," *NTT Technical Journal*, The Telecommunication Association, Japan, vol. 10, No. 1, Jan. 1, 1998, 6 pages.
- Tsunemasa, Mizuo., "CTI World 2: World of CTI," *Business Communication*, vol. 34, No. 2, Feb. 1, 1997, 13 pages.
- Van Zijl, Lynette, et al., "A Tool for Graphical Network Modeling and Analysis," *IEEE Software*, Jan. 1992, 8 pages.
- Vazquez, E., et al., *Graphical Interface for Communication Network Analysis and Simulation*, Department of Telematic Engineering, Technical University of Madrid, IEE, 1991, Spain, 4 pages.
- Wang, Yong et al., "Real-time scheduling for multi-agent call center automation", *Information service agents lab, school of computing science Simon Fraser University, Burnaby, BC Canada*, 1999, 13 pages.
- Wolter, Roger., "XML Web Services Basics," *Microsoft Corporation*, Dec. 2001, 4 pages.
- Zenel, Bruce et al., *Intelligent Communication Filtering for Limited Bandwidth Environments*, Computer Science Department, Columbia University, IEEE, 1995, 7 pages.
- Beck, C. et al., *Interactive process of operating system for multimedia communication center*, Genesys Telecom Lab, Inc. 2014, 3 pages.
- Canadian Office Action for Application No. 2,259,912, dated Nov. 19, 2001, 2 pages.
- Canadian Office Action for Application No. 2320978, dated Jun. 2, 2003, 2 pages.
- Canadian Office Action for Application No. 2334513, dated May 30, 2003, 2 pages.
- Canadian Office Action for Application No. 2347721, dated Aug. 12, 2004, 3 pages.
- Canadian Office Action for Application No. 2352973, dated Apr. 17, 2003, 3 pages.
- Chinese Office Action for Application No. 200980151937.6, dated Jul. 1, 2013, 14 pages.
- Chinese Office Action for Application No. 98812259.6, dated Jan. 10, 2003, 9 pages.
- Chinese Office Action for Application No. 98812261.8, dated Jun. 20, 2003, 10 pages.
- Chinese Office Action for Application No. 99808531.6, dated Mar. 14, 2003, 14 pages.
- Chinese Office Action for Application No. 99811995.4, dated Apr. 8, 2005, 6 pages.
- Chinese Office Action for Application No. 99811995.4, dated Jul. 6, 2007, 11 pages.
- Chinese Office Action for Application No. 99811996.2, dated May 9, 2003, 10 pages.
- Chinese Office action for Patent Application No. 200980151937.6, dated Feb. 15, 2015, 6 pages.
- Chinese Office action with English Translation for Application No. 200980151937.6 dated May 23, 2014, 7 pages.
- European Office action Application No. 04011886.1, dated Mar. 9, 2007, 6 pages.
- European Office action for Application No. 00115441.8, dated Feb. 11, 2004, 7 pages.
- European Office action for Application No. 00115441.8, dated Mar. 15, 2005, 4 pages.
- European Office Action for Application No. 00115441.8, dated May 18, 2006, 11 pages.
- European Office Action for Application No. 00119160.0, dated Jan. 16, 2004, 6 pages.
- European Office Action for Application No. 00123331.1, dated Apr. 18, 2006, 5 pages.

(56)

**References Cited**

## OTHER PUBLICATIONS

European Office Action for Application No. 00305049.9, dated Dec. 29, 2003, 5 pages.

European Office Action for Application No. 00908266.0, dated Aug. 10, 2005, 6 pages.

European Office action for Application No. 02400027.5, dated Jan. 21, 2008, 5 pages.

European Office action for Application No. 02756535.7, dated Aug. 5, 2005, 6 pages.

European Office Action for Application No. 03022831.6, dated Nov. 30, 2006, 7 pages.

European Office Action for Application No. 03800376.0, dated Jul. 8, 2008, 6 pages.

European Office Action for Application No. 04009176.1, dated Oct. 12, 2011, 8 pages.

European Office Action for Application No. 98903471.5, dated May 29, 2006, 4 pages.

European Office Action for Application No. 98903471.5, dated Oct. 11, 2004, 6 pages.

European Office Action for Application No. 98908545.1, dated Mar. 15, 2005, 4 pages.

European Office Action for Application No. 98908545.1, dated Nov. 14, 2003, 10 pages.

European Office Action for Application No. 98924821.6, dated Aug. 26, 2003, 4 pages.

European Office Action for Application No. 98926248.0, dated Aug. 5, 2004, 4 pages.

European Office Action for Application No. 98926248.0, dated Dec. 11, 2003, 4 pages.

European Office Action for Application No. 98926248.0, dated Oct. 21, 2002, 6 pages.

European Office Action for Application No. 98944799.0, dated Aug. 18, 2005, 7 pages.

European Office Action for Application No. 98944799.0, dated Mar. 26, 2008, 5 pages.

European Office Action for Application No. 98944830.3, dated Jan. 30, 2006, 9 pages.

European Office Action for Application No. 98946907.7, dated Jun. 1, 2006, 6 pages.

European Office Action for Application No. 98946926.7, dated Dec. 8, 2005, 4 pages.

European Office Action for Application No. 98953947.3, dated Aug. 22, 2006, 6 pages.

European Office Action for Application No. 98953962.2, dated Oct. 28, 2005, 5 pages.

European Office Action for Application No. 98956309.3, dated Jun. 8, 2005, 5 pages.

European Office Action for Application No. 99905907.4, dated Oct. 31, 2005, 4 pages.

European Office Action for Application No. 99906856.2, dated Sep. 24, 2007, 5 pages.

European Office Action for Application No. 99906958.6, dated Feb. 22, 2006, 7 pages.

European Office Action for Application No. 99927333.7, dated Aug. 21, 2006, 9 pages.

European Office Action for Application No. 99927340.2, dated Aug. 9, 2011, 6 pages.

European Office Action for Application No. 99927340.2, dated Nov. 25, 2013, 5 pages.

European Office Action for Application No. 99945479.6, dated Aug. 9, 2006, 6 pages.

European Office Action for Application No. 99945519.9, dated Aug. 20, 2007, 6 pages.

European Office action for Application No. 99956732.4, dated Aug. 17, 2006, 7 pages.

European Office action for Application No. 99956745.6, dated Mar. 14, 2006, 5 pages.

European Office Action for Application No. 99960267.5, dated May 10, 2007, 6 pages.

European Office Action for Application No. 99960279.0, dated Aug. 16, 2005, 6 pages.

European Office Action for Application No. 99965163.1, dated Jul. 13, 2009, 5 pages.

European Search Report and Written Opinion for Application No. 05783002.8, dated Mar. 16, 2009, 8 pages.

European Search Report for 0115441.8 (now EP1075153), dated Nov. 6, 2002, 3 pages.

European Search Report for Application No. 00123331.1, dated Dec. 5, 2003, 6 pages.

European Search Report for Application No. 00305049.9, dated May 7, 2003, 3 pages.

European Search Report for Application No. 00908266.0, dated May 24, 2005, 3 pages.

European Search Report for Application No. 00913226.7, dated Feb. 14, 2005, 3 pages.

European Search Report for Application No. 0119160.0, dated Apr. 17, 2003, 3 pages.

European Search Report for Application No. 01920248.0, dated May 3, 2004, 3 pages.

European Search Report for Application No. 01927387.9, dated Jun. 2, 2006, 3 pages.

European Search Report for Application No. 02400027.5, dated Feb. 20, 2004, 3 pages.

European Search Report for Application No. 02756535.7, dated May 25, 2005, 4 pages.

European Search Report for Application No. 03002575.3, dated Jun. 4, 2003, 3 pages.

European Search Report for Application No. 03008532.8, dated Dec. 27, 2004, 3 pages.

European Search Report for Application No. 03008534.4, dated Jul. 23, 2003, 3 pages.

European Search Report for Application No. 03022831.6, dated Mar. 22, 2006, 3 pages.

European Search Report for Application No. 03023463.7, dated Jun. 14, 2004, 3 pages.

European Search Report for Application No. 03076826.1, dated Sep. 10, 2003, 3 pages.

European Search Report for Application No. 03077174.5, dated Sep. 4, 2003, 4 pages.

European Search Report for Application No. 03077712.2, dated Mar. 29, 2004, 3 pages.

European Search Report for Application No. 03800376, dated May 7, 2007, 3 pages.

European Search Report for Application No. 04007911.3, dated Aug. 17, 2004, 5 pages.

European Search Report for Application No. 04007913.9, dated Aug. 5, 2004, 4 pages.

European Search Report for Application No. 04011886.1, dated Jun. 22, 2006, 5 pages.

European Search Report for Application No. 07018035.1, dated Apr. 23, 2009, 4 pages.

European Search Report for Application No. 98944799.0, dated Aug. 5, 2004, 3 pages.

European Search Report for Application No. 98944830.3, dated Aug. 11, 2004, 3 pages.

European Search Report for Application No. 98946907.7, dated Aug. 11, 2004, 3 pages.

European Search Report for Application No. 98946926.7, dated Aug. 11, 2004, 3 pages.

European Search Report for Application No. 98948164.3, dated Jun. 15, 2004, 3 pages.

European Search Report for Application No. 98953947.3, dated Aug. 20, 2004, 3 pages.

European Search Report for Application No. 98953962.2, dated Sep. 2, 2004, 3 pages.

European Search Report for Application No. 98956187.3, dated Sep. 16, 2005, 3 pages.

European Search Report for Application No. 98956309.3, dated Sep. 10, 2004, 3 pages.

European Search Report for Application No. 99905907.4, dated Jun. 1, 2005, 3 pages.

(56)

**References Cited**

## OTHER PUBLICATIONS

European Search Report for Application No. 99906856.2, dated Oct. 4, 2006, 3 pages.  
 European Search Report for Application No. 99906958.6, dated Aug. 19, 2005, 3 pages.  
 European Search Report for Application No. 99927333.7, dated Mar. 30, 2005, 5 pages.  
 European Search Report for Application No. 99927340.2, dated Oct. 18, 2004, 3 pages.  
 European Search Report for Application No. 99945479.6, dated Mar. 24, 2006, 3 pages.  
 European Search Report for Application No. 99945519.9, dated Oct. 18, 2005, 3 pages.  
 European Search Report for Application No. 99945556.1, dated Nov. 16, 2004, 3 pages.  
 European Search Report for Application No. 99956732.4, dated Apr. 19, 2006, 4 pages.  
 European Search Report for Application No. 99956745.6, dated Jun. 30, 2005, 3 pages.  
 European Search Report for Application No. 99960267.5, dated Jul. 14, 2005, 3 pages.  
 European Search Report for Application No. 99960279.0, dated Apr. 26, 2005, 3 pages.  
 European Search Report for Application No. 99965163.1, dated Nov. 19, 2004, 4 pages.  
 European Search Report for Application No. 99971602.0, dated Feb. 6, 2007, 3 pages.  
 International Preliminary Examination Report for PCT/US01/40267, dated Dec. 9, 2002, 4 pages.  
 International Preliminary Report on Patentability for PCT/US20051027544, dated May 22, 2007, 7 pages.  
 International Search Report and Written Opinion for PCT/US2009/068402, dated Mar. 31, 2010, 10 pages.  
 International Search Report for PCT/US03141677, dated Apr. 10, 2006, 1 page.  
 International Search Report for PCT/US05/27544, dated Jun. 14, 2006, 1 page.  
 Japanese Interrogation and Re-Examination Report for Application No. 1999-502827, mailed Oct. 26, 2004, 7 pages.  
 Japanese Office Action for Application No. 1998-531244, mailed Jan. 6, 2004, 4 pages.  
 Japanese Office Action for Application No. 1998-536740, mailed Feb. 24, 2004, 5 pages.  
 Japanese Office Action for Application No. 1999-500765, mailed Feb. 10, 2004, 6 pages.  
 Japanese Office Action for Application No. 1999-502827, mailed Dec. 3, 2002, 4 pages.  
 Japanese Office Action for Application No. 1999-502827, mailed Nov. 1, 2005, 8 pages.  
 Japanese Office action for Application No. 2000-220082, mailed on Apr. 1, 2003, 3 pages.  
 Japanese Office Action for Application No. 2000-511299, mailed Feb. 3, 2004, 4 pages.  
 Japanese Office Action for Application No. 2000-511299, mailed May 16, 2006, 7 pages.  
 Japanese Office Action for Application No. 2000-512336, mailed Jun. 24, 2003, 4 pages.  
 Japanese Office Action for Application No. 2000-519541, dated May 16, 2005, 4 pages.  
 Japanese Office Action for Application No. 2000-519541, mailed Dec. 2, 2003, 7 pages.

Japanese Office Action for Application No. 2000-519541, mailed Mar. 14, 2006, 6 pages.  
 Japanese Office Action for Application No. 2000-531940, mailed Dec. 3, 2002, 4 pages.  
 Japanese Office Action for Application No. 2000-554115, dated Apr. 27, 2005, 5 pages.  
 Japanese Office Action for Application No. 2000-554115, mailed Jan. 6, 2004, 4 pages.  
 Japanese Office Action for Application No. 2000-556311, mailed Oct. 21, 2003, 6 pages.  
 Japanese Office Action for Application No. 2000-570673, dated Oct. 4, 2005, 4 pages.  
 Japanese Office Action for Application No. 2000-570673, mailed Mar. 8, 2005, 6 pages.  
 Japanese Office Action for Application No. 2000-570673, mailed Oct. 14, 2003, 6 pages.  
 Japanese Office Action for Application No. 2000-570677, mailed May 11, 2004, 8 pages.  
 Japanese Office Action for Application No. 2000-570677, mailed Nov. 30, 2004, 10 pages.  
 Japanese Office Action for Application No. 2000-570941, mailed Oct. 7, 2003, 6 pages.  
 Japanese Office Action for Application No. 2000-578753, mailed May 11, 2004, 11 pages.  
 Japanese Office Action for Application No. 2000-580124, mailed Apr. 12, 2005, 6 pages.  
 Japanese Office Action for Application No. 2000-580124, mailed Oct. 7, 2003, 5 pages.  
 Japanese Office Action for Application No. 2000-580329, mailed Feb. 15, 2005, 8 pages.  
 Japanese Office Action for Application No. 2000-580329, mailed May 13, 2008, 8 pages.  
 Japanese Office Action for Application No. 2000-580329, mailed Oct. 4, 2005, 5 pages.  
 Japanese Office Action for Application No. 2000-581781, mailed Feb. 3, 2004, 4 pages.  
 Japanese Office Action for Application No. 2000-590363, mailed Apr. 1, 2003, 6 pages.  
 Japanese Office Action for Application No. 2001-526724, mailed Aug. 1, 2006, 5 pages.  
 Japanese Office Action for Application No. 2001-526724, mailed Dec. 13, 2005, 5 pages.  
 Japanese Office Action for Application No. 2001-526724, mailed May 17, 2005, 4 pages.  
 Japanese Office Action for Application No. 2006-127262, mailed Jun. 1, 2010 (5 pages).  
 Japanese Office Action for Application No. 2006-127262, mailed Nov. 18, 2008 (7 pages).  
 Japanese Office Action for Application No. 2011-543586, mailed Jan. 24, 2013, 5 pages.  
 Japanese Office Action for Application No. 532950, dated Dec. 17, 2002, 6 pages.  
 Korean Office Action for Application No. 10-2011-7016735, dated Jun. 13, 2013, 3 pages.  
 Korean Office Action for Application No. 10-2011-7017067, dated Aug. 21, 2012, 9 pages.  
 Wagner, Susanne., "Intralingual Speech-to-Text Conversion in Real-Time: Challenges and Opportunities," Challenges of Multidimensional Translation Conference Proceedings, 2005, 10 pages.  
 T-Server for Alcatel A4400/OXE, Deployment Guide, Framework 7.6, Genesys an Alcatel-Lucent Company, 6 pages.

