

1 TELEPHONE CALL CONTROL SYSTEM FOR THE PUBLIC SWITCHED
TELEPHONE NETWORK

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FIELD OF THE INVENTION

This invention relates to telephone services and, in particular, to a system for allowing a subscriber to select features of the subscriber's telephone service.

BACKGROUND

10 People have used various means for limiting interruptions due to the telephone. In the past, people used switchboards and secretaries to screen incoming, or inbound, calls. Voice mail systems took over some of this role both in the home and in the central office. Today, there are web-based companies managing 3rd-party call control, via the toll-switch network, which allow users to enter call control information through a web portal. There are also edge
15 devices in each of the public telephone company's central offices which provide local control, but offer an extremely limited number of features and do not provide true 3rd-party call control.

The web-based toll systems provide good user interaction but they are not economical and cannot take advantage of local number portability because they do not provide local
20 control and connectivity.

The Public Switched Telephone Network (PSTN) consists of a plurality of edge switches connected to telephones on one side and to a network of tandem switches on the other. The tandem switch network allows connectivity between all of the edge switches, and a signalling system is used by the PSTN to allow calling and to transmit both calling and called
25 party identity.

Until now, optional features were provided by the local service telephone company (telco) through the edge switch at the central office (CO). It was not possible to provide

1 optional features through any other means. Control of these features was done through the
first party (calling party) or the second party (called party), or worse yet, manually by calling
the business office.

5 In the past, numerous devices have been built that allow the connection of two lines
together at an edge switch. These devices can be used to add features to a telephone network
by receiving a call on one line and then dialing out on another line. The problem with these
devices is that, because they are connected through an edge switch, transmission losses and
impairments occur, degrading the overall connection. In addition, signalling limitations
prevent full control, by the subscriber or the system, over the call.

10 The invention described herein connects at the tandem, thereby eliminating these
problems.

15 In the edge devices residing in the PSTN central offices, the 1st party (the calling
party) has numerous features available (dialing options). The 2nd party (called party) also has
options available such as call forwarding, but these features typically require access from the
first or second party's device and are extremely awkward to program. The user interaction is
not only awkward, it is limited and requires interaction with the telephone company to
provision them. In other words, past systems for provisioning, meaning addition,
modification, or control of telephone features, required a subscriber to make the feature
selection through the telephone business office. Central office workers would then implement
20 the provisioning under request of the business office.

Call Forwarding is one popular provision. There is signification transmission
degradation for Call Forwarding to take place. The calling party pays for a call to the edge
device, and the edge subscriber, the called party, pays for the call to the forwarding number.
For enhanced inbound call control to occur, a direct 3rd-party call control means is needed.

25 A variety of services have arisen to address the problems mentioned above. Many of
these systems allow the called party to make changes to his/her call forwarding attributes
which do not allow direct 3rd-party call control. These services provide good user interaction,
some via the internet, but they rely upon the toll network through the use of "800" numbers.
This requires the subscriber to pay by the minute and does not allow the subscriber to take
30 advantage of number portability in order to obtain 3rd-party call control. There are other toll
network mechanisms for remote call forwarding. For example, MCI offers a service where

1 the customer can remotely change the forwarding target number for "800" numbers.
Contacting the ultimate end-user before terminating the first incoming call is similar to the
manner in which "800" credit calls and collect calls are processed, but these are not done at
the local subscriber level.

5 In addition to these toll services, there are edge devices that perform some of the same
services. Edge devices such as phones and PBXs that include voice mail, inter-active voice
response, call forwarding, speed calling, etc., have been used to provide additional call
control. These devices allow the phone user direct control over incoming and outgoing calls.
The disadvantage of edge devices is that they add cost, degrade voice and transmission
10 quality, can be difficult to program, are not easily programmed remotely, can require the user
to pay for two lines, provide lower quality of service, and cannot provide the same level of
functionality as a system that controls the PSTN directly. There are Voice Over Internet
Protocol (VoIP) products emerging that provide better user interfaces and control but they do
not take advantage and voice quality of the PSTN.

15 SUMMARY

The present invention adds direct control of third party call control features, but does
not suffer from any of the disadvantages listed above, and allows the subscriber to manage
his/her telephone system in a dynamic and exceptionally useful manner that is not currently
available through the existing PSTN. The invention allows enhanced direct third-party call
20 control features, such as selective call routing and remote dialing, to be added to the PSTN
(Public Switched Telephone Network) using local call control and providing dynamic
provisioning of the system by the subscriber. Direct 3rd-party control means that the ability
to provision the 3rd-party features is directly available to a subscriber, eliminating the need to
go through the telephone company (telco) business office.

