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Centralized Resource Management for Network Infrastructure Including Ip Telephony by Integrating a Mediator Between the Heterogeneous Data Sources

Mohammed Fethi Khalfi, Malika Kandouci

***Abstract*—**Over the past decade, mobile has experienced a revolution that will ultimately change the way we communicate.All these technologies have a common denominator exploitation of computer information systems, but their operation can be tedious because of problems with heterogeneous data sources.To overcome the problems of heterogeneous data sources, we propose to use a technique of adding an extra layer interfacing applications of management or supervision at the different data sources.This layer will be materialized by the implementation of a mediator between different host applications and information systems frequently used hierarchical and relational manner such that the heterogeneity is completely transparent to the VoIP platform.

***Keywords*—**TOIP, Data Integration, Mediation, information computer system, heterogeneous data sources

I. Introduction

TECHNOLOGICAL change on the one hand and the explosion of telecommunications and multimedia on the other hand have transformed the field of information systems, there has been a single-user applications to client-server until you get applications integrating various technologies: IP telephony and mobile, Pocket PC, video monitoring. Voice over IP (VoIP) is a service using the IP network protocol used to connect IP devices (IP phone) as well as software (softphone) that will allow phone calls over Internet Protocol [1]. This variety of technologies has led to applications in which data sources are heterogeneous and have to work in an interoperable way. We focused particularly on the heterogeneity of data, several models exist (Hierarchical, Network, Relational, Object, XML) and each has its own syntax for data modeling.

Our present work is to deploy a network infrastructure including IP telephony, adding a layer to be materialized by the implementation of a mediator between different host applications and information systems so that such heterogeneity is completely transparent to the user community. They can exploit the resources within their companies that have a directory in the form of LDAP (Unix environment) or Active Directory (MS) which describes the exploitable resources or access the database of IP PBX SIP describes the accounts of users.

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Console IP telephony (MIPTEL) provides technology services that retrieve data from the mediation layer can benefit from the services offered by the prototype such as Web conferencing, Instant Messaging, Voice Mail and Conference Audio. This console will help us to develop our mediation module; it will be the basis of our prototype data integration in a 100% IP telephony.

II. Deployment

We will use the 3CX Phone System IP PBX server to deploy IP telephony and 2003 Active Directory to manage user information, equipment and organization of a company.

Console MIPTEL (SIP client) consists of different packages:

- Manage call history (received, made and absence).
- Management of a notion of presence status for the user.
- Managing a contact list.
- Under multiple identities at a time: 5.
- Management of double and multiple calls. Lectures.

Fig.1 Console MIPTEL

III. Implementation of Architecture

A. Architecture Software

The software architecture MIPTEL consists of 3 layers:

- Client interface layer.
- Layer mediator.
- Layer data sources.

1. *Client Layer*

It includes client applications and users to formulate their queries; it uses the various services offered by the prototype such as Web conferencing, instant messaging, voicemail and audio conferencing.

2. *Mediation layer*

It handles requests from users and directs them to the adapters; it transmits the results of the data source layer to layer client.

3. *Layer data sources*

It represents the different data sources and adapters. It receives requests and returns the results of these requests to the mediation layer.

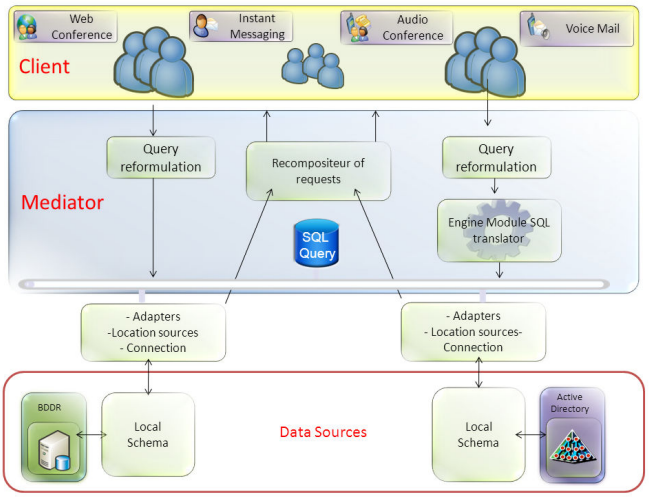

Fig. 2 Architecture of the prototype mediation

B. Operation of the architecture

1. Choice of model integrations (LAV):

The data sources are defined as a set of views on the overall pattern [2]; it is a top-down approach from the mediator to the sources. The main advantage of the approach LAV (Local-as-View) is easier available for adding a new source.