\* cited by examiner

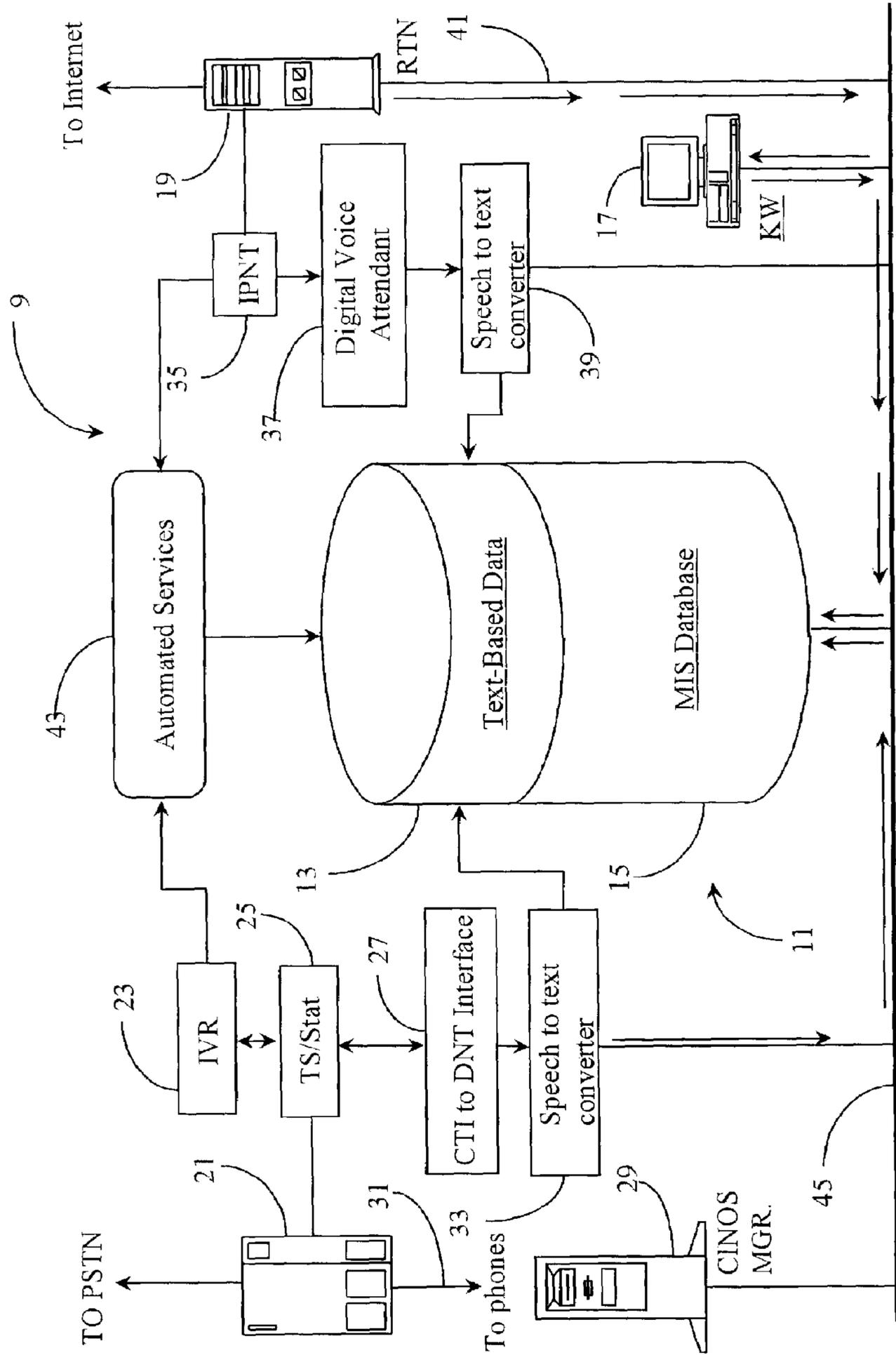


Fig. 1

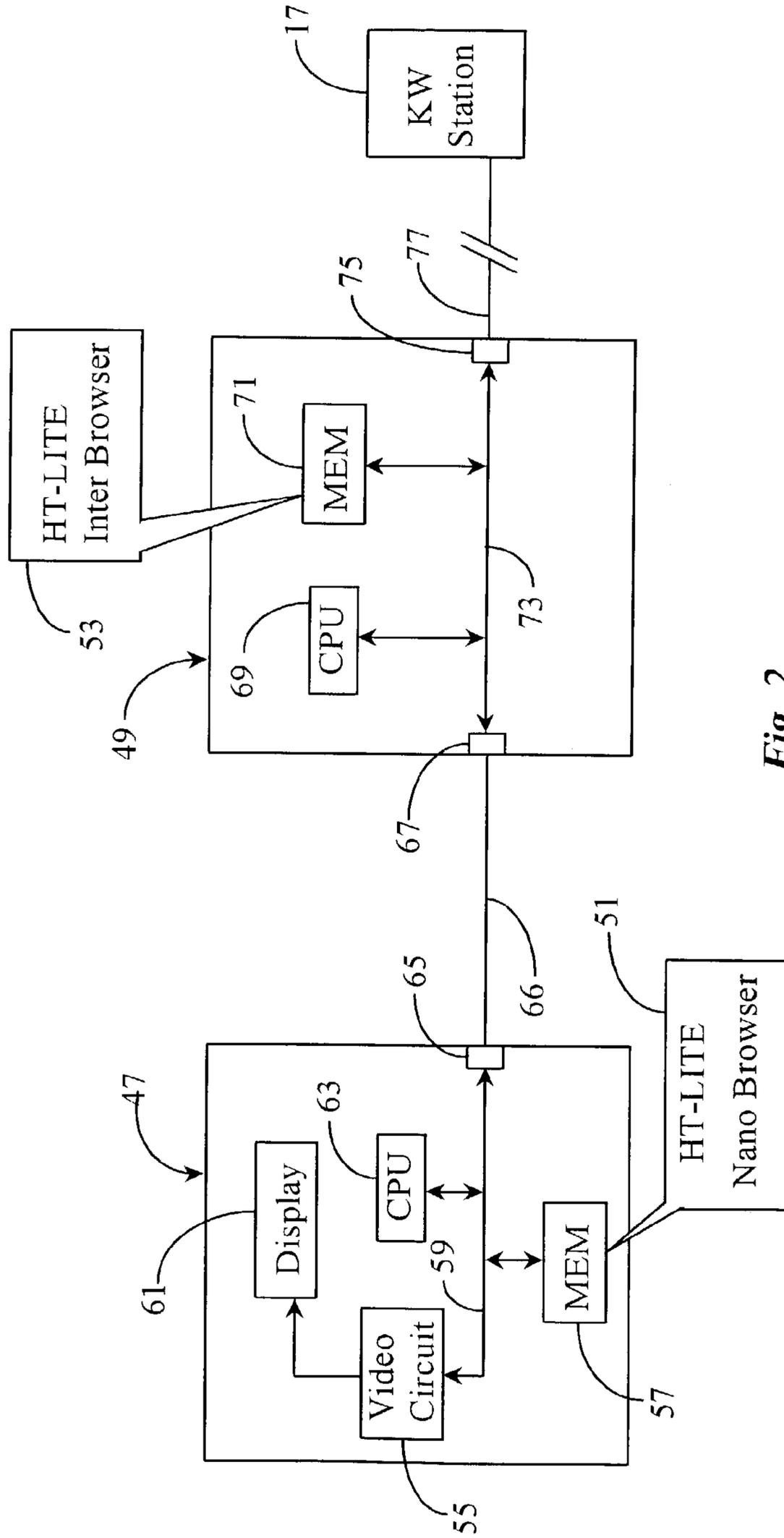


Fig. 2

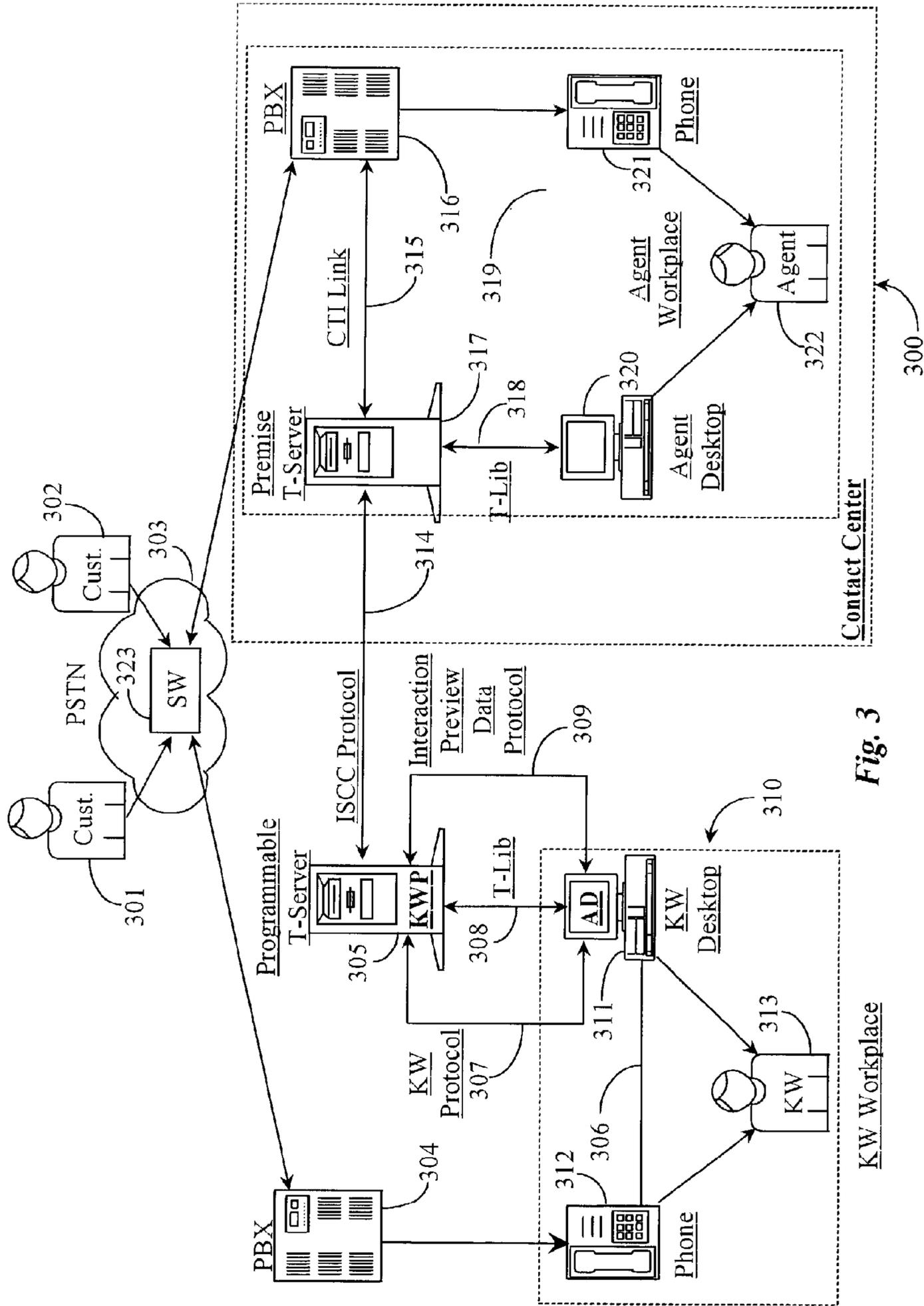


Fig. 3

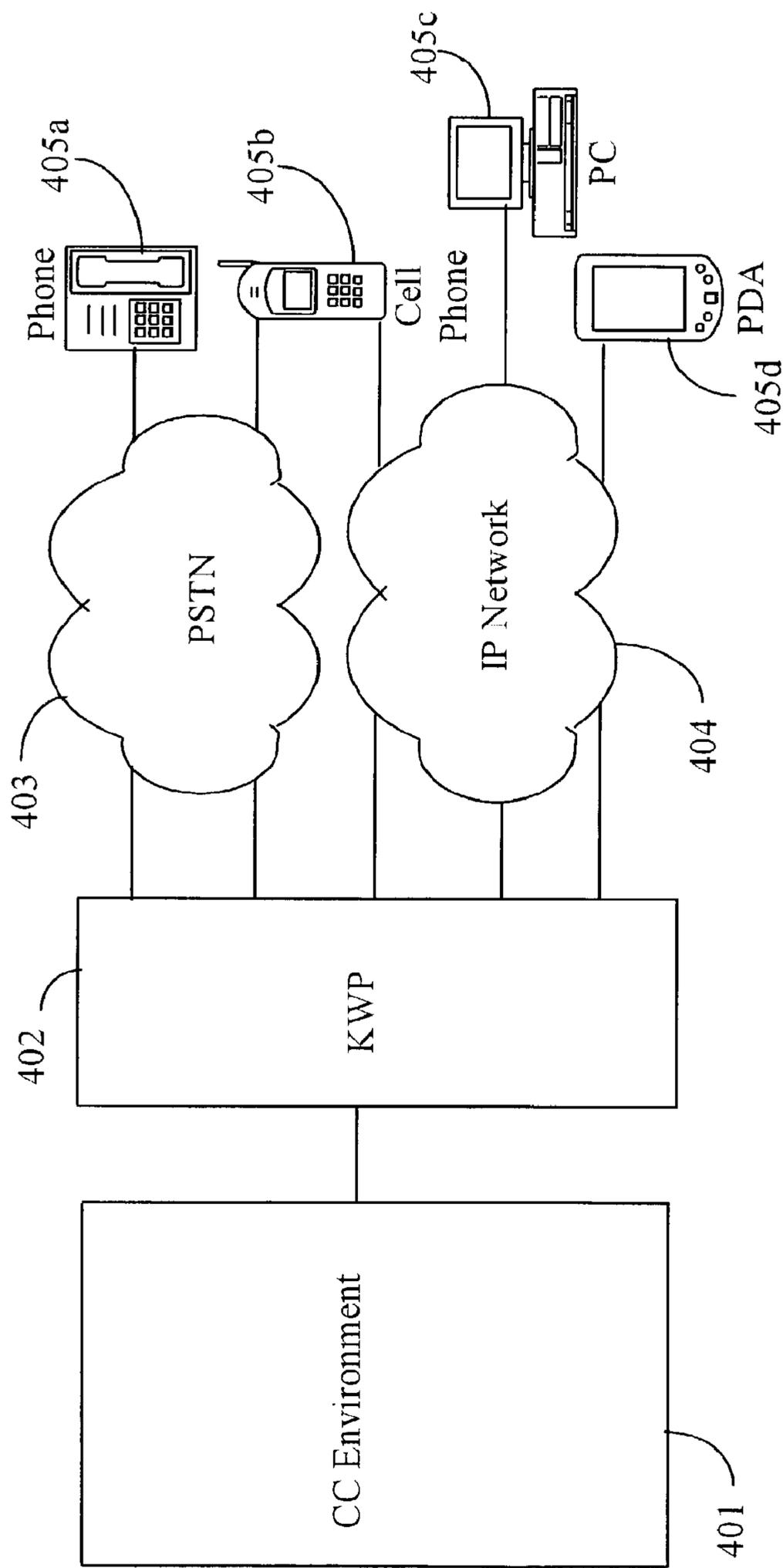
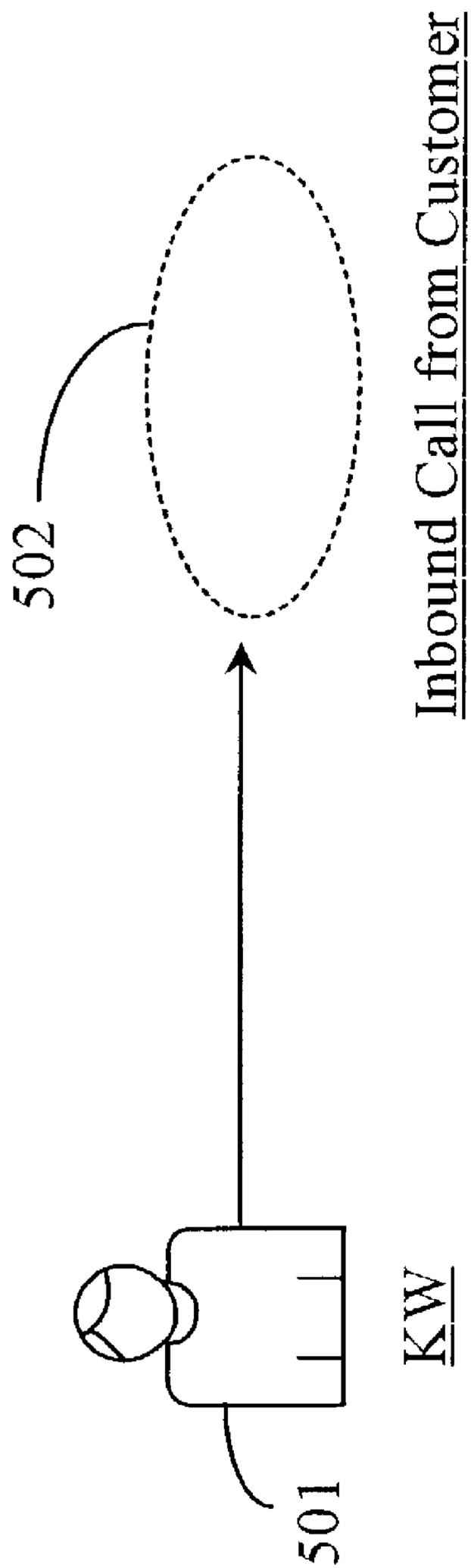
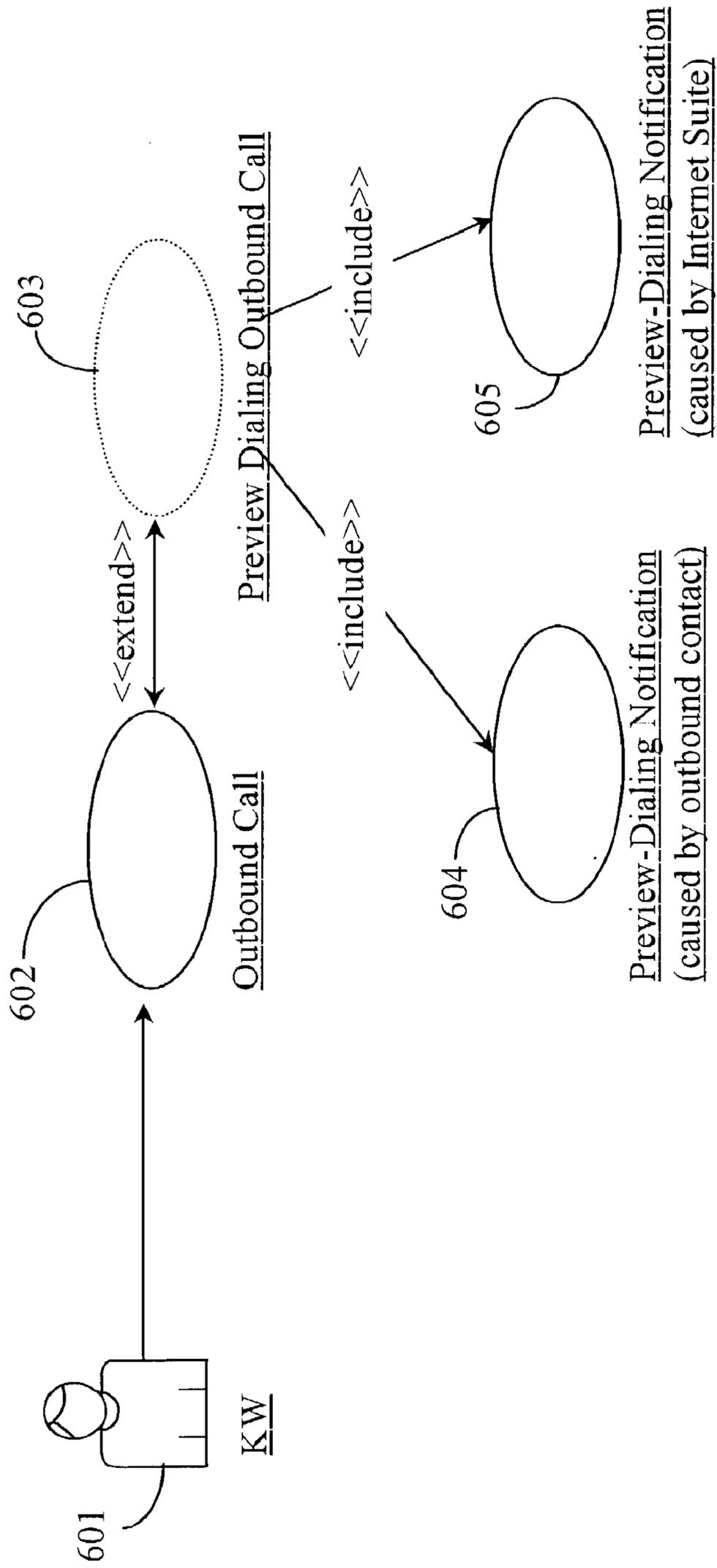


Fig. 4



**Fig. 5**



**Fig. 6**

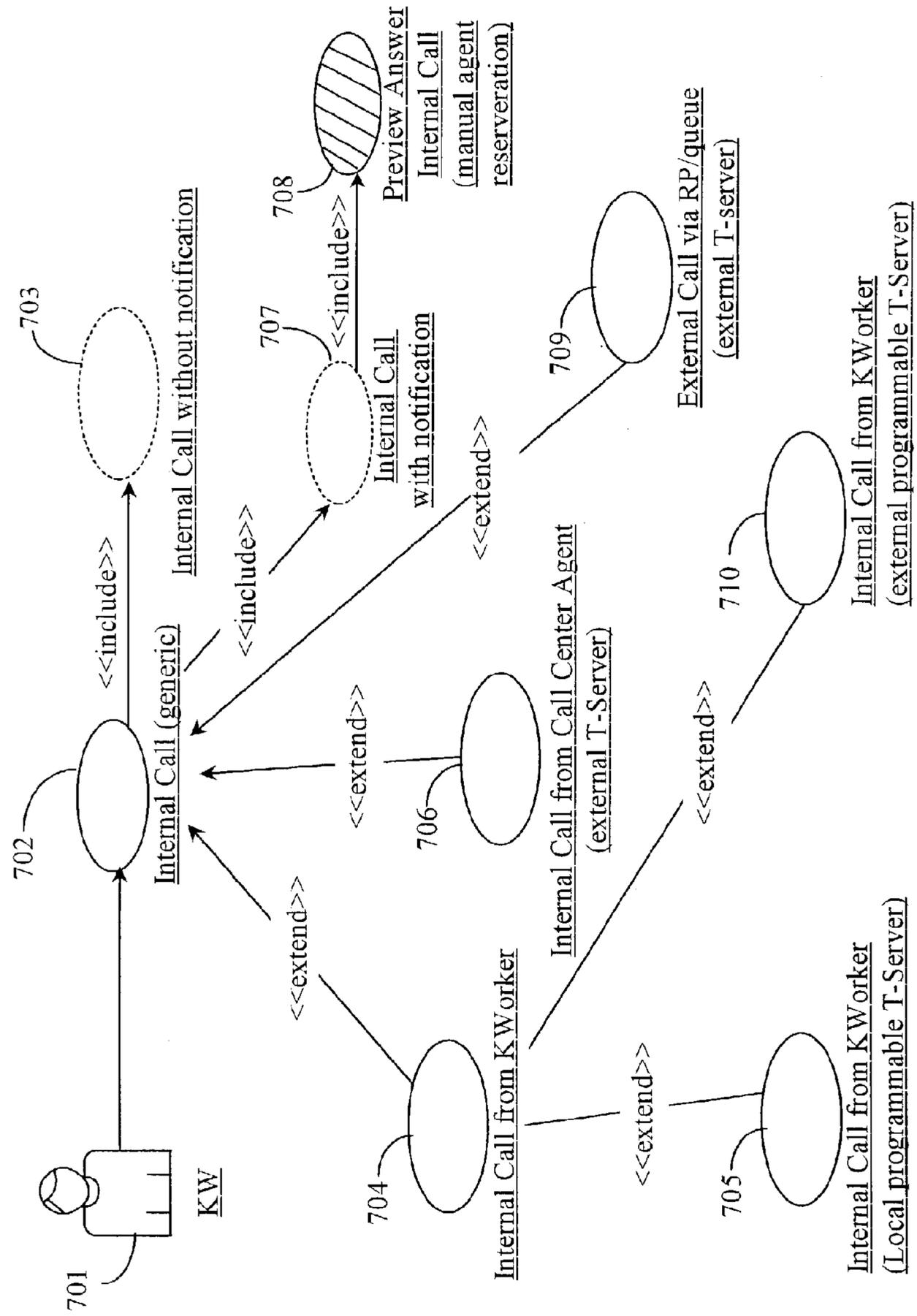
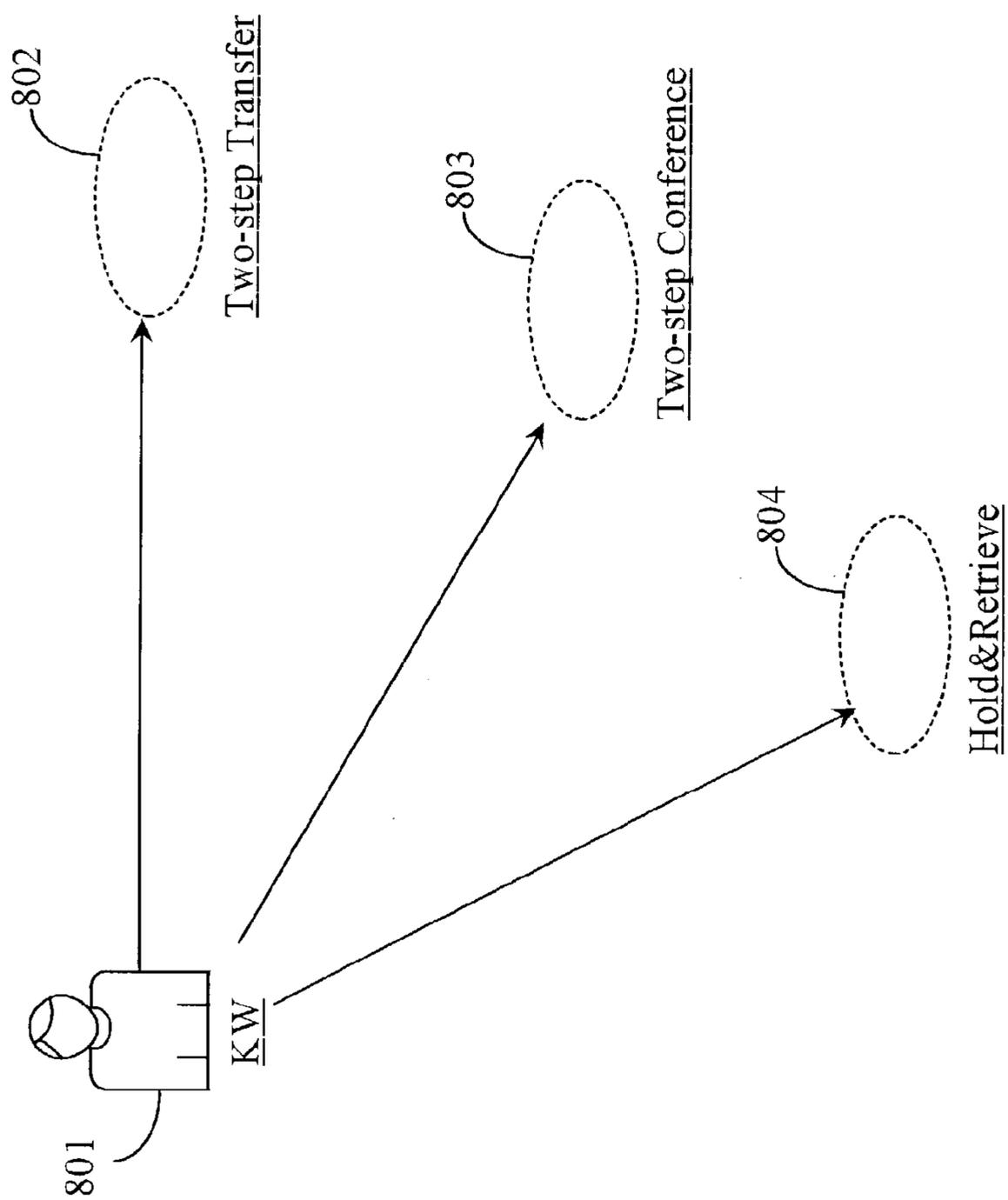
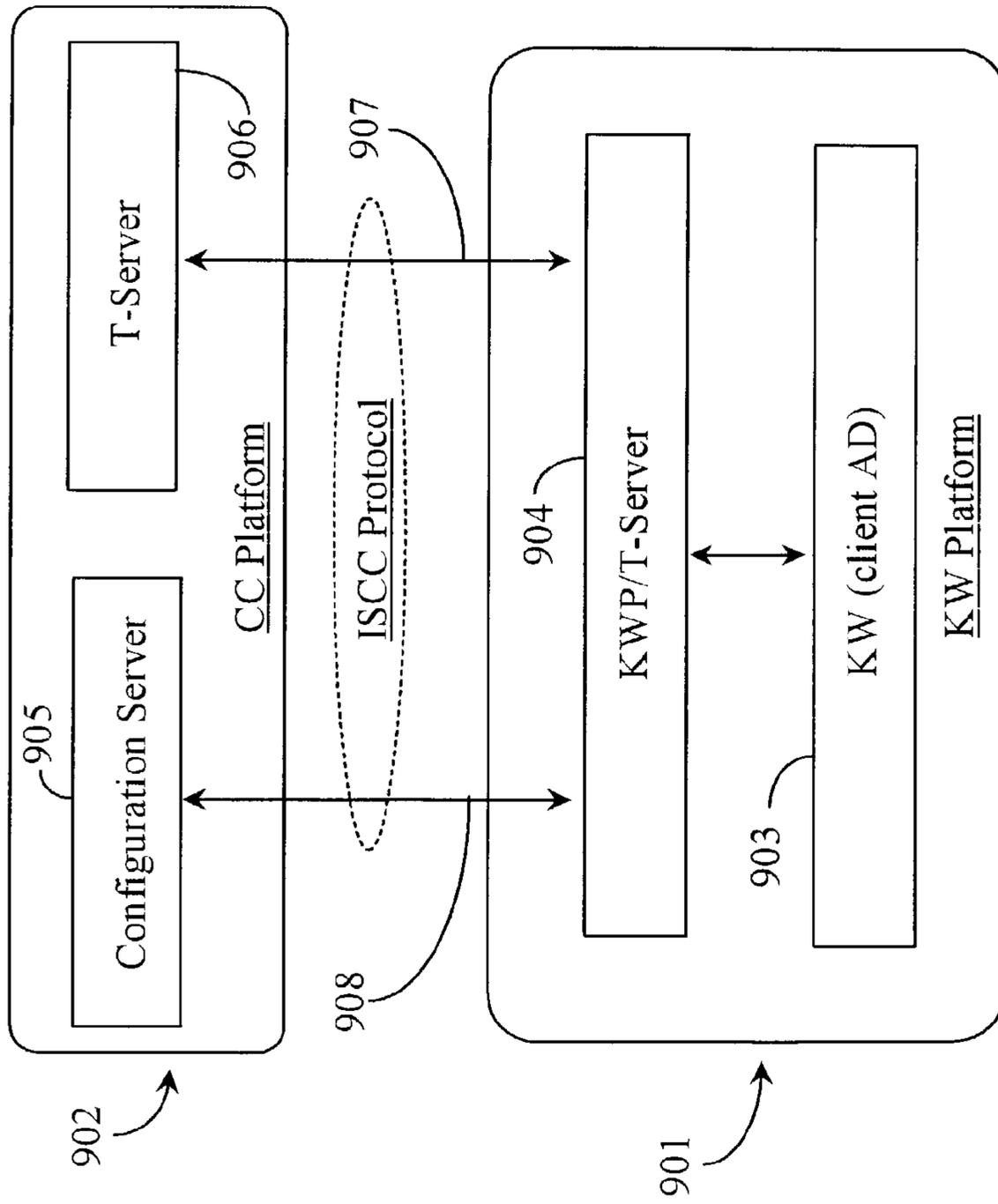