25 In one embodiment, the system includes a processor (referred to herein as a tandem
access controller) connected to the PSTN which would allow anyone to directly provision,
that is to say set-up and make immediate changes to, the configuration of his or her phone
line. In another embodiment, a tandem access controller (TAC) subsystem is connected
internally to the PSTN in a local service area. The TAC provides features, selected by the
30 subscriber, to all edge switches connected to the PSTN tandem switch. Connecting directly to

1 the PSTN tandem switch (or embedding the system into the tandem switch) eliminates the
signal degradation problems previously described.

5 In one embodiment, the system allows provisioning of features via the internet under
direct control of the subscriber. Recently, several products have been introduced that provide
a means of controlling features via the public internet. However, all these devices fall short in
that they require the subscriber to obtain an "800" number or some other number that requires
the subscriber to pay a toll charge each time a call is made. The present invention connects
locally, so no toll charges are incurred.

10 The web-enhanced services in one embodiment of the invention coexist with and
overlay the local phone service at the local level, thereby providing good economics and user
interaction, single number access to multiple subscriber devices, connectivity without
transmission impairments and true, direct 3rd-party call control.

15 The present invention relies upon use of local telephone facilities thereby eliminating
all the extra charges associated with making toll calls. It also allows the user to take
advantage of number portability and keep his/her existing public phone number.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates the tandem access controller (TAC) of the present invention
connected to the existing PSTN tandem switch, the TAC providing features for the
subscriber's telephone as requested by the subscriber via the web.

20 Fig. 2 illustrates a system similar to Fig. 1 but showing multiple tandem switches and
TAC's and also showing how the subscriber may, in addition to using the standard
telephone, make phone calls using Voice Over IP via a conventional digital telephone.

Fig. 3 is a flowchart of one method that a person may use to set up a subscriber
account and to designate features the subscriber would like for his/her telephone.

25 Fig. 4 is a flowchart of a method that can be performed by the TAC in response to the
subscriber (or other service) controlling the TAC, using the web (or other packet-based
system), to change the subscriber's telephone provisioning or perform another function, such
as make a VoIP call.

1 Fig. 5 is a flowchart of a method that can be performed by the TAC in response to an inbound call to the subscriber.

Fig. 6 is a flowchart of a method performed by the subscriber and the TAC when the subscriber desires to make an outbound call via the web or using a conventional telephone.

5 Fig. 7 illustrates a system, using the TAC, that allows wireless cell phones to obtain the same provisioning options as the conventional telephones.

Fig. 8 illustrates a system, using the TAC, that allows fax and modem calls to benefit from the provisioning offered by the TAC.

DETAILED DESCRIPTION OF THE EMBODIMENTS

10 Fig. 1 shows a tandem access controller (TAC) 10 that allows an authorized subscriber 12 to establish 3rd-party control criteria for calls to the subscriber's telephone 14 (having a "public" phone number that callers dial). In one embodiment, the TAC 10 is a programmed processor. The TAC 10 may use any combination of hardware, firmware, or software and, in one embodiment, is a conventional computer programmed to carry out the
15 functions described herein.

The TAC 10 is connected to or inside the conventional PSTN tandem switch 16 such that calls may flow through the TAC 10 in the same manner as the existing PSTN tandem switch, except that additional 3rd-party features are applied to the call. As is well known, PSTN tandem switches are exchanges that direct telephone calls (or other traffic) to central
20 offices 17, 18 or to other tandem switches. Details of the operation of the existing phone network may be found in the publication entitled "New Net SS7 Tutorial," by ADC Telecommunications, copyright 1999, incorporated herein by reference. Additional details may be found in the numerous books describing the PSTN.

25 The PSTN tandem switch 16 directs a first call (from the calling party 20 to the subscriber's phone 14 using the subscriber's public phone number) to the TAC 10, which in turn places a second call, subject to 3rd-party control information, to the subscriber's "private" phone number without yet terminating the first call. When the subscriber 12 terminates (or answers) the second call, the TAC 10 terminates the first call and connects it to the second call, thereby connecting the calling party 20 to the subscriber 12. Hence, the

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