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(54) **Automatic location-aware feature selection**

Automatische ortsbewusste Dienstauswahl

Sélection automatique de services tenant compte de l'emplacement

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Description

Field of the Invention

[0001] This invention relates generally to communication systems such as PBXs, and more particularly to a system for automatically enabling communication features based on the location of a user within the environment of the communication system.

Background of the Invention

[0002] PBX features are in large part designed to provide the user with the ability to specify how communications should be handled when the user is away from his/her office or desk. For example a user may specify that calls should not be directed to his/her telephone but should be immediately rerouted to a voice mail account. This capability allows for efficient communications within the organization that the PBX serves. However, according to the prior art, the user is required to manually set up and enable such services via his/her desk telephone. Active set up and enablement of such features is often a hindrance for a busy worker who, for example, may be hurrying to a meeting. Often times the user will forget to set the features up in the most advantageous way, which decreases the value of the PBX feature set.

[0003] One approach to overcoming this problem is set forth in U.S. Patent No. 5,454,032- 'Method of establishing communication link to one of multiple devices associated with single telephone number' by Pinard, Raju and Rehder, wherein a 'one-number' system is used to ring many telephones at the same time or in sequence, in the hope of locating the user. Such prior art 'one-number' systems do not provide the full flexibility of most PBX feature sets.

[0004] US-A-4752951 discloses a method of providing location dependent person location service. EP-A-0932099 discloses a dynamic modification of a database management system.

[0005] GB-A-2353612 discloses coordinating processing by use of synchronised tuple spaces and assertions. WO99/09533 A1 discloses a telephone communication system having a locator and a scheduling facility.

[0006] "Integrating Communication Services", C Low, IEEE Communications Magazine, vol. 35, no. 6, 1 June 1997, pages 164-169, discloses various PBX architectures for integrated communication services.

Summary of the Invention

[0007] According to the present invention, a system is provided for automatic feature enablement on the basis of the user's current location, in order to enable the most appropriate set of features. The system is implemented within a tuple space for allowing communication among system components. A location service is provided (e.g. a wireless device such as a Bluetooth appliance, or a card reading registration system, telephone based registration etc.) for tracking the location of a user. Policy daemons are created which contain user specified policies to select appropriate feature sets depending on the user's location. An interface is provided for specifying user preferences for features depending on location. Finally, a basic PBX feature architecture is used which includes a database to hold individual user feature selections as a set of tuples, and a call processing system which uses these feature selections.

[0008] According to an important aspect of the invention, the elements set forth above operate outside of the standard PBX call processing environment. The invention therefore enjoys the advantage of providing a low risk extension to product functionality. There is no detrimental effect on the complexity of call processing. Instead, a simple decision is made as to the appropriate feature sets depending on the user's current location. Consequently, the system according to the present invention may be deployed "behind" any manufacturer's PBX which includes the necessary functionality to set a particular user's features.

Brief Description of the Drawings

[0009] A detailed description of the invention is set forth herein below, with reference to the sole drawing, which is a block diagram of an architecture for automatic feature selection based on user location, according to the preferred embodiment.

Detailed Description of the Preferred Embodiment

[0010] Before discussing the invention is detail, a brief introduction is set forth below of the basic structure and operation of a tuple space.

[0011] A tuple space is a set of type/value ordered pairs called ingles. Each ingle consists of a type (e.g. Name) and a value (e.g. John Doe). Thus, a tuple which describes an employee for a company could, for example, be:

```
{ :name John Doe :age 37 :employee_number
12345 :start_date 810126 :position T12 }
```

[0012] The tuple space enables coordination by allowing queries based on the matching of tuples by anti-tuples. An anti tuple is a tuple that can be used as a query in the tuple space. In form, it is identical to a tuple except that the value of any or all fields may be replaced by a '?' which indicates a 'don't care' condition. Tuple spaces are set up to match tuples with anti-tuples which agree in all fields except for the one(s) indicated by the ? query, which acts as a "wild card". Thus the anti tuple:

```
{ :name ? :age
37 :employee_number ? :start_date ? :position
```

T12 }

would return the tuples for all employees of position T12 who are 37 years old.

[0013] Operations on the tuple space include:

Poke - place a tuple in the tuple space. Duration may be specified for how long the tuple should remain in the space. This may be any period up to indefinite.

Peek - query the tuple space with an anti-tuple. This query may be specified to last for any period up to indefinite. Copies of matching tuples are returned through the interface and the tuples remain in the tuple space.

Pick - query the tuple space with an anti-tuple. This query may be specified to last for any period up to indefinite. Copies of matching tuples are returned through the interface and the tuples are removed from the tuple space.