Fig. 7



**Fig. 8**



**Fig. 9**

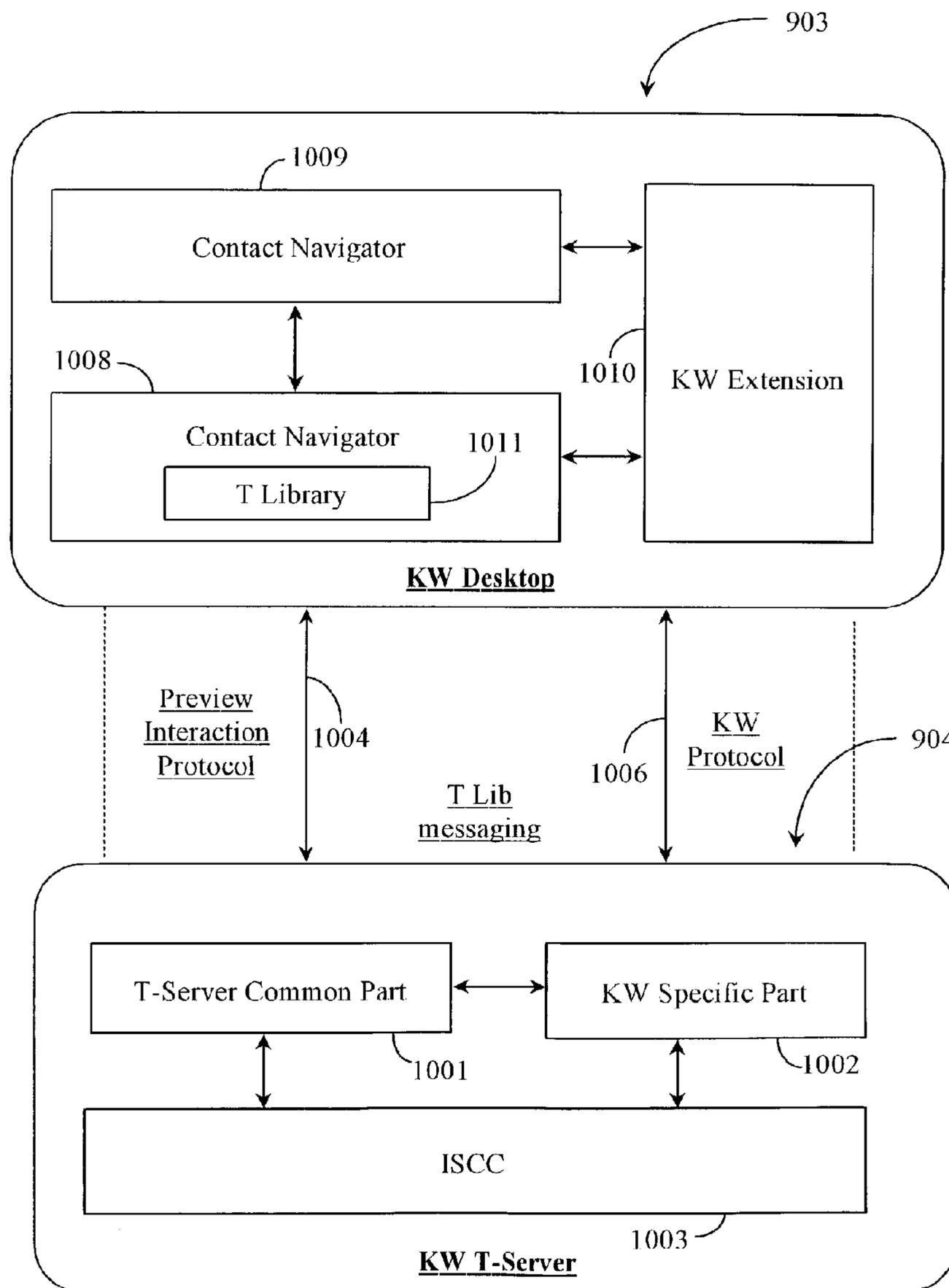
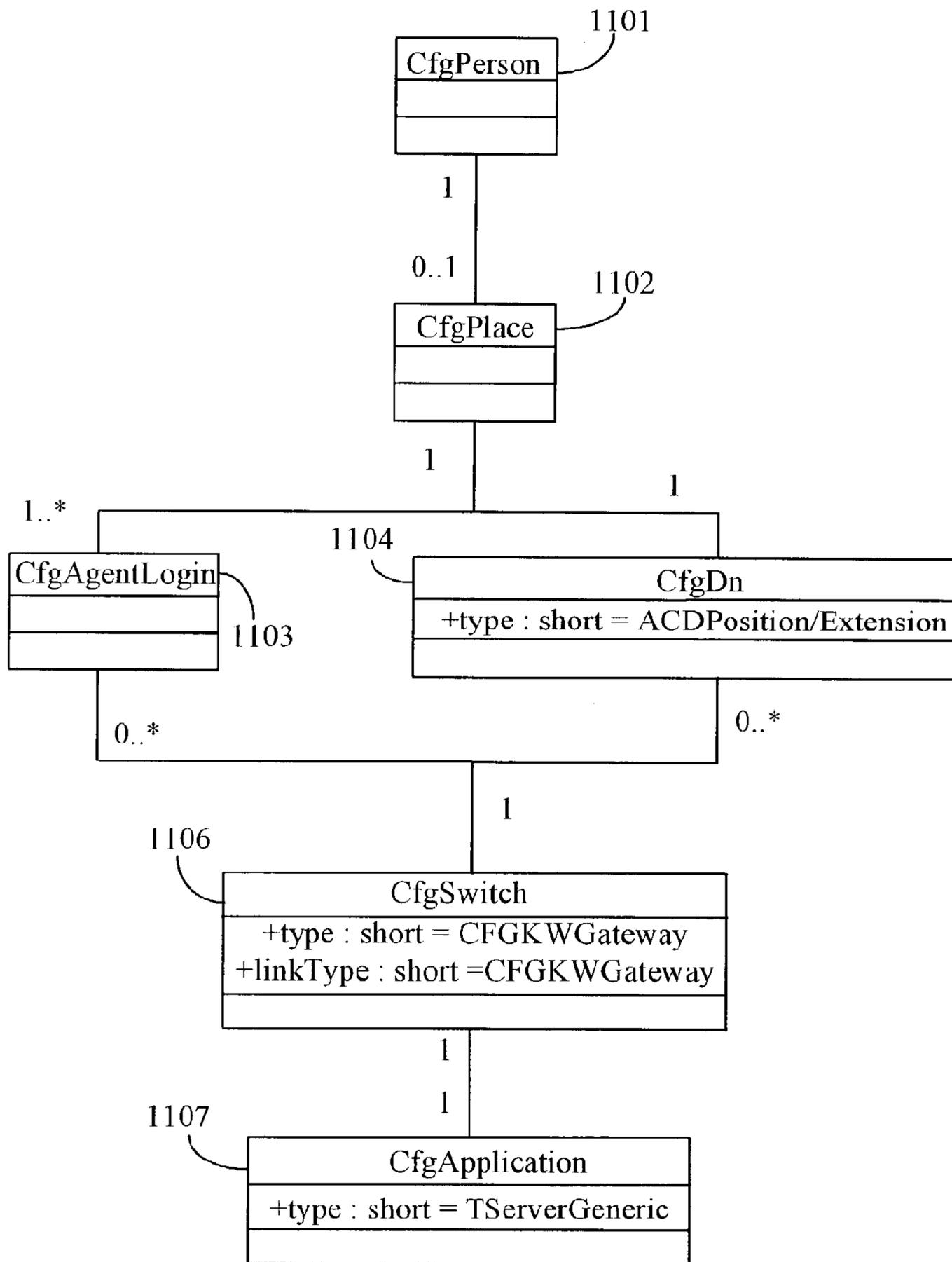


Fig. 10



**Fig. 11**

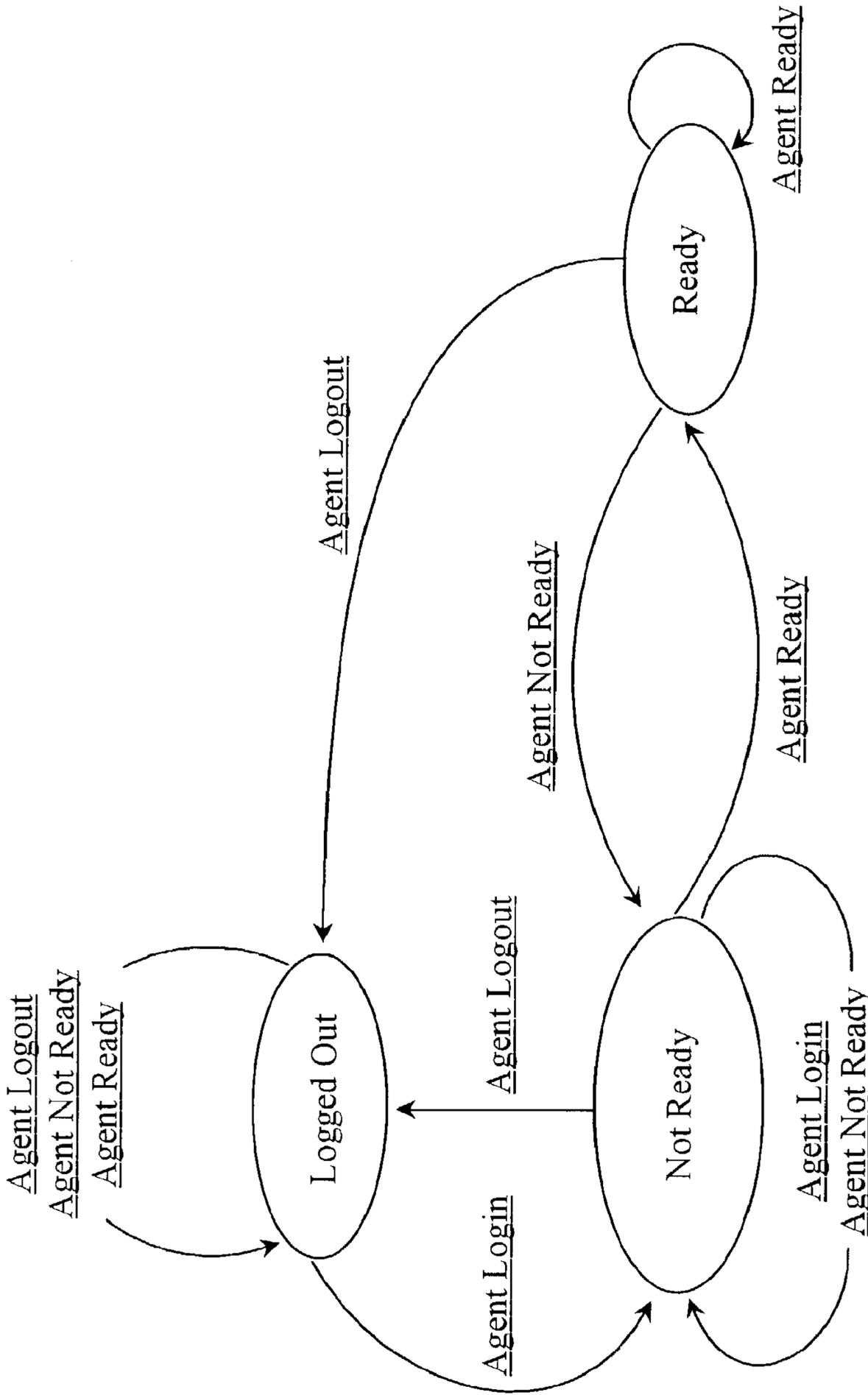


Fig. 12

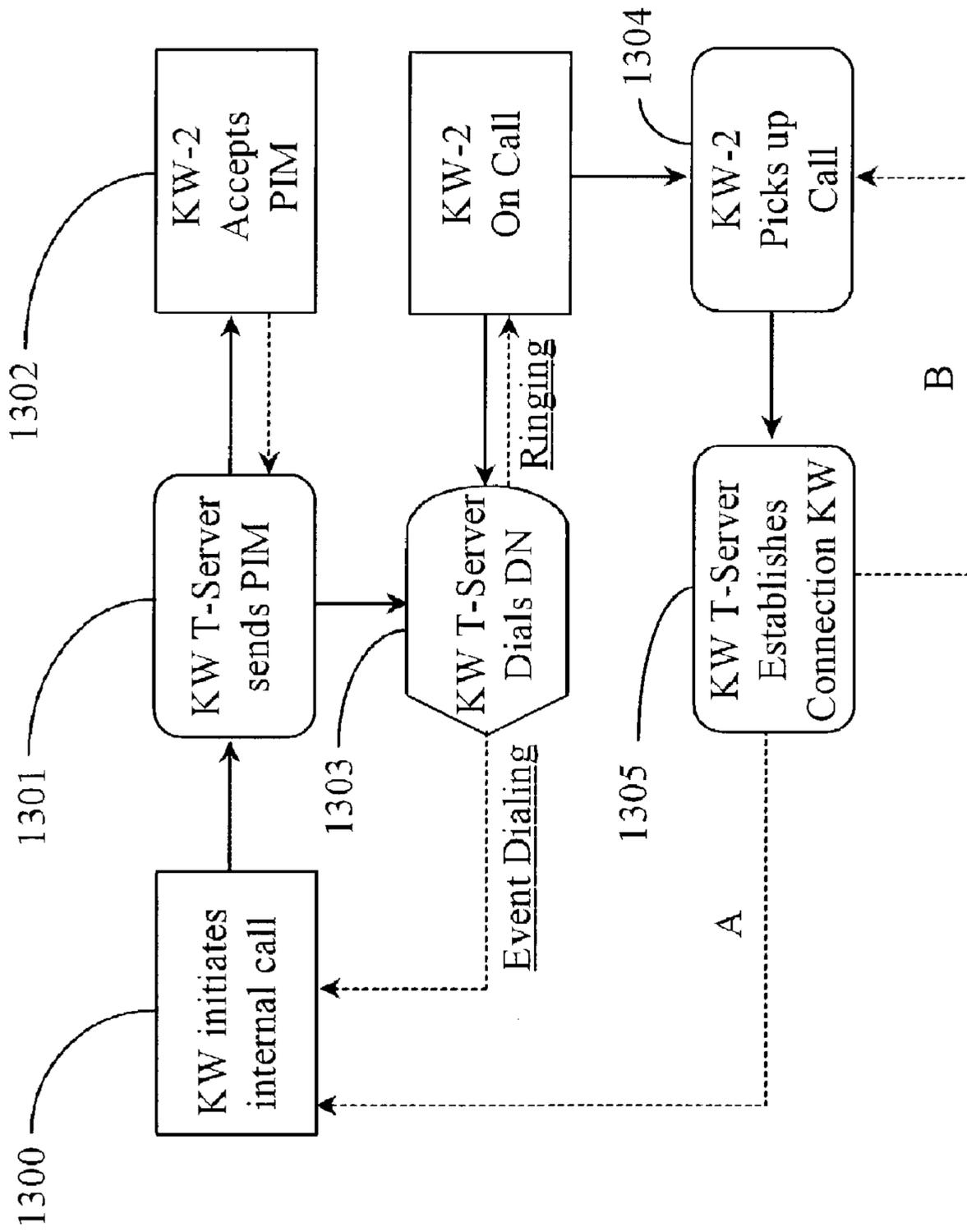
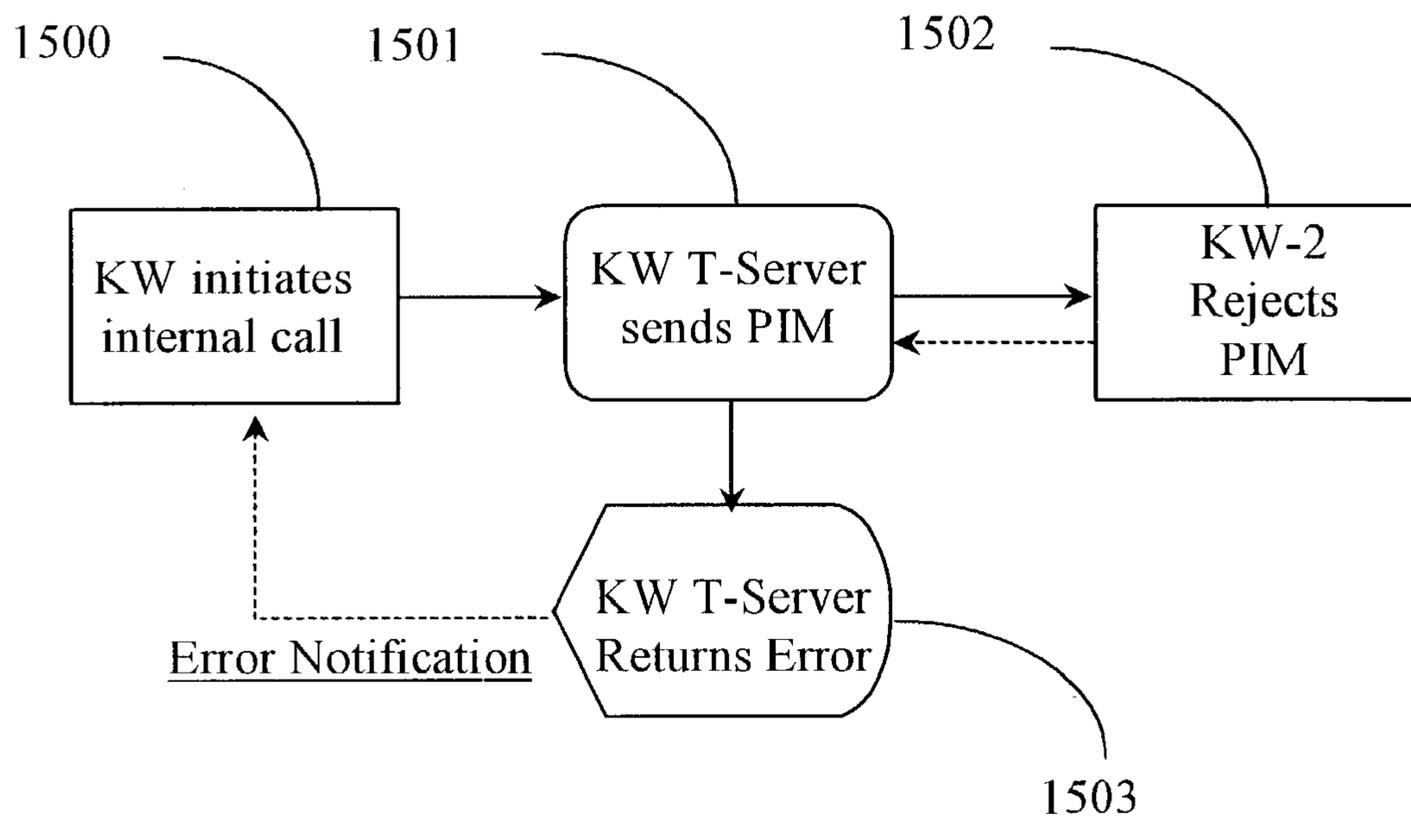


Fig. 13





*Fig. 15*

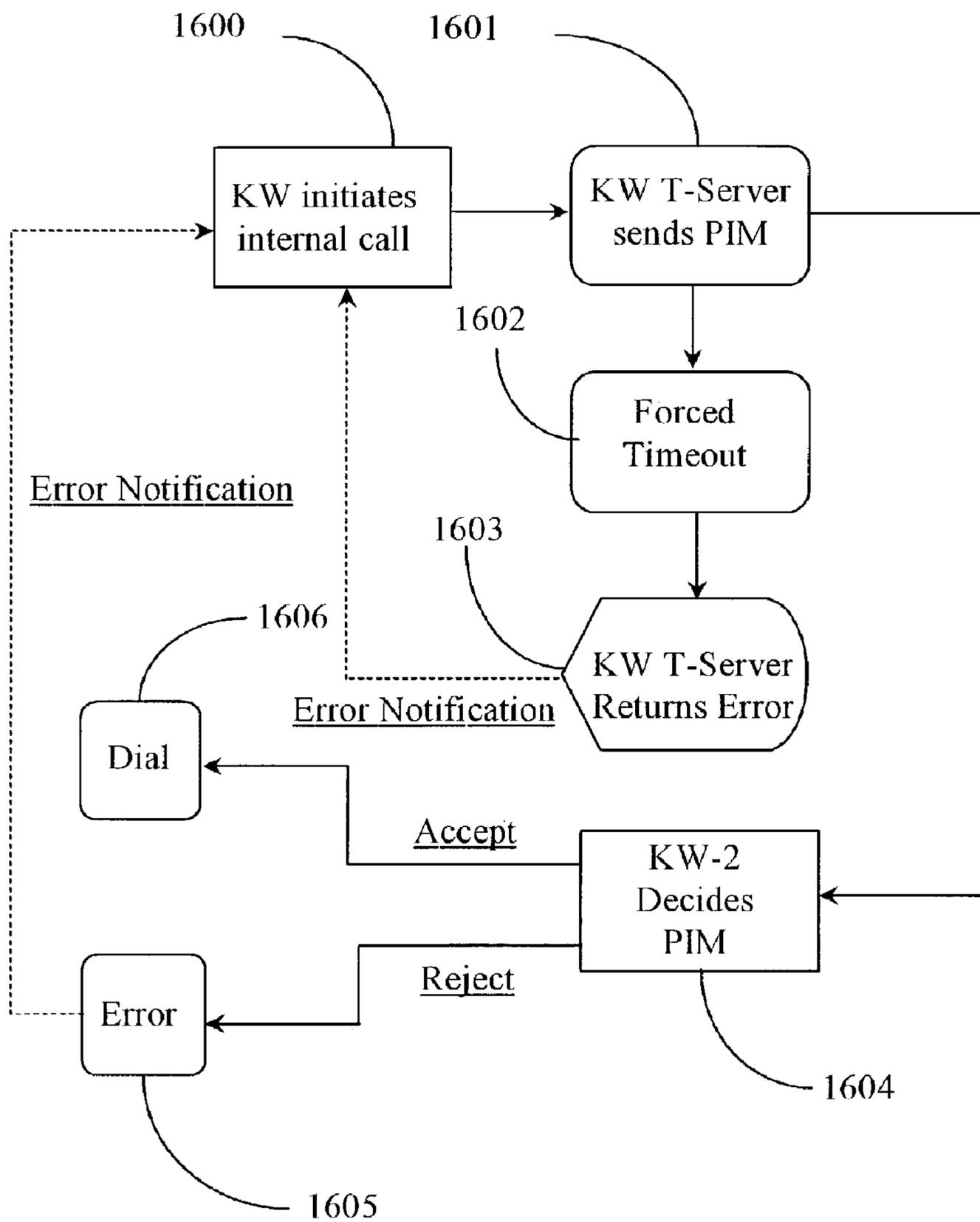


Fig. 16

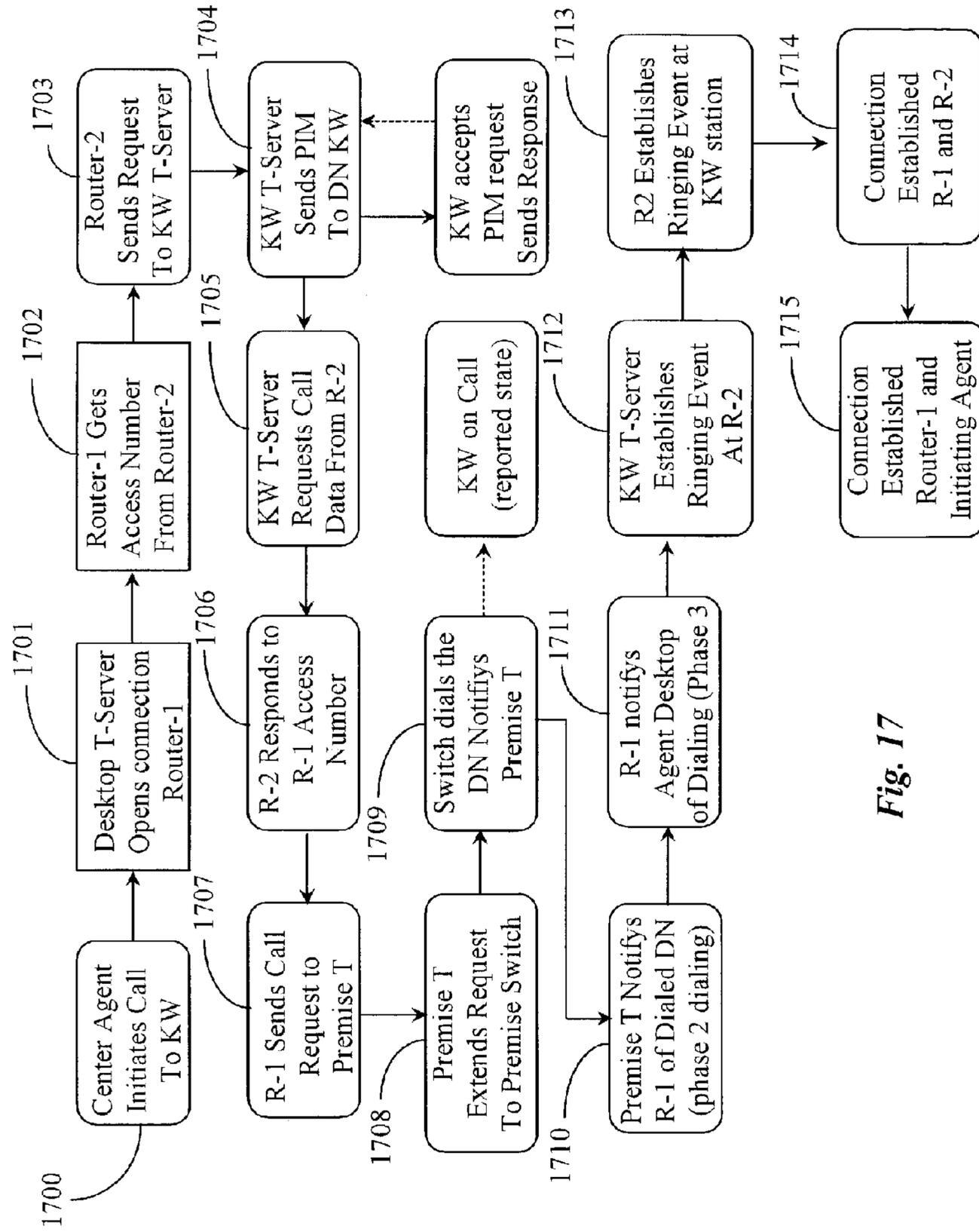


Fig. 17

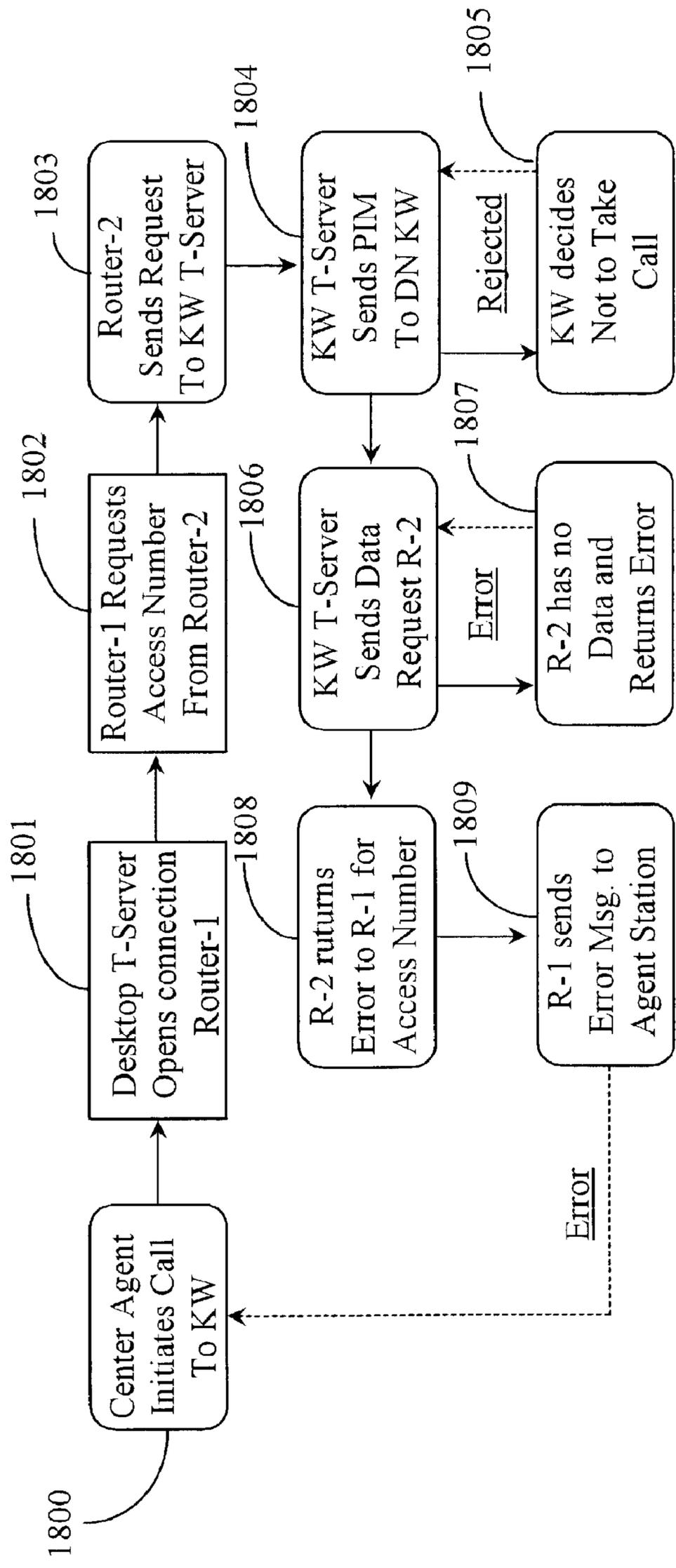


Fig. 18

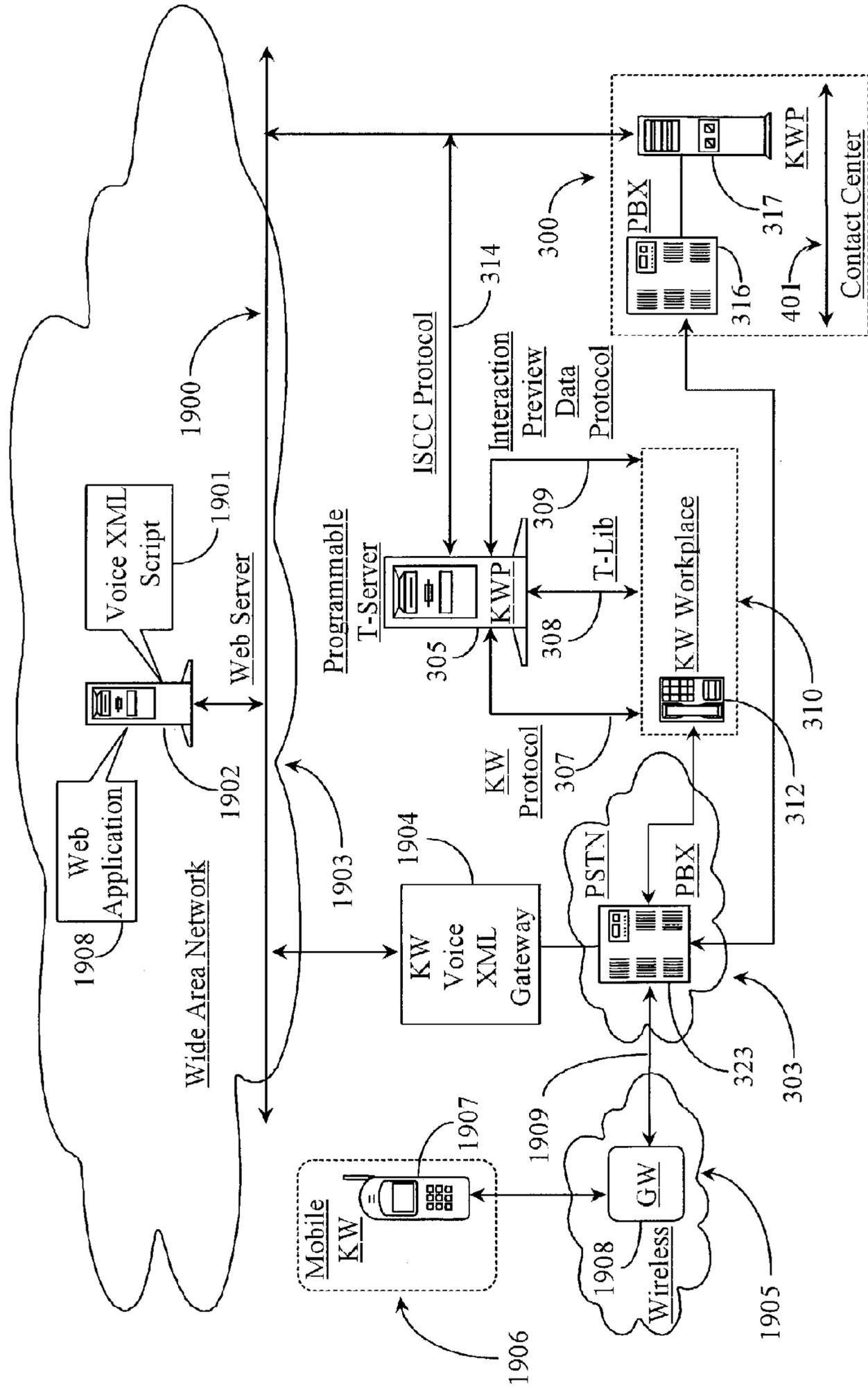


Fig. 19

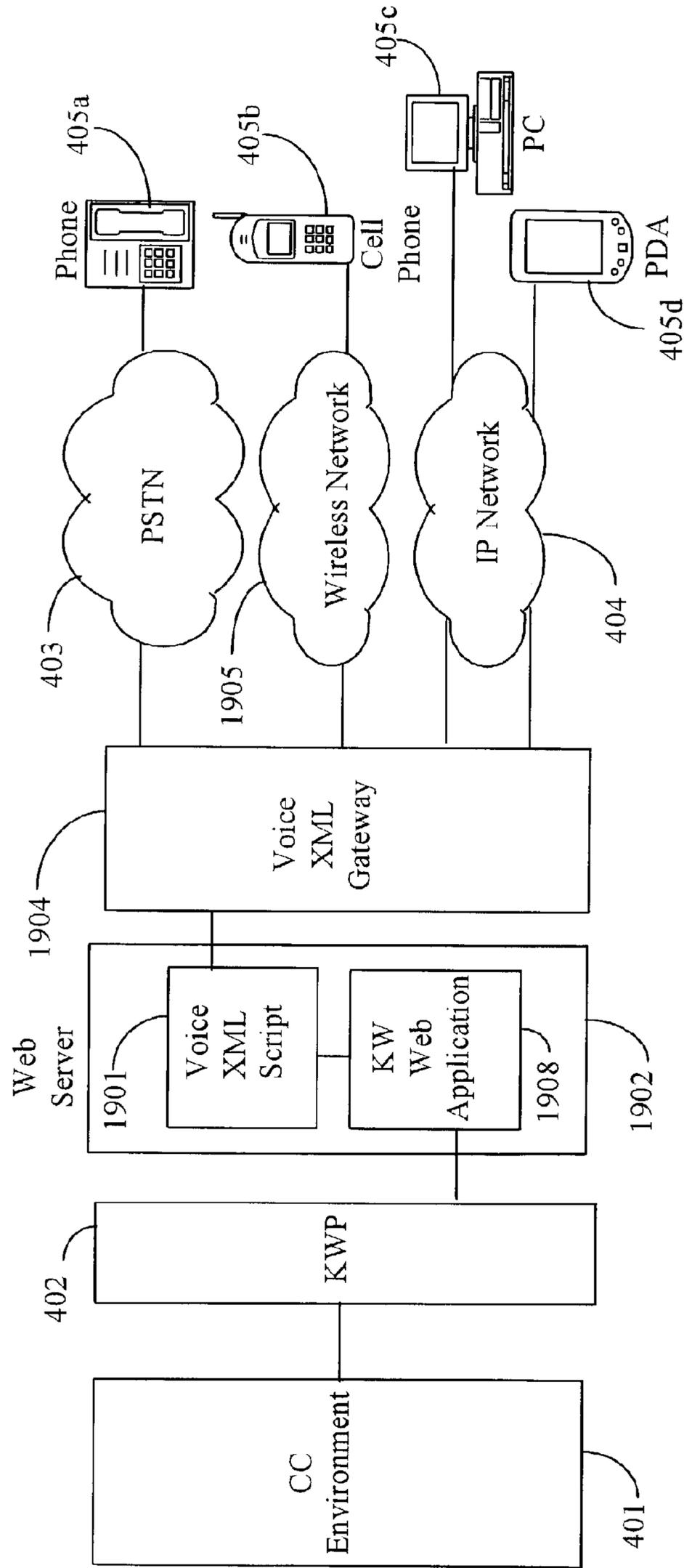
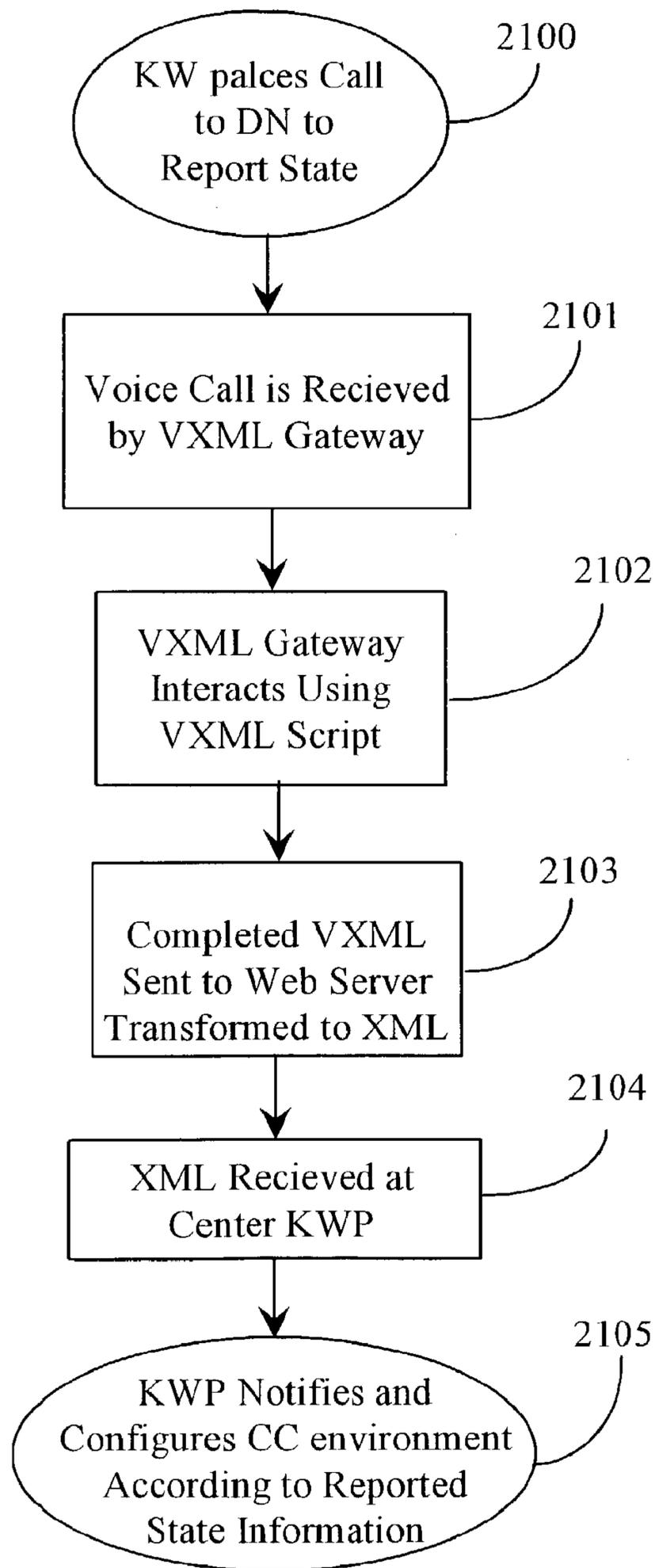
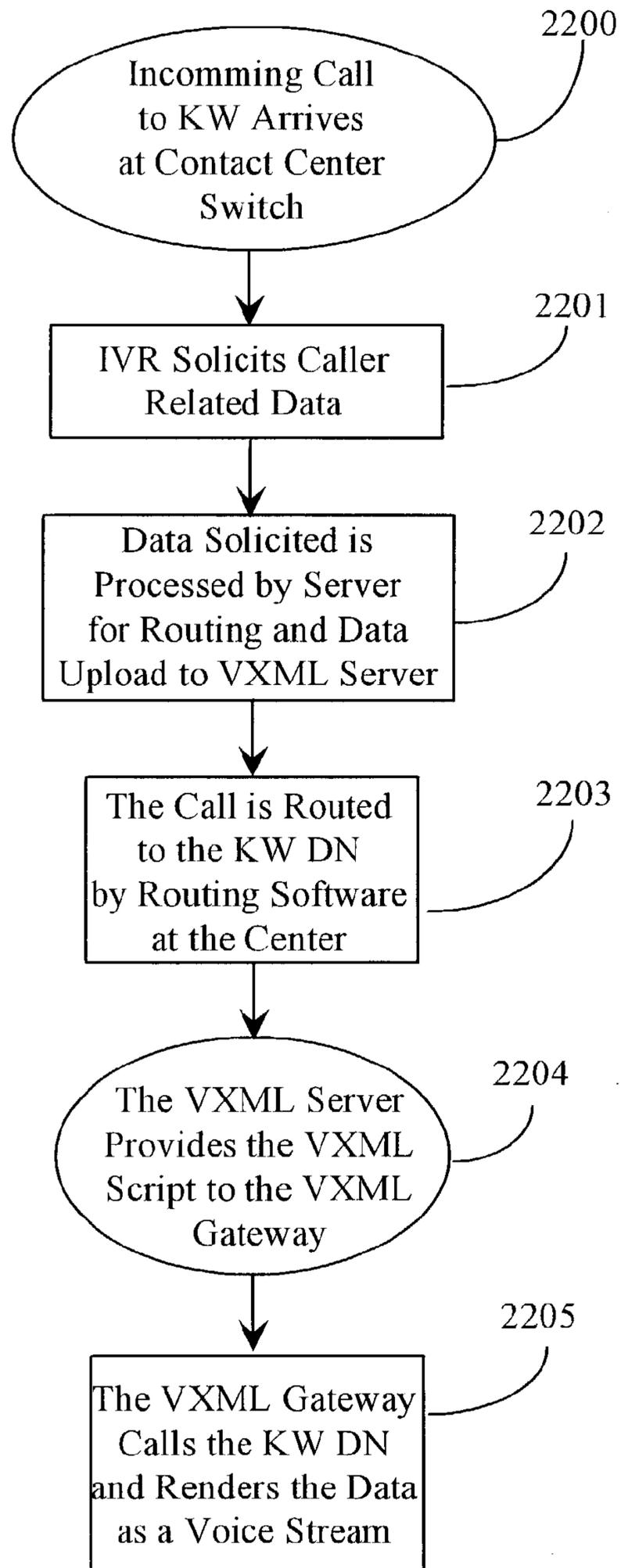


Fig. 20

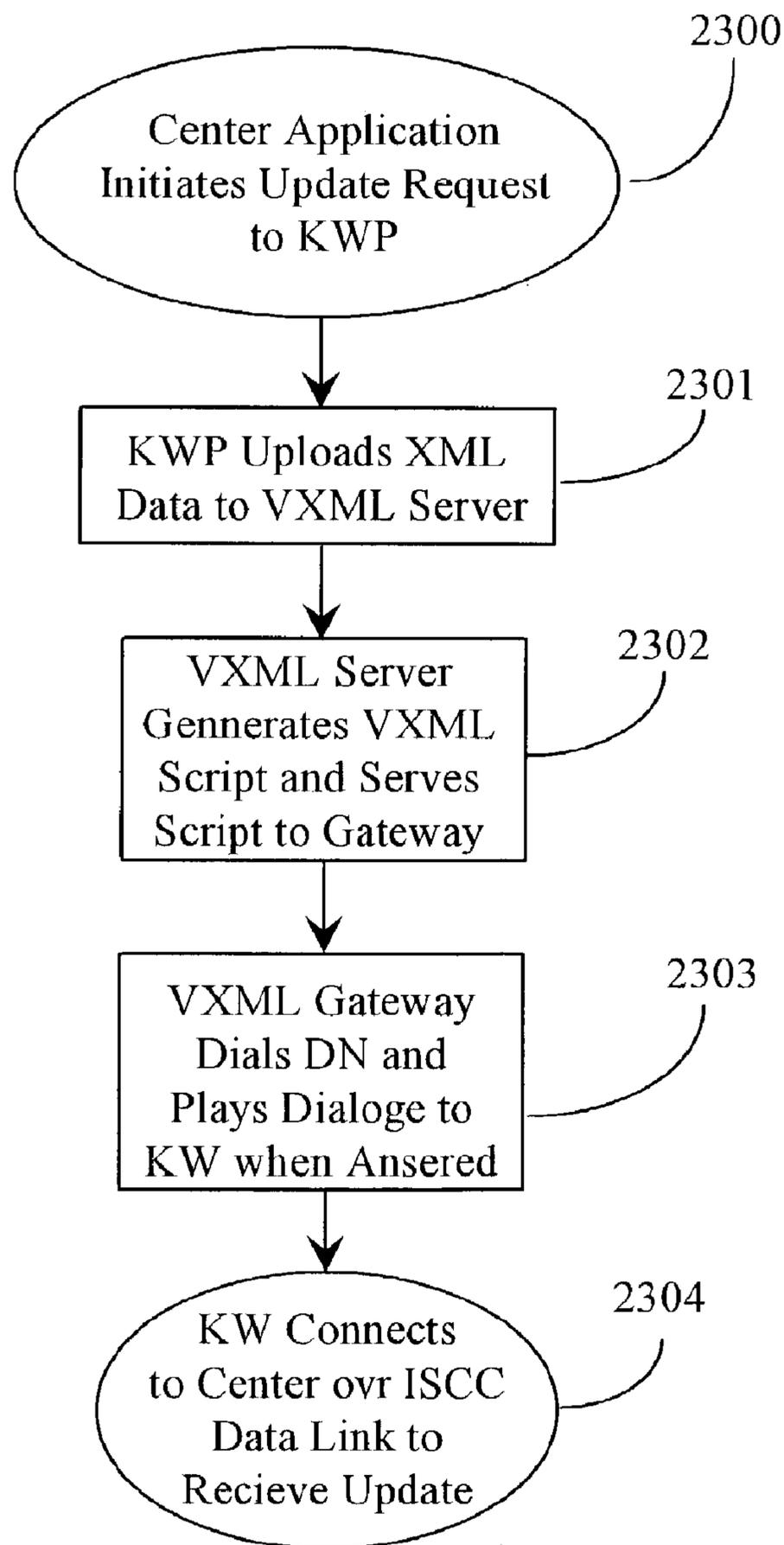


*Fig. 21*



**Fig. 22**

steps for alerting a KW to accept a KW update over a data link



**Fig. 23**

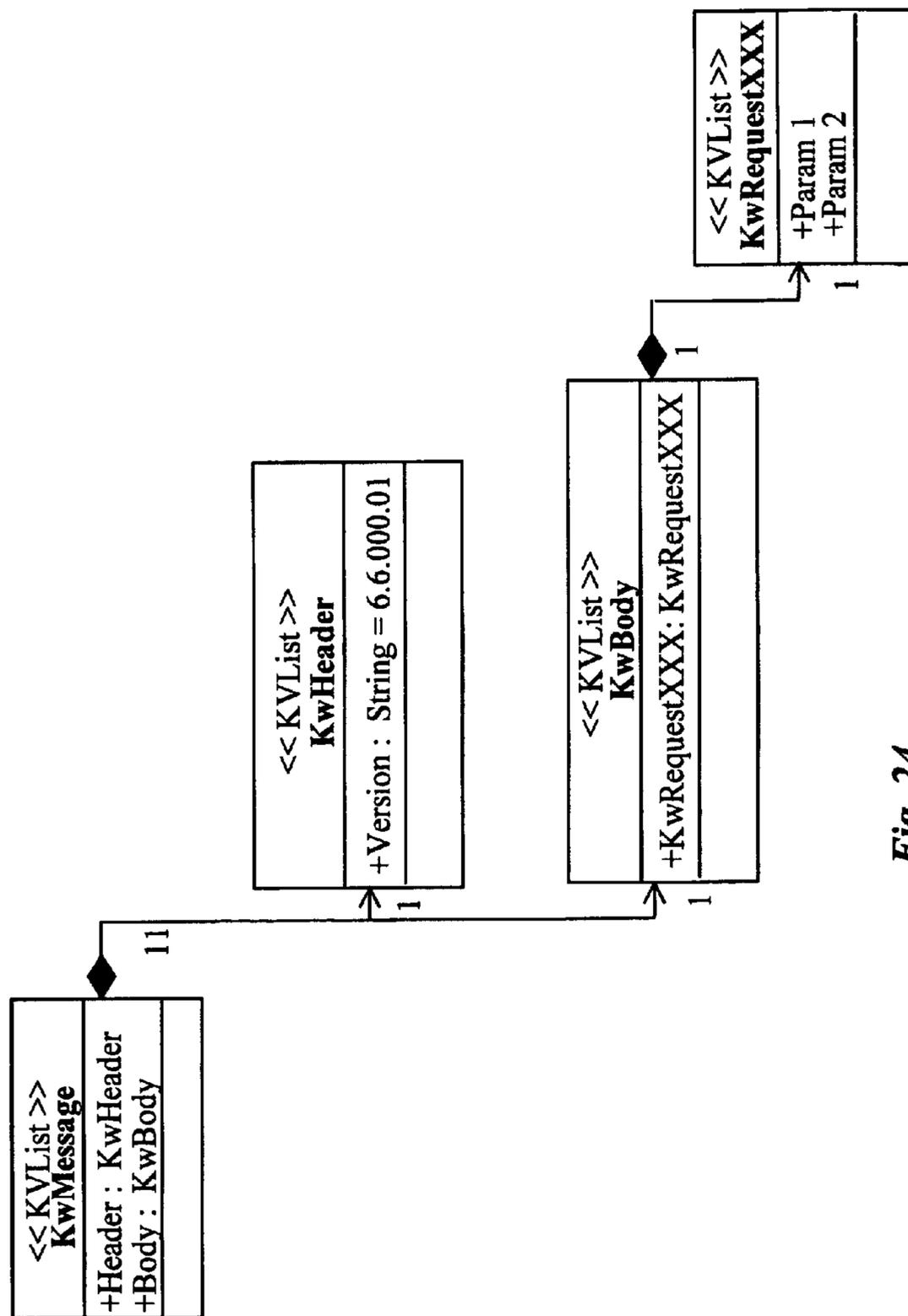


Fig. 24

**METHOD AND APPARATUS ENABLING  
VOICE-BASED MANAGEMENT OF STATE  
AND INTERACTION OF A REMOTE  
KNOWLEDGE WORKER IN A CONTACT  
CENTER ENVIRONMENT**

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.**

CROSS-REFERENCE TO RELATED  
DOCUMENTS

[The present invention is a continuation in part (CIP) to a U.S. patent application Ser. No. 10/269,124 entitled Method and Apparatus for Extended Management of State and Interacdon of a Remote Knowledge Worker from a Contact Center filed on Oct. 10, 2002 now U.S. Pat. No. 6,985,943, which is a CIP to a U.S. patent application Ser. No. 09/405,335 entitled Method and Apparatus for Data-Linking a Mobile Knowledge Worker to Home Communication-Center Infrastructure filed on Sep. 24, 1999 now U.S. Pat. No. 6,711,611, which is a CIP to U.S. application Ser. No. 09/151,564, now U.S. Pat. No. 6,108,711 filed Sep. 11, 1998 and issued on Aug. 22, 2000, all of which are incorporated herein at least by reference.] *The present application is a reissue patent application of U.S. Pat. No. 7,222,301, filed on Apr. 2, 2003, as U.S. patent application Ser. No. 10/406,511, which is a continuation-in-part (CIP) of U.S. patent application Ser. No. 10/269,124, filed on Oct. 10, 2002, now U.S. Pat. No. 6,985,943, the content of which is incorporated herein by reference in its entirety. The contents of U.S. patent application Ser. No. 09/405,335, filed on Sep. 24, 1999, now U.S. Pat. No. 6,711,611, and of U.S. patent application Ser. No. 09/151,564, filed on Sep. 11, 1998, now U.S. Pat. No. 6,108,711, are incorporated herein by refer-  
ence in their entirety.*

FIELD OF THE INVENTION

The present invention pertains to telephony communications systems and has particular application to methods including software enabling extended management capabilities of state and interaction of a remote knowledge worker from a contact center using voice-based technologies.