Cancel - with a specified anti-tuple. All matching anti-tuples are removed from the tuple space. Tuples themselves may be removed directly by an appropriate pick request.

[0014] Additional operations may be provided such as disclosed in UK Mitel Patent Application No. Mitel #520 entitled 'Tuple Space Operations for Fine Grained Control'.

[0015] Turning to the block diagram, with respect to feature control a PBX feature architecture consists of a call processing system 1 that uses feature set up and enabling information from a database 3 to modulate its service to a user. The database 3 stores records that indicate if and how individual users prefer each PBX feature to behave. The feature interaction between multiple features is handled internally by call processing 1 and does not form part of the present invention. For example, if both Call-Forward-Busy and Call-Waiting are enabled on a busy telephone, a decision must be made within call processing 1 as to which feature will be selected since the operating of these features are mutually exclusive - with Call-Forward-Busy the call is directed to another end point whereas with Call-Waiting the call waits at the original end-point. Systems are known for handling feature interaction, all of which are outside the present scope of invention. The present specification addresses only the set up and enabling of features.

[0016] As indicated above, the database 3 contains a set of records for each user which indicate how features are to be set up and whether they have been enabled. For the purposes of this disclosure the records consist of a set of key-value pairs which identify the feature, whether it is enabled or not and, if necessary, other information important to that feature.

[0017] Examples of such feature records are:

<Feature> <Call-Forward-Always>, <Enabled> <Yes>, <Forwarding-Number> <1742>
<Feature> <Call-Forward-Busy-Internal>, <Enabled> <Yes>, <Forwarding-Number> <1112>
<Feature> <Call-Forward-Busy-Extemal>, <Enabled> <Yes>, <Forwarding-Number> <2397>
<Feature> <Do-Not-Disturb>, <Enabled> <Yes>

[0018] A user's selected feature set comprises a collection of such records that indicate how the user wishes his/her features to behave. Typically, a user will have several different types of feature sets stored for use. As an example, a user may wish to invoke different feature sets for different conditions or circumstances, such as:

1. Away from the office (i.e. - not in building)
2. In a meeting room
3. At another person's desk
4. In an executive office
5. In the cafeteria
6. In the washroom
7. ...etc.

[0019] Currently, a user must maintain a mental or written list of the necessary feature selections and then manually set up the features in the database 3 prior to each change in condition or circumstance. Since repeatedly enabling and disabling features can be a time consuming and non-trivial task, in many cases the user does not bother to do so. For example, a user who is hurrying to an important meeting will be hesitant to take the time to enable the proper set of features. In many cases the task is neglected and the user loses the advantages in connectivity provided by the PBX feature set. The present invention addresses this problem and eases the burden of feature selection on the user and hence increases the values of the feature set to him/her. This, in turn, improves the efficiency of the enterprise within which the user functions and consequently increases the attractiveness and value of the vendor's PBX technology in the market place.

[0020] According to the present invention, each user is provided with a policy daemon 5, which, among, other things has a link to the PBX database 3 for the purpose of setting up the user's feature selection records to any desired state, as discussed in greater detail below.

[0021] Location information for each user is gathered by a location daemon 9 and is placed in the tuple space 7 in a raw format. The precise mechanism of how location is determined is outside of the scope of the present invention. Indeed multiple types of registration may be used, as discussed above. For example, wireless detection mechanisms may be employed using smart badges or Bluetooth devices. Card readers may be provided in meeting rooms by which a user can register his/her presence. The user may also register his/her presence by dialing a special feature in the PBX. In any event the

location daemon 9 places tuples in the tuple space 7 of the basic form:

<User> <Unique name for User>,
<Status> < a description of the user's current location>.
<Directory_Number> <directory number for that location>

[0022] As used in the present description, a policy may be defined as a condition-action pair. Conditions in this context are assertions that are placed in the tuple space 7 by the user's location daemon 9, the user's policy daemon 5, or by another policy daemon. Detection of a condition specified in a policy triggers an associated action, which for the present invention means either placing an assertion in the tuple space 7, or updating a user record in the PBX database 3.

[0023] The user is provided with a user interface and associated management tool for specifying the feature sets that the user wishes to have, given one of the circumstances listed above. The provision of such a user interface would be well known to a person of ordinary skill in the art. Thus, the user may wish to indicate that:

- if he/she is in a meeting room, all calls should be forwarded to voice mail number
- if he/she is at someone else's desk, calls should be forwarded to that desk
- if he/she is in the cafeteria, a paging announcement should be made
- if he/she is in a executive's office, disable the ringer on his/her wireless telephone
- ...etc.