BACKGROUND OF THE INVENTION

In the field of computer-telephony-integrated (CTI) telephony communication, there have been many improvements in technology over the years that have contributed to more efficient use of telephone communication within hosted call-center environments.

In recent years, advances in computer technology, telephony equipment, and infrastructure have provided many opportunities for improving telephone service in public-switched and private telephone intelligent networks. Similarly, development of a separate information and data network known as the Internet, together with advances in computer hardware and software have led to a new multimedia telephone system known in the art by several names. In this new system telephone calls are simulated by multimedia computer equipment, and data, such as audio data, is

transmitted over data networks as data packets. In this system the broad term used to describe such computer-simulated telephony is Data-Network-Telephony (DNT) of which Internet-Protocol-Network-Telephony (IPNT) is a sub-set. Conventional non-DNT telephony systems are referred to herein as Connection-Oriented-Switched-Telephony COST systems.

Recent improvements to available technologies associated with the transmission and reception of data packets during real-time DNT communication have enabled companies to successfully add DNT, principally IPNT, capabilities to existing CTI call centers. Such improvements, as described herein and known to the inventor, include methods for guaranteeing available bandwidth or quality of service (QoS) for a transaction, improved mechanisms for organizing, coding, compressing, and carrying data more efficiently using less bandwidth, and methods and apparatus for intelligently replacing lost data via using voice supplementation methods and enhanced buffering capabilities.

In addition to Internet protocol (IPNT) calls, a DNT center may also share other forms of media with customers accessing the system through their computers. E-mails, Video mails, fax, file share, file transfer, video calls, and so forth are some of the other forms of media, which may be used. This capability of handling varied media leads to the term multimedia communications center. A multimedia communications center may be a combination CTI and DNT center, or may be a DNT center capable of receiving COST calls and converting them to a digital DNT format. The term communication center will replace the term call center hereinafter in this specification when referring to multimedia capabilities.

In typical communication centers, DNT is accomplished by Internet connection and IPNT calls. For this reason, IPNT and the Internet will be used in examples to follow. It should be understood, however, that this usage is exemplary, and not limiting.

Keeping contact histories, reporting statistics, creating routing rules and the like becomes more complex as newer types of media are added to communication center capability. Additional hardware implementations such as servers, processors, etc. are generally required to aid full multimedia communication and reporting. Therefore, it is desirable that interactions of all multimedia sorts be analyzed, recorded, and routed according to enterprise (business) rules in a manner that provides seamless integration between media types and application types, thereby allowing agents to respond intelligently and efficiently to customer queries and problems.

A customer-interaction network operating system for managing interactions in a multimedia communication center is known to the inventors and described in disclosure of U.S. Pat. No. 6,108,711 with reference to the cross-reference section of this specification. The system has an external media layer for managing media contact between customers and the communication center, a workflow layer for processing customer interactions and routing events to enterprise agents and knowledge workers; and an internal media layer for managing media contact with the agents and knowledge workers. The workflow layer captures each transaction, prepares a text version of at least a portion of each non-text transaction, and extracts knowledge from the text transaction or text version of a non-text transaction to be stored in a knowledge base for later use in routing and other management functions. All transactions, text versions, and extracted knowledge is related in storage for future analysis and use.

Due to modernization of contact centers and to incorporation of full multimedia capabilities and recovery capabilities of contact history, a new breed of center agent has emerged that can provide assistance with specialized skill-based knowledge that conventional center operative personnel do not normally possess. This newer type of agent is termed a knowledge worker (KW) in the art.

A knowledge worker, whether an agent or specialized technician, generally has all of the resource in the way of customer data, interaction data, product data, and multimedia support at his fingertips as long as he or she is operating from a designated PC/VDU or other supported station within the communication center. In some cases, a knowledge worker may have full data access and multimedia support if he is located off-site but is linked to the center by a suitable data-network connection such as from a home office or remote station.

When a knowledge worker is away from a home-center such as on the road, or at a client location, he is generally limited in data access and interaction capability with his or her home communication-center data and tools. In some cases this may be a liability to the center. In many cases she/he will be limited to specific data that was carried along, or that may be downloaded from the center to such as a cellular telephone, a personal digital assistant (PDA) or a Laptop computer. Moreover, a mobile knowledge worker in the field may also be limited in providing service to the home-center by virtue of the same data-access limitations.

In typical contact centers, which may also include multimedia communication centers, the preponderance of incoming and outgoing interactions are processed by voice (DNT) or Web-based self service interfaces or by communication-center agents located within the domain of the center and managed through a communication center environment. However, many interactions cannot be successfully processed through client self-service interfaces or on-site agents often because of a high level of assistance required. Such interactions require the expertise of a knowledge worker.

Knowledge workers are not required for routine service assistance or other duties that are routinely performed within the domain of the center. As a result, they are typically located off site in a pool or remote to the extent of performing as a home-based or traveling workers. Therefore, standard communication center control systems and procedures cannot be applied to such knowledge workers. Often this problem is due to an absence of a CTI link established between the location of the knowledge worker and the communication center.

Off-site knowledge workers are mobile and typically operate using a variety of communication equipment (non-CTI telephone, personal digital assistants [PDAs], wireless Web, etc.) and using applications that are not assimilated in standard or unified array throughout the communication environment. Therefore, it becomes increasingly difficult to provide management from the communication center in terms of state control and report accessibility.

Remote knowledge workers are, from a control and management standpoint, invisible to standard CTI-enabled facilities. Not having the ability to manage these workers causes the ongoing costs associated with doing business from a communication center to rise.

The inventors are familiar with certain hardware/software methods for providing access to communication center facilities using telephony switch control or other first-party control methods. In these methods call center services are supported by cooperation between software at the CTI

processor and the computer platform at the remote station. In one embodiment the data link, once established, is kept open while calls continue to be switched to the remote station. In another embodiment after an initial agent log in, dial up is done from the remote station upon detecting calls from the call center by a TAPI compliant device. A reduced log is performed at the CTI processor at the call center to save time. In yet another method, the CTI processor establishes the data connection each time using a modem bank adapted for dialing. The modem bank switches the call from the call center to the remote station. A plurality of remote stations may be thus supported.

A drawback with these system types is that it requires first-party control equipment established at the remote agent workplace. The first-party control equipment controls the remote agent phone separately from the agent's computer platform.

A proxy system is known to the inventor and described in disclosure of U.S. patent application Ser. No. 09/405,335 listed in the cross-reference section of this specification. This system enables a worker remote from a communication center and limited to a light computer device unable to operate as a workstation at the communication center to operate with full access to data and software at the communication center. A proxy server, core to the system, has a two-way data link to the light computer device operated by the remote agent, and executes software, which ascertains the hardware and software characteristics of the light device. The proxy server accesses communication center data at direction from the light device, operates communication center software tools, and provides results to the light device over the communication link in a form usable by the light device.

The proxy server accesses communication-center data at direction of the light device, operates communication center software tools, and provides results to the light device over the communication link in a form usable by the light device. This approach suggests a general method for management of remote knowledge workers from within a contact center (CC). In particular, it suggests using a proxy server as a mediator between a contact center environment and a remote agent device. However, it is still limited in terms of further enhancement that might enable more specific techniques and mechanisms. Part of this solution includes a remote option that requires special equipment to be provided and connected to the remote agent's telephone set, which in addition, must be a specially adapted telephone set to accept the equipment.

Some enhancement is provided over the proxy system by yet another system known to the inventors and referenced in this specification as U.S. patent application Ser. No. 10/269,124. This system is a network system for managing remote agents of a communication center. The system includes a primary server connected to the network the primary server controlling at least one routing point. The system has one or more secondary servers distributed on the network and accessible to the remote agents, the secondary server or servers have data access to agent computing platforms and communication peripherals. The system utilizes a software suite distributed in part to the secondary server or servers and distributed in part to one or more agents computing platforms and peripherals, the software suite includes protocol for reporting agent status data. The system monitors agents computing platforms and peripherals for activity state through the one or more secondary servers. The one or more secondary servers exchange control messaging and event

5

related data using ISCC supported protocols with the primary server over the network for intelligent routing purposes.

While the above-described system provides full and unfettered access to communication-center data and services for a mobile or otherwise remote knowledge worker, such interaction is limited in terms of control signaling and interaction management that might be initiated from the side of the knowledge worker.

What is clearly needed is a system and methods for managing remote knowledge workers using state-of-art voice technologies that enable human-to-application control and interaction.

#### SUMMARY OF THE INVENTION

In a preferred embodiment of the present invention a network system for enabling voice interaction between communications-center applications and human agents remote from the center is provided, comprising a primary server connected to the network the server controlling at least one routing point used by the center, a secondary server connected to the network the secondary server for generating and serving voice extensible markup language, a voice gateway associated with the secondary server, the gateway for executing voice extensible markup language and recognizing speech input, and a software platform based in the primary server and distributed in part as a server application to the secondary server, the software suite functioning as a data transformation interface between the center applications and the gateway. This system is characterized in that the remote agents report state information over the network to the center using speech, the speech recognized and text rendered at the gateway, the text transformed to one or more formats understood by the primary server and certain ones of the center applications and, wherein data sourced from center applications destined to remote agents is provided and incorporated to one or more VXML scripts at the secondary server, the scripts executed by the gateway, the gateway connecting to voice-capable devices used by the remote agents over the network, the scripts played as synthesized voice media.

In some preferred embodiments of the system the network includes at least one of a wired telephony network, a wireless communications network and a wide area network all bridged for seamless communication. Also in some preferred embodiments the network includes the Internet network, the public switched telephone network, and a wireless digital network. In still further preferred embodiments the communications center applications include computer telephony integration compatible applications. In yet further preferred embodiments the at least one routing point is a private branch exchange telephony switch.

In yet other embodiments of this system the secondary server is a Web server and the distributed part of the software suite is a Web-based application. In yet other embodiments the gateway contains an interpreter application that controls automated speech recognition software and text to speech software. In still other embodiments the voice-capable devices are COST telephones, and in some cases the telephones are cellular telephones.

In still other cases the voice-capable devices are one of an IP telephone, a personal digital assistant, or a computer telephony application, and in others the server application uses XML-Style-Sheet-Language-Transformation for transforming VXML to XML-based languages. In yet other cases the data sourced from center applications includes center-

6

archived data and data related to active telephony events, and in others the VXML scripts are generated from VXML templates during active interaction and executed immediately thereafter in event routing scenarios.

In another aspect of the present invention a method for receiving at a communications center routing point state information, the information reported vocally from a non-CTI-enabled agent telephone remote from the center and routing a subsequent telephony event and optionally, event-related data, from the routing point to the remote agent's telephone based on at least the reported state information and optional caller interaction is provided, comprising steps of (a) connecting to and interacting with a predetermined telephone number dialed from the agent telephone, the number registered to a gateway application, the interaction therewith comprising at minimum prompted vocalization of the agent state reported thereto; (b) recognizing at the gateway the vocalization of state information and populating one or more data fields of a VXML script with a text version of the state information reported; (c) transforming the language of the script to one or more languages understood at the routing point rendering the information available to the routing point; (d) receiving an incoming event destined for the remote agent at the routing point and optionally, interacting with the caller from the routing point to obtain event related data; (e) routing the event to the agent telephone, simultaneously making the event related data available to a VXML-enabled server; (f) transforming the event related data to a form useable in one or more data fields of a VXML script; and (g) establishing a telephone connection to the remote agent, executing the script once connected.

In some preferred embodiments of the method in step (a), the gateway application is VXML-enabled. Also in some preferred embodiments, in step (a), the agent telephone is a cellular telephone and the connection method is wireless. In some other preferred embodiments, in step (a), the agent telephone is a plain old telephony service (POTS) telephone and the connection is made through normal public-switched-telephone channels. In still others, in step (a), the gateway application is associated with a VXML-enabled Web server. In yet others, in step (b), the gateway uses automated speech recognition to interpret vocalized state information.

In some embodiments, in step (b), the VXML script is generated by the Web server, and in others, in step (c), language transformation includes use of XSLT and is performed by a Web server application. In still other embodiments, in step (c), a Web server serves the data to a server controlling the routing point the server hosting an application for implementing any required configurations or notifications to other applications. In still other embodiments, in step (c), the information is XML-based, and in yet others, in step (d), interaction with the caller is performed using interactive voice response technology.

In still further embodiments, in step (d), event related data is supplemented with archived data, and in further embodiments, in step (e), the event related data is uploaded as XML data to the server. In some cases, in step (e), the VXML-enabled server is a Web server, and in others, in step (f), the transformation of data is performed using XSLT by a Web application. In still other cases, in step (g), the telephone connection is established and script execution is performed by a VXML-enabled gateway, and in still others, in step (g), executing the script results in voice synthesis of the populated dialogue fields of the script played over the telephone connection.

In some other cases of this method, in step (g), the telephone is not the same telephone used to pick-up the

related call routed in association with the event related data, and in others, in step (g), the agent is already connected to the caller and places the caller on hold to receive the event related data on the same telephone.

In yet another aspect of the present invention, in a VXML-based telephone communication system, a method for alerting a remote service agent to activate a networked workstation that is currently offline to receive an automated data update or service configuration is provided, comprising steps of (a) providing a text rendering comprising the alert to a VXML-enabled server; (b) transforming the text rendering to a form useable in a VXML script; and (c) establishing a telephone connection with the agent and executing the script once connected.

In some preferred embodiments of this method, in step (a), the text alert is a request from a communications application, the request tied to an activity threshold detected by the application. In other preferred embodiments, in step (a), the application is a load balancing application and the activity threshold quantifies a current call load. In yet other preferred embodiments, in step (a), the server is a Web server the alert uploaded thereto from a contact center.

Also in some preferred embodiments of this method, in step (a), the alert is rendered in the form of XML. In others, in step (b), transformation includes use of XSLT and is performed by a Web server application. In yet others, in step (b), a VXML script is generated containing the alert. In still others, in step (c), wherein the connection is established by a VXML-enabled gateway associated with the server.

In still further embodiments of this method, in step (c), the connection is established to a cellular telephone through a wireless network, and in still further embodiments, in step (c), the connection is established to a plain old telephony service (POTS) telephone and the connection is made through normal public-switched-telephone channels. In still others, in step (c), the telephone connection is established and script execution is performed by a VXML-enabled gateway.

In some, in step (c), executing the script may result in voice synthesis of the populated dialogue fields of the script played over the telephone connection, and in other cases, in step (c), script execution involves text-to-speech technology.

#### BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is an exemplary overview of a multimedia-interaction storage system within a communication center according to an embodiment of the present invention.

FIG. 2 is a block diagram illustrating a connective relationship between a proxy server and a hand-held computer operated by a mobile knowledge worker according to a preferred embodiment of the present invention.

FIG. 3 is an architectural overview of a state and interaction management system according to an embodiment of the present invention.

FIG. 4 is a block diagram illustrating system connection hierarchy according to an embodiment of the invention.

FIGS. 5 through 8 are block diagrams illustrating call control use cases according to an embodiment of the present invention.

FIG. 9 is a block diagram illustrating components of the Knowledge Worker software and integration thereof to a communication center framework.

FIG. 10 is a block diagram illustrating components of the knowledge worker platform.

FIG. 11 is a configuration model for knowledge worker state information.

FIG. 12 is a data model for presenting an active knowledge worker state.

FIG. 13 is a process flow diagram illustrating the sequence of a successful internal call.

FIG. 14 is a process flow diagram illustrating a variation of the sequence of FIG. 13 with a forced answer.

FIG. 15 is a process flow diagram illustrating the sequence of a failed internal call.

FIG. 16 is a process flow diagram illustrating the sequence of an internal call with a forced timeout before PIM decision according to an embodiment of the invention.

FIG. 17 is a process flow diagram illustrating the sequence of a successful external call from agent to remote KW according to an embodiment of the present invention.

FIG. 18 is a process flow diagram of a failed external call according to an embodiment of the present invention.

FIG. 19 is an architectural overview of a state and interaction management system enhanced with voice-management capabilities according to an embodiment of the present invention.

FIG. 20 is a block diagram illustrating system connection hierarchy including voice-based enhancement according to an embodiment of the invention.

FIG. 21 is a process flow diagram illustrating steps for VXML-enabled remote-KW state reporting to a CC environment according to an embodiment of the present invention.

FIG. 22 is a process flow diagram illustrating steps for VXML-based transfer of call data to a remote KW from a communication center according to an embodiment of the present invention.

FIG. 23 is a process flow diagram illustrating steps for issuing a VXML-based alert to login and receive a KW update to a remote workplace.

FIG. 24 illustrates the structure of messages in KWP.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is an exemplary overview of a multimedia-interaction storage system within communication-center architecture 9 according to an embodiment of the present invention. Communication center 9 is illustrated solely for the purpose of illustrating just one of many possible system architectures in which the invention may be practiced. Center 9, which in a preferred embodiment comprises both conventional and data-network telephony (DNT) apparatus, is exemplary of an architecture that could facilitate a network operating system such as CINOS (known to the inventor). Communication center 9 may be assumed to have all the internal components described in the background section such as agent workstations with LAN connected PC/VDUs, agent's COST telephones, and so on. Such a communication center operating an enhanced interaction network operating system such as CINOS would employ knowledge workers trained to interact with associates, clients, and in some cases internal systems that require programming, scripting, researching, and the like.

For the purposes of this specification, a knowledge worker (KW) is a highly skilled individual that is at least trained in systems programming and implementation using software tools. A KW is also typically trained in the use of all supported communication media and applications that may be used with a network operating system. In many instances, a KW may also handle high level sales and service

while functioning as an agent for the communication center both inside the center and at a client's location. However, as described in the background section, a KW away from home (in the field) will not generally have full access to all communication center data and tools unless he/she carries a powerful computer station along, or commandeers a client's station having suitable connectivity and ability to perform all of the applications at the home station. Therefore, having many such highly skilled workers in the field and not in the communication center may be, at times, a considerable liability to the communication center, but unavoidable at times. It is to this aspect that the present invention mostly pertains.

Referring again to FIG. 1, a multimedia data-storage system represented herein by a centralized grouping of connected and labeled text blocks is provided and adapted to facilitate rules-based storage of all communication-center interaction between agents and clients including co-workers and associates. Such a representation illustrates an important part of CINOS function.

At the heart of the storage system is a mass-storage repository **11** adapted to store multimedia interactions as well as text-based related files. Repository **11** may utilize any form of digital storage technology known in the art such as Raid-Array, Optical Storage, and so on. The storage capacity of repository **11** will depend directly on its implementation with regard to the size of communication center **9** and predicted amount of data that will be stored and kept by the system.

In this example, repository **11** is divided logically into two sections. One section, multimedia information system (MIS) **15**, is responsible for storing copies and records of all multimedia interactions, defined as media that is not text-based, such as audio, video, and graphics-based media. All multimedia interactions are stored in MIS **15** whether incoming, outgoing, or internal. A second section, herein referred to, as text section **13** is responsible for all text-based interactions as well as text versions and annotations related to non-text files.

Repository **11** is connected to a communication-center local area network (LAN) **45**. Repository **11** is accessible via LAN **45** to authorized personnel within a communication center such as agents, KWs, or the like using computerized workstations connected on the LAN, and may, in some instances, also be made available, in full or in part, to clients and associates communicating with the call center. A network router (RTN) **19** is shown connected to LAN **45** via network connection **41**. In this example, network router **19** is the first point within a communication center wherein data network telephony (DNT) media arrives. Network router **19** is exemplary of many types of routers that may be used to route data over LAN **45**. An Internet-protocol-network-telephony (IPNT) switch **35** is connected to network router **19** via a data link. IPNT switch **35** further routes or distributes live IPNT calls that do not require routing to a live agent. IPNT calls that are routed to live agents are sent over connection **41** to LAN **45** where they reach agent PC/VDU's at agent and KW workstations connected to the LAN (PC/VDU is exemplary) or DNT-capable phones (not shown) as illustrated via directional arrows.

In the multimedia storage system represented herein, a KW such as one operating at a provided work station (PC/VDU **17**) typically has access to all multimedia interaction histories that are stored in repository **11**. CINOS applications (not shown) executable on workstations such as PC/VDU **17** empowers the KW to facilitate many tasks in the realm of communication center functionality. Such tasks

include, but are not limited to, researching and creating virtually any type of system report regarding data held in repository **11**, updating and creating new management applications that may alter or enhance CINOS functionality, and other such system-administrator-type duties. LAN **45** is the network through which the "in-house" KW is empowered to access such as a CINOS MGR server **29**, repository **11**, and other connected data sources and systems (not shown) that may be present in a communication center such as center **9**.

By reviewing capabilities of the multimedia storage system of communication center **9**, a full appreciation of the necessity of various in-house skills possessed by a KW, such as the skill of operating at station **17**, may be acquired by one with skill in the art. Therefore, a detailed review of communication-center operation, particularly storing interactions follows.

Creating text-based versions of non-text multimedia transactions may, in some cases, be accomplished by an automated method. For example, a digital voice attendant **37** is provided and linked to IPNT switch **35**. Digital voice attendant **37** may be of the form of a DNT-capable IVR or other digital voice-response mechanism as may be known in the art. Such automated attendants may interact with a voice caller instead of requiring a live agent. A speech-to-text converter **39** is provided and linked to voice attendant **37**. As digital voice attendant **37** interacts with a caller, speech-to-text converter **39** converts the speech to text. Such text may then be stored automatically into text section **13** of repository **11** and related to the also-recorded audio data. Part of the purpose and rationale for the creation of text documents related to non-text files is that text can be more easily mined for content and meaning than non-text files.

It will be apparent to one with skill in the art that as speech recognition technologies are further improved over their current state, which is adequate for many implementations, reliable text versions of audio transactions are not only possible but also practical. Such speech-to-text conversions are used here only for the convenience of automation wherein no live attendant is needed to transcribe such audio data. The inventor is familiar with such converters as used in such as the CINOS system incorporated herein by reference. Such converters provide convenience in transaction recording but are not specifically required to achieve the interaction storage objectives of communication center **9**. A KW such as one operating from station **17** may be called upon to create and set-up the various rules-based applications that are required for routing and determining when digital voice attendant **37** will interface with a client or associate.

An automated services system **43** is provided and has a direct connection to section **13** of data repository **11**. System **43** is adapted to handle automated interaction and response for certain text-based interactions such as e-mails, facsimiles, and the like, wherein a complete text record of the interaction may be mirrored, or otherwise created and stored into text section **13**. For example, a fax may be sent and mirrored into section **13** or, perhaps recreated using an optical character recognition (OCR) technique and then entered. Physical text-documents such as legal papers and the like may be automatically scanned, processed by OCR techniques, and then entered into text section **13** before they are sent to clients. There are many possible automated techniques for creating and entering text files into a database including methods for generating automated responses. A KW such as one operating at station **17** may be called upon to oversee the creation and operation of all automated services insuring such as prompt response time, queue

management, accurate threading and organization into a database, updating or adding enhanced capability, and so on.

With respect to the dual telephony capability (COST/DNT) of communication center **9**, a central telephony switch **21** is provided to be a first destination for COST calls arriving from, for example, a PSTN network. Switch **21** may be a PBX, ACD, or another known type of telephony switch. Internal COST-wiring **31** connects telephony switch **21** to agent's individual telephones (not shown). Switch **21** is enhanced by a computer-telephony integration (CTI) processor **25** running an instance of a T-server CTI suite and an instance of a Stat-server, which are software enhancements known to the inventor. Such enhancements provide CTI applications, such as intelligent routing, statistical analysis routines, and so on. CINOS as previously described and disclosed in the co pending prior application incorporated herein is adapted to be integrated with such software when present in a CINOS-enhanced communication-center. A KW such as one operating station **17** may be called upon to compile and analyze results provided from statistical analysis routines executed at processor **25** for the purpose of creating new routing rules of routines that further enhance functionality.

An intelligent peripheral in the form of a COST IVR **23** is provided for the purpose of interacting with callers seeking information and the like who do not require connection to a live agent at the communication center. IVR technology may comprise voice response, touch tone interaction, or a combination of such known technologies. IVR **23** is linked to processor **25** and also to automated services **43**. An example of an IVR interaction may take the form of a presentation to a caller from the PSTN of options for using an automated service such as those described above, or perhaps waiting for a live agent. A KW such as a KW operating at station **17** may be called upon to create and install appropriate interaction scripts into IVR **23** for interaction with clients and associates calling in from the PSTN.

A CTI to DNT interface **27** is provided for the purpose of converting COST data to digital mode compatible with DNT so as to be adapted for digital storage and interaction according to CINOS functionality and enterprise business rules. Bi-directional arrows illustrated between interface **27** and IVR **23** represent the ability to route interactions in either direction. COST to DNT conversion may be accomplished in IVR **23** in addition to or in place of interface **27**. The connection architecture presented herein is exemplary only.

A speech-to-text converter **33** is provided for converting audio from the CTI side to text for entering into text section **13** as was taught with regard to converter **39** on the DNT side. Actual recorded media interactions are illustrated entering MIS **15** after text versions are rendered and entered into section **13** however this is not required. In some instances text versions of multimedia interactions may be rendered after the interaction is stored. There is no limitation regarding sequence. It is sufficient to say that converters **39** and **33** are capable of real-time conversion and entry.

Server **29** shown connected to LAN **45** is adapted to host a CINOS MGR (operating system) application, which provides control and organization with regard to various functions provided by the CINOS system as a whole. The storage architecture represented herein by the described text blocks, and all it encompasses in this embodiment, is meant only to be an example architecture as may be dedicated to the storage and organization of communication-center data according to enterprise rules.

It will be appreciated by one with skill in the art that a network operating system including a system for automatically storing and recording virtually all communication center transactions requires substantial skill in set-up, implementation, and administration both on the COST side and the DNT side within a communication center such as center **9**. Moreover, a substantial network operating system such as CINOS has client-side software applications that subscribers or associates must utilize in order to achieve full seamless interaction with agents and subsystems operating according to the system parameters. In some cases, the operating system may span several communication centers over a large technical campus connected by a WAN. This fact requires that system administrators and troubleshooters be available to assist in facilitating and preparing client and associate CPE for interacting with communication center equipment and software according to system parameters.

If a KW such as one operating at station **17** could be mobilized to operate effectively outside of communication center **9** such as at a client location, and still be able to service center **9** from the field, then an enterprise hosting center **9** and perhaps other like centers could save considerable resources associated with training and expenses incurred for maintaining a larger number of fixed KW's.

The inventor provides a method and apparatus whereby such a mobile KW could have full and unfettered access to virtually all data systems and sources housed within his home communication center without having to carry a powerful station or inconveniencing a client by commandeering client resources. This inventive method and apparatus is described below in enabling detail.

FIG. **2** is a block diagram illustrating a connective relationship between a proxy server **49** and a hand-held computer **47** operated by a mobile KW according to a preferred embodiment of the present invention.

Hand-held computer **47** has a CPU **63**, a memory **57**, a video adapter circuitry **55**, and a modem **65** all communicating on bus **59**. Video circuitry **55** drives a display **61**. Memory **57** may be any of a number of types, such as flash, random access (RAM), read-only (ROM) or similar type, or a combination of these. There may be other components as well, but these are not shown to facilitate description of the unique aspects of this embodiment of the invention. The hardware arrangement is intentionally shown as general, and is meant to represent a broad variety of architectures, which depend on the particular computing device used. Possibilities include many types of portable hand-held computers and also adapted cellular phones capable of receiving and sending video. A mobile KW would use such as device for communication and data access while in the field.

Proxy-Server **49** is a relatively sophisticated and powerful computer typical of computers used as WEB servers, although the use in this embodiment of Proxy-Server **49** is not the conventional or typical functions of a WEB server as known in the art. Proxy-Server **49** has a CPU **69**, a memory **71**, and a means of connecting to a data network such as the Internet. The network connecting means in this embodiment is a modem **67** communicating on a bus **73**. In other embodiments the network connecting means may be a network adapter or other.

Modem **67** in the embodiment shown is compatible with modem **65** in computer **47**. A communication link **66**, which may be facilitated by a telephone line or a wireless connection, facilitates communication between computer **47** and server **49**. The means of connection and communication can be any one of several sorts, such as a telephone dial-up, an Internet connection through an ISP, or a cell telephone

connection, wireless IP networks or other wireless link, including private cell or wireless WAN or LAN. A communication port **75** connects to communication link **77** providing communication, in this case, through the Internet, to a suitable station or server in communication center **9** of FIG. **1**. In this example, the linked station is preferably the KW's own home-center workstation or PC/VDU **17** from FIG. **1**.

Port **75** and link **77** may also be any one of several types, or a combination of types. In some embodiments, server **49** and station **17** will be nodes on a local area network (LAN) covering a large technical campus, and the link between the two servers will be a serial network link with port **75** being a LAN card according to any of a number of well-known protocols. In other embodiments link **77** may be a telephone line, and port **75** will be a dial-up telephone modem. In still other embodiments, this link could be a parallel communication link. This link could also be through the Internet or other wide area network.

Proxy-Server **49** exists in this embodiment of the invention to perform functions enabling hand-held computer **47** to operate as an apparently powerful web-browsing machine, even though the stand-alone capability of computer **47** will not even begin to support such functionality. As is well known in the art, for a computer to be a fully functional web-browsing system requires a high-performance CPU and execution of relatively sophisticated web-browsing and display applications. Such a computer typically has to operate, as described above, at or above a million instructions per second.

Proxy-Server **49** executes a program **53** the inventor terms an Inter-Browser. The Inter-Browser combines functionality of a conventional web browser with special functions for recognition of and communication with hand-held computer **47**. Commands from computer **47**, such as, for example, a command to access a WEB page on the World Wide Web, or a server or station such as station **17** within a home communication center such as center **9**, are received by Proxy-Server **49** operating the Inter-Browser program, and acted upon as though they are commands received from a conventional input device such as a keyboard.

Following the example of a command communicated over link **66** from computer **47** for accessing station **17**, shown herein and in FIG. **1**, Proxy-Server **49** accesses the appropriate server (in this case station **17**) over link **77**, and transmits the appropriate data over link **77**. Proxy-Server **49** therefore has HTML and TCP/IP capability for accessing source data over the Internet. By hosting other routines that allow interface with data systems, data sources and such as station **17**, a KW may have full access to virtually any type of data or software tools that he could access from his station if he were operating from within center **9**.

Proxy-Server **49**, instead of displaying the downloaded data (or playing video and/or audio output, as the case may be, depending on the downloaded data), translates the data to a simpler communication protocol and sends the data in a TCP/IP protocol to computer **47** for output over link **66**. Link **66** becomes a dedicated TCP/IP pipe to and from Proxy-Server **49**. Proxy-Server **49** thus acts as a proxy for computer **47**, performing those functions of WEB browsing and data download that computer **47** cannot perform under its own computing power.

Computer **47**, through execution of a program the inventor terms a NanoBrowser **51** sends commands entered at computer **47** over link **66** to Proxy-Server **49** and accepts data from Proxy-Server **49** to be displayed on display **61**. Data is transferred in a protocol the inventor terms HT-Lite. The NanoBrowser also provides for interactive selection of

links and entry into fields in displays, as is typical for WEB pages displayed on a computer screen. The NanoBrowser provides for accepting such entry, packaging data packets in TCP/IP form, and forwarding such data to Proxy-Server **49**, where much greater computer power provides for efficient processing.

One of the processing tasks that has to conventionally occur at the browser's computer is processing of received data into a format to be displayed on whatever display the user has. There are, as is well known in the art, many types of displays and many display modes. These range all the way from relatively crude LCD displays to high-resolution, multi-color displays. There are, in addition, a number of other functions that have to be performed conventionally at a user's computer to interact effectively with the WWW. For example, audio and video and some other functions typically require supplemental, or helper, applications to be installed on or downloaded to a field unit to process audio and video data and the like.

Most data transferred by WEB servers assumes relatively high-end displays, such as color SVGA displays as known in the art. Data accessed through the Internet from such as MIS database **15** of FIG. **1** would also assume a high-end display and large file size dependent on the type of media accessed. In PDAs, cellular video phones, and digital organizers, such as those anticipated for use in the present invention, the displays are relatively low resolution, and are typically LCD in nature. In the system described with the aid of FIGS. **1** and **2**, inter-Browser program **53** at Proxy-Server **49** and the HT-Lite Nano-Browser **51** at hand-held unit **47** cooperate in another manner as well. When one connects to the Proxy-Server the hand-held unit, through the HT-Lite Nano-Browser program, provides a signature, which the Proxy-Server compares with logged signatures.

An ID match when connecting a hand-held unit to the Proxy-Server provides the Proxy-Server with information about the hand-held unit, such as CPU type and power, screen size, type and resolution, presence of a pointer device, and sound capability. The Proxy-Server then uses this specific information to translate HTML and other files from the Internet to a form readily usable without extensive additional processing by the hand-held unit. For a small monochrome LCD display a 60 k/70 k JPEG file becomes a 2 k/4 k bit map, for example. Also, multi-file pages are recombined into single file pages. This translation also minimizes bandwidth requirement for link **66**, and speeds transmission of data. In this way, a mobile KW may have access to all types of data sourced at his or her home communication center. Through proxy server **49**, a KW may also initiate and receive multimedia interactions including high-end transactions while operating unit **47**.

It is in this ability of the Proxy-Server to do the heavy computing, of which the translation of HTML files is a single example, that is responsible for a unique ability of hand-held devices in practicing embodiments of the present invention to accomplish functions that they could not otherwise accomplish, and to do so without inordinate usage of stored energy. In various embodiments of the present invention, hand-held devices with CPUs having an ability to run at from 0.001 to 0.05 MIPs can serve as WEB browsers, displaying WEB pages and allowing users to initiate on-screen links and to input data into input fields. Given the above example of MIPs requirement for WEB browsing, where currently available solutions may provide a 5× advantage, practicing the present invention can provide an advantage of up to 2000×, resulting in battery life approaching 2

weeks (given a 100 g battery weight), where expected battery life for similar functionality with a powerful CPU was calculated as 8 minutes.

As a given example of an instance wherein a mobile KW may provide full service to a home center, consider the following: Assume a mobile KW from center **9** of FIG. **1** is at a client premise installing network software and therefore not at center **9**. He opens his or her hand-held device **47** and plugs in to a nearby telephone jack for the purpose of establishing a connection to proxy server **49**, which in this case, may be implemented anywhere on the Internet. While he is configuring software on a client's computer, an important call from communication center **9** arrives through server **49** (hosted by the enterprise) to his hand-held **47**. The call is pre-processed at proxy server **49** by Inter-Browser **53** and transmitted over link **66** to device **47** where it is displayed according to device parameters and rules associated with Nanno-Browser **51**.

Suppose that the call requests that the KW rewrite a script used in such as digital voice attendant **37** because the current message has become corrupted or is not playing properly. The KW may then initiate a multimedia call to his resident workstation such as station **17** (FIG. **1**) through proxy **49** by way of link **77**. The call would arrive at router **19** and be routed directly over link **41** to station **17** based on identity thus by-passing normal DNT call handling routines. Part of the call includes a command to allow the KW to control the operation of station **17** by proxy. He may then use command keys to cause Inter-Browser **53** to browse a list of pre-prepared DNT scripts stored at station **17**. Such a list may appear as a text summary on such as display **61** of device **47**. The KW may then scroll through and select a script thus issuing a command to station **17** (by proxy) to access attendant **37** (FIG. **1**) and replace the message which is overwritten by the new one.

It will be apparent to one with skill in the art that there are a wide variety of interaction possibilities by virtue of the method and apparatus of the present invention. In the cited example, a DNT call was made to the KW's computing device **47**. Therefore, proxy **49** acts in one aspect as a call router. In another embodiment, a KW may accept a cellular call or a COST call and respond to the request-using device **47**.

In still another embodiment, a KW operating a portable device such as device **47** may temporarily plug in to any connected LAN network such as may be found connecting a large technical campus or the like. Upon plugging in, the KW may initiate an outbound-call to server **49** in the Internet and receive a temporary IP address and device authentication for communicating with such as center **9**.

To practice the invention, given an accessible WEB server configured as a Proxy-Server according to an embodiment of the present invention, one needs only to load HT-Lite NanoBrowser software on a computer and to provide Internet access for the computer, such as by a telephone modem. In many cases, candidate computers have built-in modems. In other cases, an external modem may be provided and connected. In the case of hand-held devices, such as PDAs and organizers, some have an ability to load software via a serial port, a PC card slot, through the modem extant or provided, or by other conventional means. In some cases, all operating code is embedded, that is, recorded in read-only memory. In some of these cases, adding HT-Lite routines may require a hardware replacement. In virtually all cases of hand-held devices, however, the necessary routines can be provided.

One of the components of the HT-Lite Nano-Browser software (**51**) is a minimum browser routine termed by the inventor a Nano-Browser. The Nano-Browser is capable of exerting a URL over the modem connection to access the Proxy-Server. Theoretically, one could exert a URL of a WEB site other than the Proxy-Server, but the result would be an unusable connection, as the small hand-held unit would not be able to handle the sophisticated data provided to be downloaded unless it were such as e-mail or other simple data.

Connection to the Proxy-Server provides the Proxy-Server with information as to the KW and the KW's equipment. These operations proceed in a manner well known in the art for such log-on and security transactions. Once access is extended to the KW, an interface is provided for the KW to browse in a manner very similar to well-known WEB interfaces. That is, the KW's display (**61**) provides an entry field for a URL which is asserted by an enter key or the like. There may also be an address book for often-visited sites, as is common with more powerful machines.

Similarly, there are no strict requirements for the location of Proxy-Server **49** or of accessible data sources or home stations in embodiments of the present invention. No restrictions are placed on such locations beyond restrictions on servers/nodes in general. In one embodiment, a corporation with multiple and perhaps international locations may have a local area network with one or more Proxy-Servers, and employees, particularly those employees whose job functions require travel, are provided with hand-held digital assistants according to an embodiment of the present invention. Multiple functions are then provided over Internet connection in Internet protocol, far beyond what could otherwise be provided with small and inexpensive units; and battery life for these units (device **47**) would be far beyond what would otherwise be expected. Furthermore, a company could reduce or streamline a force of KW's to a smaller number of mobile KW's with enhanced portable devices such as device **47**.

It will be apparent to one with skill in the art that the device-proxy method such as the one described above could be applied to a wide range of communication center architectures and network operating systems without departing from the spirit and scope of the present invention. A KW operating a device such as device **47** may operate while traveling to or from client locations as well as on-site at a client location. Types of devices used to communicate with proxy server **49** may vary without departing from the spirit and scope of the present invention. For example, PDAs, small notebook computers, some cellular telephones, CE type machines; all may be adapted for a proxy relationship. Extended Management Control

According to another embodiment of the present invention an enhanced method and system is provided for enabling full and unobstructed access to contact center services and data for remote knowledge workers, including provision of full state and interaction management capabilities to the center managing the knowledge workers. The method and apparatus of the present invention is described in enabling detail below.

FIG. **3** is an architectural overview of a state and interaction management system implemented from a contact center **300** according to an embodiment of the present invention. Contact Center **300** can be employed in any mix of communication environment. For example, in a dually-capable COST/DNT multimedia environment, in a COST only environment, or in a DNT only environment. In the

present example, a COST environment is illustrated. Likewise, one with skill in the art will recognize that there may be more and different types of known communication center equipment present and cooperative with the system of the invention other than what is illustrated in this example without departing from the spirit and scope of the present invention.

Center **300** utilizes a central office telephony switch **316**, which in this case, is a private branch exchange (PBX) switch. Switch **316** may also be an automated call distributor (ACD) or another known type or manufacture of telephony switch. Switch **316** is a relatively dumb switch, but is enhanced for intelligent routing and control by a CTI processor **317** running an instance of CTI transaction server (T-Server) software. CTI enhancement in this example is driven by T-Server software, which is an application that controls switch **316** and provides the intelligent computerized rules and executable routines for interaction management and state detection and management. A typical CTI link **315** connects processor **317** to PBX switch **316** in this example.

An agent workplace **319** is illustrated within the domain of center **300**. Workplace **319** is adapted minimally in this example with an agent desktop computer **320** and an agent telephone **321**. It will be apparent to one with skill in the art that there will, in actual practice, be typically many agent stations provided and adapted for normal communication center routine business and communication. The inventor illustrates only one station and deems the illustration sufficient for the purpose of teaching the features of the present invention in an enabling way.

In this case, agent telephone **321** is a COST telephone connected to PBX switch **316** by standard internal telephony wiring. Agent desktop **320** is connected to a communication center LAN illustrated by a LAN network **318** labeled T-Lib (for transaction library). A transaction library contains all of the business and routing rules applied to normal center interaction and operation. It may be assumed in this example, that other equipment (not shown) is connected to LAN **318** such as other agent stations, a customer information system, a product history database, and many other equipment types both client-oriented and service-oriented.

An agent illustrated herein as agent **322** uses telephone **321** and desktop computer **320** for the purpose of handling routine interactions such as purchase orders, order status reports, internal logging and reporting, and other tasks. In one embodiment, telephone **321** may be an IP-capable telephone and also may have a sound connection to desktop computer **320**.

A COST telephony network **303** is illustrated in this example as a preferred telephony network bridging customers to center **300** using COST technology. Network **303** is a public telephony switch notably most local to center **300**. Switch **323** is the last routing point in network **303** before making connection to switch **316** in a preferred embodiment. In one embodiment, switch **323** is CTI-enabled similarly to switch **316** within center **300** and communication center routines can be executed at switch **323** over a separate network connecting the CTI processors associated with both switches **316** and **323**.

A customer **301** and a customer **302** are illustrated in association with telephone network **303**, which is a public switched telephone network (PSTN) in this example. Customer **302** is illustrated as placing a call to center **300** through switch **323** and switch **316**. In normal practice, the call of customer **302** will be internally routed using CTI intelligence to an agent or automated interface within center

**300**. In this case agent **322** receives the call on telephone **321**. Desktop **320** will display any pertinent customer information obtained from pre-interaction with customer **302** or from data sources internal to center **300**, or both.

A knowledge worker workplace **310** is illustrated in this example and is associated with communication center **300** by a network link **314** adapted for ISCC protocols. ISCC is an acronym for the well-known International Symposium on Computers and Communications. ISCC-developed protocols may be assumed to be practiced over network line **314** including a Flexible Interconnecting Protocol (FLIP).

It may be assumed then, in this example, that KW workplace **310** is located remotely from center **300** and outside of the physical domain of center **300**. Workplace **310** may be associated with other KW workplaces in a remote contact center. In another embodiment, workplace **310** may be a home-based workplace. In still another embodiment, workplace **310** may be in a state of mobility such as in a vehicle or at a remote customer worksite. KW workplace **310** has a desktop computer **311** (or equivalent) and a KW telephone **312**. A knowledge worker (KW) **313** receives calls from PSTN **303** that are directly placed from customers such as from customer **301**, or calls that are received to and then redirected from center **300**.

As described above, KW workplace **310** is not physically part of center **300** in terms of residing within a same building or physical structure. Rather, worker **313** is operating from a remote location. A major difference between the architecture of agent **322** and knowledge worker **313** is that worker **313** has no CTI link between a local switch and center **300**. In this example, a local switch **304** is illustrated and represents a local network switch (PSTN) presumably closest to KW **313**. In practice however, if workplace **310** is mobile, such as working while traveling, there may not be a specific permanent local switch from whence calls arrive to KW **313**.

It will be recognized by one with skill in the art that in the mobile sense, even in a wireless and semi-permanent networked environment, the fixtures illustrated within workplace **310** may vary widely. For example, telephone **312** may be a cellular telephone with Internet capability and desktop **311** may be a PDA or a laptop. In a fixed but remote location such as a remote knowledge worker contact center, individual knowledge workers may still be highly mobile but connected for communication to a LAN inside the center using a variety of communication devices.

To facilitate connection from center **300** to knowledge worker workspace **310**, a programmable T-server/Processor **305** is provided and distributed on a data packet network (DPN) such as, for example, the well-known Internet network. If workplace **310** is part of a permanent contact center operating remotely from center **300**, then switch **304** and processor **305** may be part of the equipment maintained in the contact center. However, for knowledge workers that are home agents or highly mobile, then switch **304** and processor **305** are network level systems, switch **304** in the PSTN and processor **305** in a private or public DPN.

The fact that there is no CTI link to center **300** means that under normal circumstance, the activities of KW **313** in workplace **310** cannot be managed. The system of the invention is enabled by a software platform known to the inventor as a Knowledge Worker Platform (KWP) that functions in cooperation with hosting equipment, namely processor **305**, to alleviate the requirement for a hardwired CTI link or other complicated connection methods, system dependant CPE, or complex client software applications. KWP is a proxy agent that receives KW status information (e.g. ready or not ready) from a KW device such as from

desktop **311** and sets the information within CC environment at center **300**. Status reporting is used for determining KW availability for routing determination. KWP also supplies the KW device with call-related information (e.g. customer/product information) when an event is routed.

Workplace **310** is connected to processor **305**, running an instance of programmable T-server, by a network link **308**. In this case, processor **305** is accessible from desktop computer **311**. In this particular embodiment, desktop **311** and telephone **312** are permanent fixtures and workplace **310** is part of an established physical center. In this case, link **308** may be a LAN network providing connectivity to other KW stations. Similarly, telephone **312** would be just one of many connected to switch **304** by internal telephone wiring. In this case, telephone **312** is also connected to desktop **311** by a cable so that desktop **311** may monitor call activity on telephone **312**. It will be appreciated that there are many other possible architectural scenarios both fixed and mobile using wireless technologies.

Desktop computer **311** has an instance of agent desktop (AD) application installed thereon similar to a traditional application expected for a traditional in-house desktop like desktop **320** manned by agent **322** within center **300**. However, the program on desktop **311** is modified to interact with KWP running on processor **305**. KWP (processor **305**) and AD (KW desktop **311**) exchange information including Transaction Library data (T-Lib), Knowledge Worker Protocol (KW Protocol), and Interaction Preview Data Protocol (IPDP). Data links **307** and **309** are logical only and all data shared between processor **305** and desktop **311** may travel over a single physical or wireless data connection.

The AD application running on desktop **311** may be adapted to run on virtually any network-capable device such as a cellular telephone with display, an IP telephone, a PDA, a paging device, and so on. The only modifications required for AD at workplace **310** are the application program interfaces required to work with data that is not in standard CTI format. In a preferred embodiment, KWP uses Extensible Markup Language (XML)-based protocol for device independent presentation and Extensible Style sheet Language Transformation (XSLT) scripts for transforming XML source data to, for example, HTML data or other data formats to accommodate device-dependent data presentation requirements. Basically XSLT is an XML processing language known in the art.

It is important to note herein that the models for KWP and AD are the standard T-Server and agent desktop models. Appropriate extensions are made to KWP and AD to enhance capability for dealing with KW protocol and added T-Lib entities. For example, the model for a knowledge worker is an extension of the model for a standard agent. Therefore, attributes of the KW model do not exist in the standard agent model. These attributes or object entities are added to the standard T-Lib for KW use. The extended attributes define the separation of remote KW characteristics and function constraints from those of a regular CTI agent.

In practice, CTI telephony capability is extended to KW **313** by way of link **314**, **308**, and the adapted applications KWP and AD. Switch **304** remains a dumb switch having no CTI control. For example, assume customer **301** has a direct number to telephone **312** and places a call to KW **313**. The call request is routed through switch **323** to switch **304** where notification of the call exemplifies a ringing event at telephone **312**. At this point, center **300** has no indication or idea that KW **313** has a call-event ringing notification. However, when agent **313** takes the call, AD software on desktop **311** detects the activity and sends pertinent state

data to KWP in processor **305**, which in turn delivers the information to premise server **317**.

Once server **317** has the information, other calls destined to telephone **312** can be managed and queued according to KWP reporting data. During interaction with the caller on telephone **312**, KW **313** can use desktop **311** to obtain additional call and customer data, product data, history data and so on from center resources. Likewise, KW **313** may use terminal **311** to perform a call-related action such as hold, transfer, terminate, and other like commands. The command path in a preferred embodiment can be executed from server **317** and direct to a CTI-processor running an instance of T-Server (command path not shown) that intelligently enables switch **323** to terminate, interact or otherwise treat the event accordingly at switch **323**. An advantage is that management information is available from the time of call receipt. If a queue is used, the information may be used for queue management purposes so that the center can tell whether or not a particular knowledge worker is not available. The center can then route calls destined to KW **313** based on availability.