[0024] As discussed above, each user is provided with a set of policy daemons 5 which define user feature sets using policy objects which are stored in the database 3. The management of policy objects and how policies are passed to them is well-known in the art and is therefore described only conceptually herein. It should be noted that the policy objects should contain the appropriate policies at any time.

[0025] In each policy object a set of policies is provided in the form shown below for monitoring the tuple space 7 to detect changes in the location status for its user:

```
<Policy-Name><In a meeting room>,
<Anti-Tuple><
      <User><Unique name for User>
      <Status>In a meeting room>
      <?Directory_Number><?>       >
<Action>  <
      <Feature><Call-Forward-Always>,
      <Enabled> <Yes>,
      <Forwarding-Number> <?Directory_Number>
      <
<Action>  <
      <Feature><...
```

[0026] Each of these policy daemons 5 monitors the tuple space 7 for a specific change in the user location status and in response sets the PBX database 3 to the selections of features that most suitably serve that status. The policy object set forth above includes a name, followed by a description of the anti-tuple that should be placed in the tuple space 7 to detect the change in status. One or more actions indicate how the features should be set up in the PBX database 3. In the anti-tuple a value is provided which is indicated as ?Directory_Number. This is the usual syntax to indicate that the value to be placed there is the value that is returned in the tuple that is associated with the key of the associated name.

[0027] Thus, in operation, the policy daemon 5for a user places the appropriate anti-tuples in the tuple space 7. When the location daemon 9 detects a change in user location status it first 'de-bounces' this information to ensure that it is not a momentary trivial change and when this is satisfied places the new information in the tuple space 7. This triggers the appropriate policy daemon 5 to set up the PBX database 3. New calls to the user then utilize the feature set which is most appropriate to the user's current location.

[0028] For the embodiment described herein, the PBX database 3 maybe set up directly by writing records into it. For heterogeneous PBX's other methods may be used by the policy daemons 5, including simulating manual user input.

Claims

1. A system for automatic feature enablement based on the current location of a user, comprising:

a tuple space (7) configured to allow communication among system components;a location daemon (9) configured to track the location of said user and configured to post tuples to said (7) tuple space indicative thereof;
an interface configured to specify user preferences for multiple features depending on said location;
a PBX feature architecture having a database (3) for storing predetermined sets of said multiple features and a call processing system (1) for implementing said features in accordance therewith;
at least one policy daemon (5) configured to receive said user preferences, and in response: peek said tuple space (7) with anti-tuples to determine the location of said user, and create policy objects to select a predetermined set of said multiple features from the database (3) depending on the location of said user; and
wherein said system is deployed outside of a call processing environment of a PBX thereby providing an extension to product functionality

of said PBX.

2. The system of claim 1, wherein said policy objects each comprise a name followed by at least one of said anti-tuples for detecting change in location of said user and at least one action for specifying set up of each said set of said multiple features in said database.

3. A method of automatic feature enablement based on the current location of a user, comprising:

tracking the location of said user and posting tuples to a tuple space (7) indicative thereof;
receiving user preferences for multiple features depending on said location;
peeking said tuple space (7) with anti-tuples to determine the location of said user;
creating policy objects to select a predetermined set of said multiple features depending on the location of said user;
storing each of said predetermined set of said multiple features; and
implementing said features in accordance therewith wherein said tracking, said receiving, said peeking, said creating and said storing occuring outside of a call processing environment of a PBX having a database (3), said storing occurring in said database (3), thereby providing an extension to product functionality of said PBX.

4. The method of claim 3, wherein said policy objects each comprise a name followed by at least one of said anti-tuples for detecting change in location of said user and at least one action for specifying set up of each said set of said multiple features in said database.

Patentansprüche

1. System für automatisches Feature-Enablement auf der Basis des aktuellen Standorts eines Benutzers, das Folgendes umfasst:

einen Tupelraum (7), der so konfiguriert ist, dass er Kommunikation zwischen Systemkomponenten zulässt; einen Standort-Daemon (9), der so konfiguriert ist, dass er den Standort des genannten Benutzers verfolgt, und so konfiguriert ist, dass er Tupel in den genannten Tupelraum (7) postet, die dies anzeigen;
eine Schnittstelle, die zum Vorgeben von Benutzerpräferenzen für mehrere Features in Abhängigkeit von dem genannten Standort konfiguriert ist;
eine PBX-Feature-Architektur mit einer Datenbank (3) zum Speichern von vorbestimmten Sätzen der genannten mehreren Features und ein Rufverarbeitungssystem (1) zum Implementieren der genannten Features in Übereinstimmung damit;
wenigstens einen Richtlinien-Daemon (5), der zum Empfangen der genannten Benutzerpräferenzen konfiguriert ist, und als Reaktion darauf: Peeken des genannten Tupelraums (7) mit Antitupeln, um den Standort des genannten Benutzers zu ermitteln, und Erzeugen von Richtlinienobjekten zum Wählen eines vorbestimmten Satzes der genannten mehreren Features aus der Datenbank (3) in Abhängigkeit vom Standort des genannten Benutzers; und
wobei das genannte System außerhalb einer Rufverarbeitungsumgebung einer PBX eingesetzt wird, um dadurch eine Erweiterung der Produktfunktionalität der genannten PBX bereitzustellen.