In one embodiment, customer **302** places a call to KW **313** the event routed through switch **323**, and switch **316**. By identifying the DN as that of KW **313** (telephone **312**) CTI messaging takes place between switch **316** and the Premise T-server application on processor **317**. Server **317** then communicates through ISCC link **314** to the Programmable T-Server application on processor **305** enhanced as KWP. KWP messages with AD at desktop **310** to determine availability of DN (telephone **312**). AD checks telephone activity by link **306** and if available responds along the reverse chain of links. Assuming availability then switch **323** can seamlessly re-direct the event to switch **304** by command from processor **317** and cause a ringing event at telephone **312**. This assumes that processor **317** is connected to a like processor at switch **323**. Otherwise, the call can be rerouted from switch **316** through switch **323** to switch **304**. Link **306** is virtual in the sense that telephone activity at telephone **312** can instead be monitored from switch **323** if it is CTI-enabled and has a link to processor **317**.

Outbound calls, inbound calls, and KW to KW remote calls can be monitored and reported in terms of state activity and availability. Assume, for example, that KW **313** places an outbound call from telephone **312** destined for telephone **321** in agent workplace **319**. AD running on desktop **311** detects the outbound DN and uploads pertinent data to processor **305** whereupon KWP sends appropriate request for availability to Premise T-Server **317** controlling switch **316**. Premise T-server **317** has information pertinent to the activity state and availability of agent **322** in his workplace **319** by way of LAN connection **318**. Returned data follows the reverse chain and may show up on desktop **311** before the ringing event has expired. A wealth of information can be propagated between KW **313** and center **300**.

Data about callers and contact center service tools and full database access is made available to KW **313** on desktop **311** using KWP and AD applications. If there is no monitoring capability between the device that KW **313** receives an event on and the computing platform of KW **313**, then KW **313** may have to manipulate AD on the computing platform in order to access center **300** for data pertinent to the event. In other embodiments the computing platform and the device used to receive events are one in the same such as a network-capable cellular telephone for example.

KW **313** can register any number of DNs from AD on desktop **311** to receive events when he or she is leaving workplace **310** and will be away for a period. In the case of

a short distance, a wireless peripheral can be used to access center data through desktop **311** and a wireless telephone can be set-up to receive the events. There are many equipment variations that are possible.

The nature of the connection between KWP and a KW device can be configured according to a number of criteria and supported platforms. For example, a one-way connection can be utilized for practicing only KW status notification to center **300**. A two-way connection can be practiced for call-related data propagation. In addition to dial-up techniques to facilitate the connection between KWP and a KW device, wireless and Internet Protocol (IP) connections can be implemented. It is also possible to practice the invention with a simple PSTN connection.

KWP architecture supports any existing media and platform. More specifically, KWP supports a traditional desktop with a data link (illustrated in this example), wireless linking for PDAs and wireless browser applications. KWP also supports conventional voice devices including but not limited to analog telephone, conventional IVR, and VoiceXML based IVR. Messaging protocols such as Simple Messaging System (SMS), Instant Messaging (IM), email, Internet markup languages such as traditional HTML-based languages are supported along with more recently introduced Wireless Application Protocol (WAP) and Wireless Markup Language (WML). More detail regarding the software platform of the invention and how it functions in telephony scenarios is presented below.

FIG. **4** is a block diagram illustrating system connection hierarchy according to an embodiment of the invention. In this simple example, KWP**402** resides between the communication center environment (**401**) and the remote KW or KWs. Therefore, KWP **402** is a proxy-serving platform that is integrated as an extension of the CTI telephony platform generally described as the T-Server platform. In this example, CC Environment **401** is analogous to the capabilities of center **300** described with reference to FIG. **3** including any extension of those capabilities into the PSTN network by way of separate data network connections and CTI processor distribution to network level components.

KWP **402** is analogous to KWP running on processor **303** described with reference to FIG. **3**. IP network **404** and PSTN network **403** illustrate exemplary communication networks used in communication. Other networks may also be substituted therefor or used in conjunction therewith. A plurality of KW devices is illustrated as examples of varying types of devices that may be used by a KW to practice the invention. A standard analog telephone **405a** can be used in a simple embodiment to communicate with KWP through PSTN **403**. IVR-based technology is used in this case to provide the KW with call and center-related data as well as for receiving routed events. A cellular telephone **405b** is illustrated and can be adapted to communicate with KWP **402** through a COST connection or through a DNT connection. WAP and WML are supported so that XML-based data from CC environment **401** can be displayed on device **405b**.

It is noted herein that AD, described with reference to FIG. **3**, normally requires approximately 30 megabytes of disk space in a robust version for desktops and the like. Therefore, an AD-Lite application would be downloaded to device **405b** according to storage availability. In another embodiment, AD may be combined with KWP at server side wherein AD is still personalized to the particular KW authorized to access it and operate it from device **405b**.

A PC **405c** is illustrated in this example and is analogous to desktop **311** described with reference to FIG. **3**. A PDA **405d** is illustrated in this example as a possible KW device

that communicates to KWP through IP network **404**, or can also be operated with a wireless connection through PC **405c** as a host.

FIGS. **5** through **8** are block diagrams illustrating call control use cases according to an embodiment of the present invention. Referring now to FIG. **5**, the basic advantage of KWP in that KW agent **501** can accept inbound calls from customers (**502**) wherein availability status, skill level, and other criteria can be provided to the communication center environment for the purpose of routing call **502**. If the DN of KW **501** is not integrated with a KW computing platform, then KW **501** can still enter input from the KWP-connected computing platform when on call using an unregistered DN to retrieve data. At this point the communication center can track the activities and results based on KW data input. In another embodiment, the DN of the KWs receiving telephone can be set in the CC environment wherein a network level switch enhanced by CTI software can monitor state, determine best routing, and initiate data transfer of call-related and center-related data to the KW without first party input.

Referring now to FIG. **6**, KW **601** can initiate an outbound call (**602**). As an extension to traditional outbound dialing, a preview-dialing mode **603** is supported which includes preview dialing notification caused by outbound contact (**605**) and a preview-dialing mode supported by Internet suite (**605**) for IP mode.

Referring now to FIG. **7**, a KW (**701**) can place or receive internal calls (**702**) from other knowledge workers. This includes an internal call without notification (**703**), an internal call with notification (**707**). An internal call with notification includes an option (**708**) for preview answer of the internal call associated with a manual agent reservation. There are several extended options including an external call (**709**) via RP queue performed by an external T-Server, an internal call (**706**) from a center agent performed by the external T-Server, and an internal call (**704**) from another KW. Option **704** can be extended to an option of internal call (**710**) from a KW performed by an external programmable T-Server, or an option of internal call (**705**) from a KW performed by a local programmable T-Server.

Referring now to FIG. **8**, KW **801** can initiate more complicated interactions such as a two-step transfer (**802**), a two-step conference (**803**), and a hold and retrieve (**804**).

FIG. **9** is a block diagram illustrating components of the Knowledge Worker software and integration thereof to a communication center framework. The KWP **901** of the present invention includes a server application **904**, which is analogous to programmable T-Server and KWP software running on processor **305** described with reference to FIG. **3** above. A KW desktop or "client" application **903** is also part of KWP **901**. KW desktop **903** is analogous to AD running on desktop **311** described with reference to FIG. **3**.

KWP communicates with a communication center (CC) Platform **902** over a data link (**908, 907**) that supports ISCC protocol. Link (**908, 907**) is separated in terms of element number to show communication of two separate components in this example. However, the physical link is analogous to link **314** described with reference to FIG. **1**.

CC platform **902** includes a configuration server **905** and standard premise T-Server **906**. Configuration server **905** is a software implement that is used to configure and update KWP/programmable T-server **904**. In turn, KWP/T-Server programs KW desktop **903** if required. As was described further above, KWP **901** is an extension of CC framework.

For example, T-server 906 serves as a basic model whereas KWP/T-Server is extended in functionality by additional attributes and capabilities.

Existing T-Library (T-Lib) protocol is used to build additional KW messaging between KWP/T-Server and client the application 903. Standard agent desktop applications are extended to provide KW functionality.

FIG. 10 is a block diagram illustrating components of the knowledge worker platform 901 of FIG. 9. As described with reference to FIG. 9 above, KWP 901 comprises a KW desktop application 903 and a KW T-Server application 904. KW desktop application 903 comprises an agent desktop application known to the inventor as Contact Navigator given the element number 1009. Contact Navigator 1009 utilizes a Transaction Library or T-Library 1008, which contains all of the required business and routing rules and object entities needed to build useful communication between two physically disparate systems namely, the CC platform and the KWP. By themselves, navigator 1009 and library 1008 are identical to the desktop application contained within the physical contact center domain analogous to AD running on agent desktop 320 in center 300 described with reference to FIG. 3 above.

In this example, desktop 903 is enhanced with KW extension software 1010. KW extension 1010 contains all of the attributes that facilitate the added capabilities of a KW desktop over a standard model desktop. T-Lib 1011 is thus enhanced with the appropriate components defined by the extension. It is noted herein that since KW desktop 903 is based on the standard desktop model (contact navigator) added capability can be remotely programmed thereto using the configuration server described with reference to the CC platform of FIG. 9. The appropriate components are downloaded to KW extension 1010 for KW use.

KW desktop 903 has connection with KW T-Server 904 as described further above in this specification. KW T-Server 904 is partitioned into two parts, a T-Server common part 1001 and a KW specific part 1002. KW T-Server 904 is also enhanced with ISCC communication capability via ISCC protocol 1003 for the purpose of economic communication with the contact-center platform.

One main goal of the invention is to maintain separation of KW specific part of T-Server functionality from the standard functionality of T-Server framework components at the host contact center. Such separation allows independent development and support for KWP 901 over contact center framework. Further, separation enables seamless integration of KWP with a variety of host customer-relation-management (CRM)-vendors.

KW protocol is provided instead of traditional CTI protocol. KW protocol, shown exchanged over logical link 1006 between the desktop and the T-Server provides CTI like messaging capability. This means that any KW desktop that registers a DN with KW T-Server 904 establishes telephony switch functionality at the contact center for servicing those registered DNs. KW protocol carries CTI like messages regarding real-time status of any registered DNs from KW desktop to KW T-Server. Various call-control messages are supported like TmakeCall, TanswerCall, TreleaseCall, TholdCall, and so on. These messages are treated as CTI messages that inform KW T-Server 904 of status of a particular interaction.

The structure of messages in KWP is presented in FIG. 24. The KWP message is encoded in a KVLlist data type that enables future extension of KWP without breaking compatibility with older applications.

### KVLlist Structure

The following code exemplifies the structure of a KVLlist:

```

5      typedef enum {
        KVTypeString,
        KVTypeInt,
        KVTypeBinary,
        KVTypeList,
        KVTypeIncorrect = -1/* used for error indication only */
10     } TKVType;
    struct kv_pair {
        TKVType type;
        char *key;
        int length;
        union {
15         char *_string_value;
            int _int_value;
            unsigned char *_binary_value;
            struct kv_list *_list_value;
        } _value;
        #define string_value    _value._string_value
        #define int_value      _value._int_value
        #define binary_value   _value._binary_value
        #define list_value     _value._list_value
        struct kv_pair *kv_next;
        struct kv_pair *kv_prev;
20     };
    typedef struct kv_pair TKVPair;
    struct kv_list {
        struct kv_pair *list;
        struct kv_pair *current;
        struct kv_pair *tail;
25     };
    typedef struct kv_list TKVList;

```

### TEvent Structure

The following code exemplifies the structure of a transaction event (Tevent):

```

35     typedef struct {
        enum TMessageType      Event;
        TServer                Server;
        int                    ReferenceID;
        char                   *HomeLocation;
        char                   *CustomerID;
40     TConnectionID           ConnID;
        TConnectionID           PreviousConnID;
        TCallID                CallID;
        int                    NodeID;
        TCallID                NetworkCallID;
        int                    NetworkNodeID;
45     TCallHistoryInfo         CallHistory;
        TCallType               CallType;
        TCallState              CallState;
        TAgentID                AgentID;
        TAgentWorkMode          WorkMode;
50     long                     ErrorCode;
        char                   *ErrorMessage;
        TFile                   FileHandle;
        char                   *CollectedDigits;
        char                   LastCollectedDigit;
        TDirectoryNumber        ThisDN;
55     TDirectoryNumber        ThisQueue;
        unsigned long           ThisTrunk;
        TDNRole                 ThisDNRole;
        TDirectoryNumber        OtherDN;
        TDirectoryNumber        OtherQueue;
        unsigned long           OtherTrunk;
        TDNRole                 OtherDNRole;
60     TDirectoryNumber        ThirdPartyDN;
        TDirectoryNumber        ThirdPartyQueue;
        unsigned long           ThirdPartyTrunk;
        TDNRole                 ThirdPartyDNRole;
        TDirectoryNumber        DNIS;
        TDirectoryNumber        ANI;
65     char                   *CallingLineName;
        TDirectoryNumber        CLID;

```

-continued

---

TAddressInfoType	InfoType;
TAddressInfoStatus	InfoStatus;
TTreatmentType	TreatmentType;
TRouteType	RouteType;
char	*ServerVersion;
TServerRole	ServerRole;
TMask	Capabilities;
TKVList	*UserData
TKVList	*Reasons;
TKVList	*Extensions;
TTimeStamp	Time;
void	*RawData;
TDirectoryNumber	AccessNumber;
TXRouteType	XRouteType;
TReferenceID	XReferenceID,
TKVList	*TreatmentParameters;
char	*Place;
int	Timeout;
TMediaType	MediaType;/* added 7/15/99 ER#9462 */
TLocationInfoType	LocationInfo;
TMonitorNextCallType	MonitorNextCallType;
/*	
* Used in RequestPrivateService/EventPrivateInfo:	
*/	
TPrivateMsgType	PrivateEvent;

---

Another protocol provided for use in practice of the present invention is known as Preview-Interaction-Protocol (PIP) to the inventor. Preview interaction protocol is illustrated as being exchanged between KW T-Server **904** and KW desktop **901** over logical link **1004**. PIP provides an ability for a KW to preview incoming interactions before actually receiving them. In this way, a KW has the capability of accepting or rejecting an incoming interaction based on attached data such as user data attached with an incoming telephone call. This capability also allows the contact center platform to correctly process external call-control routines like external call, external transfer, external conference, and so on. All preview interaction messaging takes place between KW desktop **903** and KW T-Server **904**.

T-Library functions as a messaging transport layer in the software communication scheme. In other words, particular T-Lib messages are used to carry KW protocol and PIP messages.

FIG. **11** is a configuration model **1100** for knowledge worker state information according to an embodiment of the present invention. Configuration-Management-Entities (CME) are configured into the system for active state and call control. CME configuration model **1100** is a typical CME configuration routine for configuring remote knowledge workers to practice the present invention. First a KW is configured with CfgPerson **1101**. Secondly, the place or places of operation are configured with CfgPlace **1102**. The relationship between person and place typically includes one place where a KW will receive interactions. However in some embodiments a KW may be live at one place and have automated services set up in another place. Therefore, the relationship between person and place in this CME model can be one to many.

Place **1102** has two basic attributes that must be configured. These are agent login (CfgAgentLogin) **1103** and DN (CfgDn) **1104**. Agent login includes any pre-designed procedure deemed appropriate for a KW to login to the system of the invention. In some cases login may not be required in terms of passwords and so on. Simply opening a connection between the KW computing platform and the KW T-Server may be sufficient for login purposes. In some embodiments, KW platforms associated with automated systems may

remain connected and, therefore logged in 24/7. In other cases, automated connection establishment and login may be pre-programmed so that the KW platform will login whether the agent is actually there or not.

**5** CfgDn **1104** is used to register one or more KW DNs with the contact center environment, typically a CTI telephony switch. A KW may configure more than one DN with attached data as to what types of interactions should be routed to which DN. A DN may include one or more  
**10** telephone numbers, cell phone numbers, an e-mail address, a virtual number for an automated system, an IP address and still other location identifications. One to many relationships between place **1102** and agent login **1103** are possible. Similarly, one to many relationships between agent login  
**15** **1103** and CfgDn **1104** are possible.

CfgSwitch **1106** configures the acting telephony switch or switches practicing the present invention. This process uses a special KW gateway. CFGKWGateway enables the switch to differentiate KW telephony traffic from regular contact-center and other normal traffic. Switches with or without CTI links are configured if they are involved in KW interaction routing. CfgApplication **1107** is used to configure KWP software at the remote location. This configuration process includes configuring KW T-Server and KW desktop  
**25** software. CME provides data sync methods for data synchronization, data transformation between customer main and central storage facilities and data transfer between directories by LDAP or preferably through XML and XSLT import/export mechanisms.

**30** FIG. **12** is a data model for presenting an active knowledge worker state. The model of this example presents the various agent states that are implemented by KW T-Server **904** described with reference to FIG. **10** above. The basic reportable states are Agent Login, Agent Logout, Agent Ready, and Agent Not Ready. This model is the basic agent model for standard CTI-T-Server implementation as would be the case inside contact center **300** described with reference to FIG. **3**. Hence the term agent can be replaced with the more appropriate term knowledge worker for remote  
**35** implementation. The arrows represent all possible associations in the model. One with skill in the art will recognize that this is a basic example and that other reportable knowledge worker states may also be represented in this model. Similarly, this model may be applied to different types of interaction media including telephone interaction without departing from the spirit and scope of the invention.

FIG. **13** is a process flow diagram illustrating the sequence of a successful internal call. At step **1300** a KW initiates an internal call to another KW. This action can occur from a KW telephone or from a KW computing platform analogous to telephone **312** and desktop **311** of station **310** described with reference to FIG. **3**. At step **1301**, a KW T-Server analogous to processor **305** described with reference to FIG. **3** receives notification of the initiated call and sends a preview interaction message (PIM) to the destination KW. The PIM is forwarded before the call is dialed and gives the second KW a chance to decide whether or not he will accept the call based on the PIM data.

At step **1302**, KW-2 receives and, in this case accepts the PIM from the KW T-Server. A dotted return arrow illustrates an acceptance response forwarded back to the T-Server. At step **1303**, the T-Server dials the DN specified in the call initiation event. A notification of a dialing event (broken return arrow labeled Event Dialing) displays on the caller's computer platform or is activated on the caller's telephone with respect to KW of step **1300**. There are many indication possibilities for a dialing event. A ringing event is also

established by the T-Server at the computer platform or telephone of KW-2 as illustrated by the broken arrow labeled Ringing. At this particular moment it happens that KW-2 is on a current call. A pre-defined time period may be established for the ringing event so that KW-2 may, during that time, terminate the previous call and pick up.

At step **1304**, KW-2 picks up the call. Detecting the pick up at step **1305**, the KW T-Server establishes the connection between the KW of step **1300** and KW-2 of step **1304** as indicated by broken arrows. It will be apparent to one with skill in the art that there may be variations in this process for a successful internal call between 2 KWs without departing from the spirit and scope of the invention. Variations in the flow are dependant on actual events. For example, in the case that KW-2 could not terminate the previous call to pick up the initiated event before a sever timeout has occurred, a notification of not ready could be returned to the initiating KW. Similarly, KW-2 could opt to reject the call before it is made by rejection the PIM request.

FIG. **14** is a process flow diagram illustrating a variation of the sequence of FIG. **13** with a forced answer. In this example, steps **1400-1403** are identical to steps **1300-1303** described with reference to FIG. **13** above. Therefore, the same description given in the example above applies to steps **1400-1403** of this example as well.

At step **1404**, there is a forced server time out indicating a forced answer mode. At step **1405**, a ringing event is established at the station of KW-2 audible over telephone or audible and perhaps visible on the computing platform of KW-2. At step **1406** then, KW T-Server establishes connection for the dialed event. It is noted herein that event connection first connects the initiating party and then the receiving party as indicated by broken arrows A and B.

FIG. **15** is a process flow diagram illustrating the sequence of a failed internal call. At step **1500** a KW initiates a call to another KW as described with reference to the previous 2 examples. At step **1501**, the KW T-Server sends a PIM request to the second KW (KW-2). However, upon reviewing the request, KW-2 decides not to accept the call and rejects the PIM in step **1502** as illustrated by a broken return arrow. The result of this action is that in step **1503**, the KW T-Server returns an error message or notification to the initiating KW. It is noted herein that notification messages can take the form of a wide variety of media such as Voice over Internet Protocol (VoIP), IVR response, e-mail response, and so on dependant upon media type and equipment.

FIG. **16** is a process flow diagram illustrating the sequence of an internal call with a forced timeout before PIM decision according to an embodiment of the invention. Steps **1600** and **1601** are identical to the first 2 steps of the previous examples. However, at step **1602** a forced server timeout occurs before KW-2 responds to the PIM request sent in step **1601**.

At step **1603** the KW T-Server sends a timeout error notice to the initiating KW. In the meantime, the PIM request sent to KW-2 is still alive and pending. At step **1604** after the timeout occurs, KW-2 receives the PIM request and determines whether to accept or reject the call. If in step **1604** KW-2 accepts the request, then at step **1606** KW T-Server dials the DN number and subsequent steps for dial notification, ringing event notification and connection establishment occur as with a successful internal call. However, if KW-2 rejects the call event at step **1604**, then at step **1605** KW T-Server sends an error notification back to the initiating KW as indicated by the broken return arrow.

FIG. **17** is a process flow diagram illustrating the sequence of a successful external call according to an embodiment of the invention. At step **1700** a center agent initiates a call to a remote KW. Initiation of the call can take place from the agent telephone or from the agent desktop analogous to telephone **321** and desktop **320** in workplace **319** of center **300** described with reference to FIG. **3**. At step **1701** the desktop T Server opens a connection to a first local router or router **1**. It is noted herein that the T-server implement may be in the agent desktop itself or it may be in a premise T Server processor accessible to the agent.

At step **1702** the first router local to the agent sends a request to a second router local to the KW to get an access number or DN. At step **1703** the second router forwards the request to the KW T-Server hosting the agent. It is assumed in this example that the KW in question is logged in. Otherwise, an error message (KW not available) would be returned to the initiating agent.

At step **1704** the KW T-Server sends a PIM to the KW having the requested access number or DN. The KW is now aware of the impending incoming call and can decide whether to accept or reject the call. In this case, the KW that will receive the call accepts the PIM request as indicated by the associated block below block **1704**. At step **1705** KW T-Server requests call data from the second router. In the meantime, at step **1706** the second router gives the access number to the first router local to the agent.

At step **1707** the first router sends a call request to the premise T-Server. At step **1708** the premise T-Server extends the call request to the premise switch. At step **1709** the switch dials the associated DN and notifies the premise T Server in the first phase of dialing. At step **1710** the premise T-Server notifies the first router of the DN in phase **2** of dialing. At step **1711** the first router notifies the agent desktop of the dialing (phase **3**). This manifestation may occur on the agent telephone, desktop or both.

At step **1712** the KW T-Server establishes a ringing event at the second router local to the KW in a first phase of ring notification. At step **1713** the second router establishes the ringing event at the KW station, for example, on the telephone or desktop or both. At step **1714** the connection is established between router **1** and router **2**. At step **1715**, the connection is extended from router **1** to the calling agent. It is assumed in this example that the connection is a COST connection, however DNT interactions are similarly routed according to CTI rules.

It will be apparent to one with skill in the art that the steps described in this example may vary in number and order without departing from the spirit and scope of the present invention. For example, it may be that there are more than 2 routers involved in the connection path of the call. Similarly, server timeouts, agent availability, queuing requirements, and so on can change the nature and order of the described steps. The inventor intends that the presented example illustrate just one example of an external incoming call sourced from a center agent and destined to a remote knowledge worker according to a preferred embodiment.

FIG. **18** is a process flow diagram of a failed external call according to an embodiment of the present invention. Steps **1800** through **1804** are identical to steps **1700** through **1704** described with reference to FIG. **17** above for a successful external call from a center agent to a remote KW.

At step **1805** however, the KW decides not to accept the pending call and return a rejection response. At step **1806** the KW T-Server sends a data request to R-2 for call data. At step **1807** R-2 sends an error message to KW T-Server because of absence of call data due to KW rejection of PIM

request. At step **1808** R-2 returns an error message to R-1 local to the agent regarding the earlier request for access number at step **1802**. At step **1809** R-1 sends an error message to the agent station as indicated by a broken arrow. The error message may be that at this time KW John is not available due to current load or duties. The fact that KW decided not to take the incoming call from the agent can be expressed in a variety of syntax. Perhaps the agent could elect to receive a call back from the KW at a more advantageous time or perhaps the agent can be prompted to place the call again at a latter time period.

It will be apparent to one with skill in the art that remote call control is possible and practical using the method of the present invention without a functioning CTI link provided between the center and the local switch closest to the KW center or other remote KWs. Incoming calls can be routed to any remote KW with a connection to the KW T-Server according to availability, skill level, and so on. In a preferred embodiment intelligent routing of events to remote KWs can be made at the premise of the communication center or at network level. In the case of network level routing, a network T Server must be provided to enhance the involved network level switch or switches.

If all KWs are, for some reason, unavailable at the time of a call attempt, then IVR functionality can be utilized to prompt the caller to leave a number for a return call. In this embodiment, premise T-Server function enables outbound dialing and connection when it is determined that a KW becomes available to take calls. In one embodiment ISCC protocol enables a center agent engaged in a call to transfer the connection to a remote KW with data attached to the event. XML-based data and XSLT transformation capability renders the attached data into the desired format for dissemination at the KWs end device whether it is a voice only device or a display-capable/voice capable device, or even a display only device.

In another embodiment, the service-provider infrastructure (center) can partially monitor independent interactions through network signaling such as D-channel pinging, OSIG, or call progress detection mechanisms.

#### Voice-Based Management

According to yet another aspect of the present invention, a voice-based management system is provided to extend functionality in management of remote KWs in a communications-center environment. The methods and apparatus of this invention in preferred embodiments are described in enabling detail below.

FIG. **19** is an architectural overview of a state and interaction management system enhanced with voice-management capabilities according to an embodiment of the present invention. One goal of the present invention is to provide a voice-based system for enhancing KW state reporting capabilities and KW control from the viewpoint of a communications center. The enhanced management and reporting environment uses voice extensible markup language technology (VXML), text-to-speech (TTS) and automatic speech recognition (ASR) technologies.

This example is similar in some respects to the example described with reference to FIG. **3**, above except that voice-based management capabilities are integrated with data management and transfer capabilities across disparate networks in order to provide enhanced cross-communication between a KW and communications center applications resulting in better overall performance of the system as a whole.

Referring now back to FIG. **19**, some elements that are illustrated herein were also introduced and described with

reference to the example of FIG. **3** above. Therefore, those elements, which have already been introduced and described, retain their same element numbers and shall not be reintroduced. Contact center **300** is illustrated in this example in a much-simplified form than that described with reference to FIG. **3** above. For example, some agent-workplace components are not specifically illustrated in this example for the purpose of more clearly describing the present invention, but may be assumed to be present. PBX switch **316** is illustrated in this example along with premise T-server **317** running an instance of KWP (Knowledge Worker Platform) analogous to KWP running on server **305** described with reference to FIG. **3** and also illustrated in this example. All other communications systems that are typical of state-of-art communications centers are represented herein by a LAN arrow **401**, the illustration of which is meant to indicate a full and robust compliment of systems and components required to enable a communications center. Hereinafter, the element number **401** is used to indicate a communications center environment analogous to CC environment **401** described with reference to FIG. **4** above.

PBX **316**, which is CTI-enhanced in this example, is reachable through PSTN network **303** from a local PBX switch **323** via telephony trunk(s). KW workplace **310** is analogous to workplace **310** described with reference to FIG. **3**. Only telephone **312** is illustrated in this example as one communication component or fixture residing in workplace **310**. Telephony **312** may be an IP telephone or a plain-old-telephone-service (POTS) connected telephone. KW **313** and Computer **311** are omitted from this example for the sake of simplifying illustration but are assumed to be present. The proxy system previously described with reference to FIG. **3** including T-server **305** running an instance of KWP is illustrated in this example. As previously described, T-server **305** has connection to center **300** through an ISCC compatible data link. KW protocol, IPDP, and T-Lib protocols are available through T-server **305** and are implemented as previously described with reference to FIG. **3**.

In this example, a Wide-Area-Network (WAN) **1903** is illustrated as part of the overall communications network. In a preferred embodiment WAN **1903** is the well-known Internet network and may be referred to as Internet **1903** in this specification. In other embodiments WAN **1903** may be a private or corporate network including an Intranet or Ethernet network. The inventor chooses the Internet as a preferred embodiment in this example because of the high public access characteristic. This is also the case with respect to PSTN **303**.

Internet **1903** has an Internet backbone **1900** extending there through that represents all of the network lines, access points and equipment that make up the Internet network as a whole. It is clear, that in various types of applications, and in some other cases, this may not be "The Internet", but a private or other network's backbone. Therefore there are no geographic limitations to the practice of the present invention. Contact center **300**, also termed a communication center, has connection to Internet **1903** through any of several known Internet access methods including DSL, ISDN, dial-up or others. Internet connection capability between center **300** and Internet **1903** is a 24x7 connection in preferred embodiments of the present invention. In this example, T-server **317** also serves (logically) as an intelligent router for routing data from the Internet to appropriate destinations within center **300**. It will be appreciated however that a dedicated IP router or server may be provided instead as a separate component from T-server **317** and linked thereto for communication.

Internet **1903** has a Web server **1902** provided therein and illustrated as having connection to Internet backbone **1900** for communication. Web server **1902** is adapted to serve electronic information pages (Web pages) and is, in a preferred embodiment, hosted by a same entity that hosts center **300**. Server **1902** can be provided within the physical domain of center **300** without departing from the spirit and scope of the present invention. Center **300** is a dually-capable center, meaning that it may process both COST and DNT communication events.

Web server **1902** has a VXML application **1901** which is adapted to generate executable VXML scripts. Web server **1902** also has a KW Web application **1908** adapted to communicate with a KWP application provided to and executable from T-server **317** located within center **300**. Application **1908** converts VXML data into data of a format understood by CTI platform software and other center application formats used within center **300** for routing, scheduling, data aggregation, and other functions.

Web server **1902** is adapted to generate and execute VXML scripts. Web server **1902** is accessible by voice-based mediums (telephone) through a KW VXML gateway **1904** linked for communication to backbone **1900**. VXML gateway **1904** contains TTS and ASR software for performing various tasks related to voice recognition and voice synthesizing from text (VXML) scripts. As a vocal portal, gateway **1904** is accessible through switch **323** in PSTN **303**. For example, a KW operating phone **312** can access Web server **1902** through an appropriate link between phone **312** and gateway **1904**.

Building a VXML implementation, at the lowest level, is based upon generating one or more Web pages that contain VXML commands. These web pages are executed by VXML gateway **1904**. Gateway **1904** parses VXML pages generated and served by server **1902**. Based upon the commands on a VXML page, the VXML gateway interfaces with or includes an ASR engine and/or a TTS engine. The VXML gateway contains an interpreter application that controls telephony, ASR, and TTS resources. In one embodiment of the invention gateway **1904** including the TTS, interpreter, and ASR components mentioned is contained within one server, namely server **1902**. However, the inventor logically illustrates separate components in this example in order to more clearly describe them.

In one embodiment, PBX **323** is also accessible to a mobile KW illustrated herein as Mobile KW **1906** operating, in this case, a cellular telephone device **1907**. Typical access is wireless and achieved through connection to a wireless data network illustrated herein as network **1905** using a wireless network gateway (GW) illustrated herein as GW **1910**. In one embodiment there may be a direct connection between GW **1910** and VXML gateway **1904**. KW **1906** may, in one embodiment be the same KW that is stationed at workplace **310**, the KW having left workplace **310** temporarily and currently operating from device **1907** in a completely mobile environment such as out in the field.

In practice of the invention, a VXML-enhanced state of reporting and management is enabled wherein a KW may use any simple telephone to report state of readiness vocally through gateway **1904**. Gateway **1904** recognizes the voice renderings of the KW using ASR technology and converts the speech to VXML commands for processing by Web server **1902** running VXML scripting software **1901** and Web application **1908**.

Server **1902** downloads the reported state information as XML-based or, if so enhanced, CTI-based data to server **317** running an instance of KWP. Server **317** then notifies the

communication center environment (**401**) including PBX **316** according to whatever the reported state was including issuance of any related commands. For example, KW **1906** may dial a pre-set telephone number (VXML gateway) registered at switch **323** using phone **1907**. The pre-set number addresses VXML gateway **1904** to take the call. Based on a VXML script, the KW when prompted says, for example, "ready on mobile" meaning that he or she can now take service calls but only from the mobile telephone used to dial in or another designated telephone number that can be registered. If prompted, further state detail may be reported such as ready from a certain begin time to a certain stop time. Still more detail can be reported using phone **1907** in a same session such as availability only for a certain type of call, or available only for teleconferencing on a specific project, and so on. There are many configurable possibilities.

VXML scripts can have empty fields for accepting voice renderings or DTMF inputs that fill those fields during voice interaction. These fields may also be filled using touch-tone command methods. VXML pages also have data executable commands and voice dialogs that are played as synthesized voice media streams.

Because KW **1906** is mobile when he or she calls in to report state, he or she may be considered by center **300** to be not available for routing at his workplace if he or she has one. For example, if KW **1906** is the operator of workplace **310** it is now known after state reporting to the center that he or she is not physically present at the main workplace, hence calls requiring database access or other requirements for accessing computer information may not be routed to telephone **1907**. However, because state has been reported, center **300** can now update KW workplace **310** through ISCC compatible network **314** and can access data there from and report it back to KW **1906** as a voice synthesized media stream over telephone **1907** using TTS technology. This can occur while the KW is talking on the telephone by using call hold toggling methods.

For example, server **317** having received a "ready" state report from KW **1906** may cause a call incoming to switch **316** to be re-routed to the now-ready mobile operator **1906** on telephone **1907**. Through IVR interaction, the center determines before routing the call that some information available from KW workplace **310** may have to be presented during the interaction between the caller and KW **1906**. Server **317** can access the required data from KW workplace **310** if authorized and workplace **310** is "online". Additionally, server **317** can also provide any call-related data that may have been solicited from the caller during interaction at switch **316** before re-directing the call.

Server **317** with the aid of KWP software uploads the extracted information and the caller information to Web server **1902**. Server **1902** then generates VXML script and dials VXML gateway **1904**. Gateway **1904** parses the VXML and generates a voice media stream vocalizing the data and dials the telephone number of **1907** not necessarily in the same order. The caller, if already connected, can be put on hold while KW **1906** picks up the call from the center. When KW **1906** answers, the voice stream containing the required information is played and can be recorded at time of play, recorded by note taking, or replayed using touchtone commands. When KW **1906** receives and records the data then he or she has the information available to help the caller even though he or she cannot physically access workplace data from station **310** or contact center data from center **300** using telephone **1907**.

The system of the invention is bi-directional as exemplified in the scenario cited above, meaning that VXML scripts

are directed both ways in communication. A KW can report previous, present, or future state information related to functions or duties using a simple telephone. The center in turn can update the appropriate data systems within the center including performing any switch configurations and routing routine pre-sets. The center can also update the KW workplace with any timely information that may be required or related to the last report. The center can also make vocal requests to the KW through telephone 1907 using outbound dialing techniques through VXML gateway 1904. All data syncing functionality between the KW workplace and the center can be controlled through voice interaction alone. In fact, a KW may place a simple telephone call to the center to cause his or her workplace to boot up and be configured remotely for a planned work session. There are many possibilities of integrating VXML into the ISCC-based management system.

No appreciable modification of KWP software is required from the version described with reference to U.S. patent application Ser. No. 10/269,124 listed in the cross-reference section above and included herein. XML and XSLT including VXML are already supported by KWP software.

FIG. 20 is a block diagram illustrating system connection hierarchy including voice-based enhancement according to an embodiment of the invention. Communication center environment 401 represents center platform systems and applications including CTI call control, call control XML, Telera XML, and other languages that may be in use. KWP 402 is a proxy between the external KW environment and the CC environment. KWP configures the CC environment including CC switch management based on state reporting from a KW.

Web server 1902 running VXML application 1901 and KW Web application 1908 interacts with VXML gateway 1904 to receive audio stage reports and to deliver audio streams to KWs during interaction and telephony event processing. KWs may interact with the system of the invention from any regular telephone, for example from telephone 405a through PSTN 403 or through cellular telephone 405b through wireless network 1905. Voice interaction can also occur from a computing platform like PC 405c or PDA 405d through IP network 404.

The system of the invention, namely those components comprising server 1902 and VXML gateway 1904, adds a simple vocal management capability for center management of remote KWs that can be layered over the software suite described with the ISCC-based system. Essentially, the system of the present invention is a separate component from the system described with reference to application Ser. No. 10/269,124 except for integration with KWP and the CC environment.

Referring now back to FIG. 19, there are at least two separate communication paths in the main architecture for remote KW management. One is the VXML-enabled path between switch 323 and server 317 through server 1902 by way of backbone 1900. The other is the ISCC data path from server 317 to server 305 and workplace 310 by way of ISCC link 314 and logical connection (307, 308, and 309). Applications within center 300 can communicate using VXML by interacting with KWP in 317 and Web server 1902 to generate VXML script, which is then interpreted and synthesized as audio media streaming by gateway 1904 accessible to switch 323 and KW telephones.

Referring now back to FIG. 20, Web application 1908 interfaces with VXML application (Script) 1901 and translates the XML data to protocols used by KWP (XML, XSLT) and KWP interfaces with the CC environment (CTI, or other

XML-based call control languages) as well as other required data formats for storing and managing data including data access formats.

Referring now back to FIG. 19, a human operator residing within center 300 can use VXML spoken commands to configure or set workplace 310 for performing certain tasks or for accepting certain incoming events. This can be accomplished by out dialing through switch 316 and switch 323 to gateway 1904. VXML fields are filled in as previously described through ASR and processed at Web server 1902. At this point update and configurations are made through ISCC protocol network 314. For example, an administrator could call a special number identified and registered to a particular workplace 310. Gateway 1904 interacts with the administrator to determine which of a plurality of VXML dialogues it will use to propagate the administrators intended purpose. It is important to note herein that in one embodiment, ISCC network 314 and server 305 may be Internet hosted.

FIG. 21 is a process flow diagram illustrating steps for VXML-enabled remote-KW state reporting to a CC environment according to an embodiment of the present invention. At step 2100, a remote KW places a telephone call to the communications center (CC) to report a state. At step 2100, the KW may use any telephone or telephony voice device either from a mobile position or from a fixed workplace.

At step 2101, a VXML gateway analogous to gateway 1904 described with reference to FIG. 19 accepts the call waiting at the local switch (323 FIG. 19). In this embodiment it is assumed that the local switch is preprogrammed with the destination number used by the KW so that the communication center switch (316) does not actually receive the call. In another embodiment, the call actually progresses first to the central switch of the communication center adapted to recognize the special destination number. The call is then re-routed back to switch 323 for interaction with the VXML gateway. In the second embodiment, the communication center has knowledge of the pending state report and can also notify the VXML server and the VXML gateway of the pending call and any additional data for identifying, for example, which VXML script to serve and execute, and so on.

At step 2102 the VXML gateway presents the available options to the caller using the selected VXML template and the caller vocalizes the state reporting option or options selected. The VXML gateway uses ASR to identify the audible renderings of the KW and fills the appropriate fields with the choices. Example state reporting options may include "ready", "not ready", "busy", and so on. More complicated reporting options can include "ready on mobile", "ready, page only", "ready at time xxx for period of xxx", "ready for IP telephony only" and so on. In addition to standard telephony-type states, location state, device state, designated communications device state, itinerary or job specific state, and many other reportable states can be conceived and added to a KW VXML reporting capability. It is assumed at step 2102 that the VXML gateway already has the appropriate VXML script for caller interaction according to the call intent. However, in one embodiment, a preliminary interaction takes place with the caller to determine which VXML script must be executed and an additional step for communication with a VXML Web server to obtain a proper script is added between steps 2102 and 2103.

At step 2103, the VXML gateway sends the completed VXML back to the Web server and the server converts the

VXML data into XML-based data using a Web application analogous to application **1908** described with reference to FIG. **19**.

At step **2104** XML-based data is sent to the communication center server running KWP software. The XML-based data reports the correct state information recognizable by KWP. At step **2105** the KWP within the center notifies the CC environment of any required actions resulting from the state reported and, if required performs configurations and related tasks. These actions might include CTI or non-CTI switch configuration, database entry or access, queue configuration, routing routine pre-setting, and tasks that are subsequently initiated and performed through outbound communication to the remote KW workplace. The exact type of action or actions performed will depend on the nature of the state report received. The actions are automated by commands resulting from interpretation of VXML fields filled from audio recognition.

The CC environment is now aware of the state of the particular KW that reported and can manage and track his or her activities. All of the management tasks that may be performed or states set within the communication center environment were communicated from a human KW using VXML to a center application capable executing any required tasks resulting from reported state according to enterprise rules governing those tasks. The method of VXML state reporting can be accomplished from any telephone including a remote phone used out in the field and away from any center connected workplace.

FIG. **22** is a process flow diagram illustrating steps for VXML-based transfer of call data to a remote KW from a communication center according to an embodiment of the present invention. At step **2200** an incoming call destined for a remote KW arrives at a center switch analogous to switch **316** of center **300** described with reference to FIG. **19** above.

At step **2201** IVR interaction solicits call related data from the caller. Call related data includes but is not limited to caller identification data; determining purpose of the call; determining payment method; determining if additional (center stored) data is required to complete the transaction; and so on. In one embodiment, the IVR system may be VXML-enabled and ASR is used to interact with the caller. In another embodiment touch tone interaction is used.

At step **2202** the solicited data is processed at a server connected to the center switch for routing purposes and to package the solicited data for upload to a VXML Web server. If the interacting IVR is VXML-enabled, it uses VXML scripts that can be uploaded as they are to a VXML Web server. If the IVR is not VXML-enabled then the touch-tone responses of the caller are interpreted as XML-based data by KWP and sent to the VXML server for VXML script generation. In this case any VXML Web page generated simply contains the instructions for producing the required one-way voice dialog to the KW.

At step **2203** the caller is routed according to in-place routing rules to the registered KW DN assuming a ready and available state. At step **2204** the switch-connected server sends the solicited data to the VXML Web server in the form of VXML data, if so enabled, or in the form of XML-based data that can be used to generate a VXML script.

At step **2204** the VXML Web server provides a VXML script containing the instructions for voice synthesizing of the data, the data provided in the appropriate dialogue fields of the VXML script to the VXML gateway.

At step **2205** the VXML gateway dials the DN of the KW and renders the data as a voice media stream to the KW

when the call is answered. The gateway uses TTS rendering to synthesize the dialogue fields into a media stream.

In one embodiment, the KW may already be on the call with the routed caller, in which case he or she places the caller on hold to receive the voice data from the VXML gateway. The KW can record the stream, take notes or order the stream to repeat. The stream can include information solicited directly from the caller as well as information about the caller that was retrieved at the center from center-housed data during interaction with the caller at step **2201**. The stream can be sent to any regular telephone used by the KW and, in some cases may be sent to any additional registered DN used by the KW simultaneously with the phone used for taking calls.

Using this VXML-based method, important data about a call and caller can be forwarded to a remote KW even if the KW has no CTI or other connect ability to the center data or remote workplace data. Therefore, the KW can provide complete service to the caller from the remote DN.

FIG. **23** is a process flow diagram illustrating steps for issuing a VXML-based alert to login and receive a KW update to a remote workplace. At step **2300** a center application initiates an update request to KWP within the communication center. Virtually any automated center routine may make such a request. It is assumed herein that at the time of update, the KW remote workplace is not logged into the system or not online. At step **2301**, KWP running on a center server processes the request, packages it for upload and uploads the XML-based data to the VXML server.

At step **2302** the VXML server generates a VXML script containing the update data in the proper dialogue field or fields and serves the script to the VXML gateway for interpretation and synthesizing. At step **2303** the VXML gateway dials the DN of the KW and executes the VXML dialogue as a voice stream when the KW answers the call. At step **2304** the KW logs into the center system and receives the update through the ISCC compatible network. The addition of VXML voice notification capability can be used to alert remote KWs in the field to login at certain times to receive certain data updates or workplace configurations for specific center campaigns. Load balancing can be practiced among a plurality of KWs who are on call with automated outbound VXML alerts going out to stand-by KWs to call them in to handle peak call loads based on a pre-set call threshold ceiling.

It will be apparent to one with skill in the art that the methods and apparatus of the present invention can be practiced from any type of communications network including over the Internet network including bridged communications networks of wireless, COST, and DNT forms. VXML management and state reporting can be practiced using only standard COST telephones without requiring any software on the end communication device.

The method and apparatus of the present invention should be afforded the broadest scope in view of the many possible applications, many of which have been detailed above. The spirit and scope of the present invention is limited only by the claims that follow.

What is claimed is:

**1.** A network system for enabling voice interaction between communications-center applications and human agents remote from the center comprising:

- a primary server connected to the network the server controlling at least one routing point used by the center;
- a secondary server connected to the network the secondary server for generating and serving voice extensible markup language;

a voice gateway associated with the secondary server, the gateway for executing voice extensible markup language and recognizing speech input; and  
 a software platform based in the primary server and distributed in part as a server application to the secondary server, the software [suite] platform functioning as a data transformation interface between the center applications and the gateway, wherein the software platform is configured to utilize a communication protocol selected from at least one of a knowledge worker (KW) protocol or interaction preview data protocol (IPDP);

characterized in that the remote agents report state information over the network to the center using speech, the speech recognized and text rendered at the gateway, the text transformed to one or more formats understood by the primary server and certain ones of the center applications and, wherein data sourced from center applications destined to remote agents is provided and incorporated to one or more VXML scripts at the secondary server, the scripts executed by the gateway, the gateway connecting to voice-capable devices used by the remote agents over the network, the scripts played as synthesized voice media.

2. The system of claim 1 wherein the network includes at least one of a wired telephony network, a wireless communications network and a wide area network all bridged for seamless communication.

3. The system of claim 1 wherein the network includes the Internet network, the public switched telephone network, and a wireless digital network.

4. The system of claim 1 wherein the communications center applications include computer telephony integration compatible applications.

5. The system of claim 1 wherein the at least one routing point is a private branch exchange telephony switch.

6. The system of claim 1 wherein the secondary server is a Web server and the distributed part of the software [suite] platform is a Web-based application.

7. The system of claim 1 wherein the gateway contains an interpreter application that controls automated speech recognition software and text to speech software.

8. The system of claim 1 wherein the voice-capable devices are COST telephones.

9. The system of claim 8 wherein the telephones are cellular telephones.

10. The system of claim 1 wherein the voice-capable devices are one of an IP telephones a personal digital assistant, or a computer telephony application.

11. The system of claim 1 wherein the server application uses XML-Style Sheet-Language-Transformation for transforming VXML to XML-based languages.

12. The system of claim 1 wherein the data sourced from center applications includes center-archived data and data related to active telephony events.

13. The system of claim 1 wherein the VXML scripts are generated from VXML templates during active interaction and executed immediately thereafter in event routing scenarios.

14. A method for receiving at a communications center routing point state information, the information reported vocally from a non-CTI-enabled agent telephone remote from the center and routing a subsequent telephony event and optionally, event-related data, from the routing point to the remote agent's telephone based on at least the reported state information and optional caller interaction comprising steps of:

(a) connecting to and interacting with a predetermined telephone number dialed from the agent telephone, the number registered to a gateway application, the interaction therewith comprising at minimum prompted vocalization of the agent state reported thereto;

(b) recognizing at the gateway the vocalization of state information and populating one or more data fields of a VXML script with a text version of the state information reported;

(c) transforming the language of the script to one or more languages understood at the routing point rendering the information available to the routing point;

(d) receiving an incoming event destined for the remote agent at the routing point and optionally, interacting with the caller from the routing point to obtain event related data;

(e) routing the event to the agent telephone utilizing a communication protocol selected from at least one of a knowledge worker (KW) protocol or interaction preview data protocol (IPDP), simultaneously making the event related data available to a VXML-enabled server,

(f) transforming the event related data to a form useable in one or more data fields of a VXML script; and

(g) establishing a telephone connection to the remote agent, executing the script once connected.

15. The method of claim 14 wherein in step (a) the gateway application is VXML-enabled.

16. The method of claim 14 wherein in step (a) the agent telephone is a cellular telephone and the connection method is wireless.

17. The method of claim 14 wherein in step (a) the agent telephone is a plain old telephony service (POTS) telephone and the connection is made through normal public-switched-telephone channels.

18. The method of claim 14 wherein in step (a) the gateway application is associated with a VXML-enabled Web server.

19. The method of claim 14 wherein in step (b) the gateway uses automated speech recognition to interpret vocalized state information.

20. The method of claim 18 wherein in step (b) the VXML script is generated by the Web server.

21. The method of claim 14 wherein in step (c) language transformation includes use of XSLT and is performed by a Web server application.

22. The method of claim 14 wherein in step (c) a Web server serves the data to a server controlling the routing point the server hosting an application for implementing any required configurations or notifications to other applications.

23. The method of claim 14 wherein in step (c) the information is XML-based.

24. The method of claim 14 wherein in step (d) interaction with the caller is performed using interactive voice response technology.

25. The method of claim 14 wherein in step (d) event related data is supplemented with archived data.

26. The method of claim 14 wherein in step (e) the event related data is uploaded as XML data to the server.

27. The method of claim 14 wherein in step (e) the VXML-enabled server is a Web server.

28. The method of claim 14 wherein in step (f) the transformation of data is performed using XSLT by a Web application.

29. The method of claim 14 wherein in step (g) the telephone connection is established and script execution is performed by a VXML-enabled gateway.

30. The method of claim 14 wherein in step (g) executing the script results in voice synthesis of the populated dialogue fields of the script played over the telephone connection.

31. The method of claim 14 wherein in step (g) the telephone is not the same telephone used to pick-up the 5 related call routed in association with the event related data.

32. The method of claim 14 wherein in step (g) the agent is already connected to the caller and places the caller on hold to receive the event related data on the same telephone.

\* \* \* \* \*