2. System nach Anspruch 1, wobei die genannten Richtlinienobjekte jeweils einen Namen gefolgt von wenigstens einem der genannten Antitupel zum Erkennen einer Änderung des Standorts des genannten Benutzers und wenigstens einer Aktion zum Vorgeben eines Setup jedes genannten Satzes der genannten mehreren Features in der genannten Datenbank umfassen.

3. Verfahren für automatisches Feature-Enablement auf der Basis des aktuellen Standorts eines Benutzers, das Folgendes beinhaltet:

Verfolgen des Standorts des genannten Benutzers und Posten von Tupeln in einen Tupelraum (7), die dies anzeigen;
Empfangen von Benutzerpräferenzen für mehrere Features in Abhängigkeit von dem genannten Standort;
Peeken des genannten Tupelraums (7) mit Antitupeln, um den Standort des genannten Benutzers zu ermitteln;
Erzeugen von Richtlinienobjekten zum Wählen eines vorbestimmten Satzes der genannten mehreren Features in Abhängigkeit von dem Standort des genannten Benutzers;
Speichern jedes genannten vorbestimmten Satzes der genannten mehreren Features; und
Implementieren der genannten Features im Einklang damit, wobei das genannte Verfolgen, das genannte Empfangen, das genannte Peeken, das genannte Erzeugen und das genannte Speichern außerhalb einer Rufverarbeitungsumgebung einer PBX mit einer Datenbank (3) erfolgen, wobei das genannte Speichern in der genannten Datenbank (3) erfolgt, um dadurch eine Erweiterung der Produktfunktionalität der genannten PBX bereitzustellen.

4. Verfahren nach Anspruch 3, wobei die genannten Richtlinienobjekte jeweils einen Namen gefolgt von wenigstens einem der genannten Antitupel zum Erkennen einer Änderung des Standorts des genannten Benutzers und wenigstens einer Aktion zum Vorgeben eines Setup jedes genannten Satzes der genannten mehreren Features in der genannten Datenbank beinhalten.

Revendications

1. Système de validation automatique de services basée sur la localisation actuelle d'un utilisateur, comprenant :

   un espace de n-uplets (7) configuré pour permettre la communication entre des composants système ;
   un daemon de localisation (9) configuré pour suivre la localisation dudit utilisateur et configuré pour poster dans ledit espace de n-uplets (7) des n-uplets indiquant ladite localisation ;
   une interface configurée pour spécifier les préférences de l'utilisateur pour des services multiples en fonction de ladite localisation ;
   une architecture de services PBX possédant une base de données (3) pour stocker des ensembles prédéterminés desdits services multiples et un système de traitement d'appels (1) pour implémenter lesdits services conformément à ladite architecture ;
   au moins un daemon de politique (5) configuré pour recevoir lesdites préférences de l'utilisateur et, en réponse, parcourir ledit espace de n-uplets (7) avec des anti-n-uplets afin de déterminer la localisation dudit utilisateur et créer des objets de politique afin de sélectionner un ensemble prédéterminé desdits services multiples à partir de la base de données (3) en fonction de la localisation dudit utilisateur ; et
   dans lequel ledit système est déployé à l'extérieur d'un environnement de traitement d'appels d'un PBX afin d'obtenir ainsi une extension de la fonctionnalité produit dudit PBX.

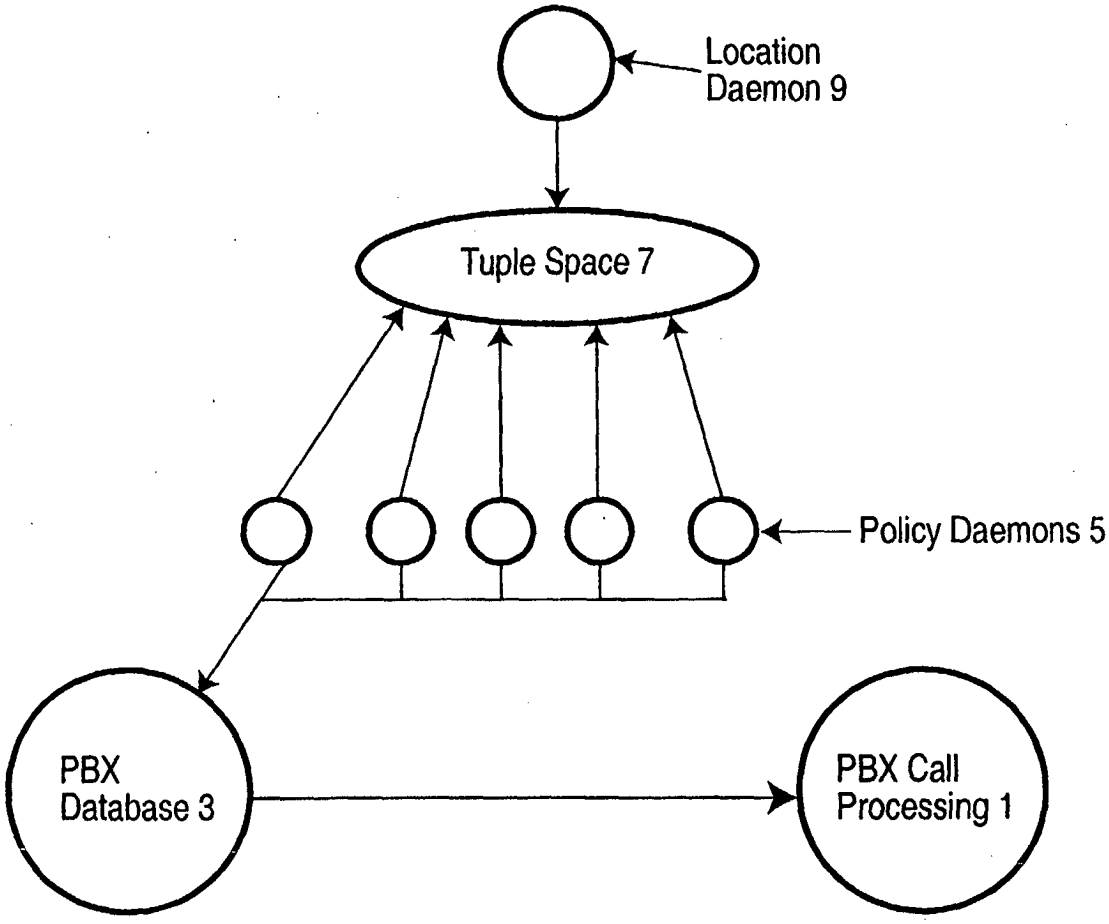
2. Système selon la revendication 1, dans lequel lesdits objets de politique comprennent chacun un nom suivi d'au moins un desdits anti-n-uplets afin de détecter un changement de localisation dudit utilisateur et au moins une action pour spécifier la configuration de chacun desdits ensembles desdits services multiples dans ladite base de données.

3. Procédé de validation automatique de services basée sur la localisation actuelle d'un utilisateur, comprenant les étapes consistant à :

   suivre la localisation dudit utilisateur et poster dans un espace de n-uplets (7) des n-uplets indiquant ladite localisation ;
   recevoir des préférences d'un utilisateur pour des services multiples en fonction de ladite localisation ;
   parcourir ledit espace de n-uplets (7) avec des anti-n-uplets afin de déterminer la localisation dudit utilisateur ;
   créer des objets de politique afin de sélectionner un ensemble prédéterminé desdits services multiples en fonction de la localisation dudit utilisateur ;
   stocker chacun desdits ensembles prédéterminés desdits services multiples ; et
   implémenter lesdits services conformément à ceux-ci, lesdites étapes de suivi, de réception, de parcours, de création et de stockage étant effectuées à l'extérieur d'un environnement de traitement d'appel d'un PBX qui possède une base de données (3), ledit stockage s'effectuant dans ladite base de données (3) afin d'obtenir ainsi une extension de la fonctionnalité produit dudit PBX.

4. Procédé selon la revendication 3, dans lequel lesdits objets de politique comprennent chacun un nom suivi d'au moins un desdits anti-n-uplets afin de détecter un changement de localisation dudit utilisateur et au moins une action pour spécifier la configuration de chacun desdits ensembles desdits services multiples dans ladite base de données.

Figure 1


Location
Daemon 9
Tuple Space 7
Policy Daemons 5
PBX
Database 3
PBX Call
Processing 1

REFERENCES CITED IN THE DESCRIPTION

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