2. Choosing the mediation model (Query):

The Ombudsman shall adopt a single language called the language of mediation to allow different users and applications to query different data sources in a uniform manner by hiding the details of their heterogeneity and localization [3]. The choice of using the SQL query as a model is justified by the richness of this language, namely the abundance of descriptions, data typing, clarity and extensibility.

C. Description of the various modules of the software architecture

1. Data Source Layer:

The various sources are accessible via the adapters, the mediator knows each source by its domain name or IP address, connection string, driver software and a user name and password.

1.1 Sources Relationnel Database 3CX PBX:

3CX is an IP telephony system [4] to a relational database like PostgreSQL contains 44 tables [5]. The main tables used in the integration are USERS, GRP and EXTENSION.

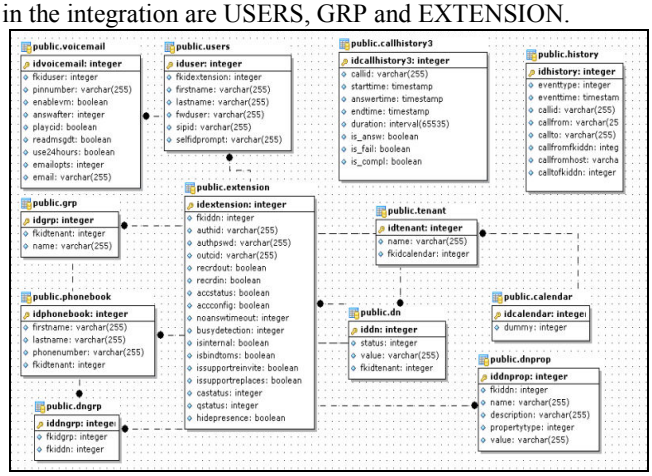

Fig. 3 Diagram of the database 3CX

1.2 Sources hierarchical

Remote access to data from the Active Directory via dedicated adapters involved in the location and connection. The LDAP data model is hierarchical. The data is structured into a tree. The root of the tree is the entry point to the directory. The data manipulation language used by this model requires specifying the path to the data by navigating the graph of the directory. The data are therefore not suited to be represented as a table. It is not easy to incorporate these data into a relational database standard.

2. Layer Mediator:

To proceed with the processing of queries in a mediation system we distinguish the following phases:

- Decomposition of the global query into sub queries local.
- Execution of requests under the various sources.
- Recovery of interim results, recomposition of the final result.

3. Module Decomposition of a user request

This module is responsible for decomposing a global query into local sub queries; it defines the virtual views that enable quick access to data [6]. Relational model for querying the source is via the SQL language is used to define views of the database.

The LDAP data model is hierarchical, the data manipulation language requires you to specify the path by browsing the directory of the graph, and there is no independence between programs that access data and internal data structure. One of the limitations of the directories for data retrieval, directory

services and management of resources traditionally propose a protocol for querying, this limits the query by non-specialists, so any change in the data structure affects programs. The proposed solution is to get our requests from a linked server (query engine), "LINKED SERVER"

Translator Module SQL Engine

Querying AD from SQL Server can be views and knuckles from a SQL Server (2000 or 2005) with other data sources or servers, in our case, we will use the connector "Active Directory Services 2.5".

- SQL script creation

```
sp_addlinkedserver 'MIpTel_ADSI', 'Active Directory Service Interfaces', 'ADSDSOObject', 'adsdatasource'
```

So we can run queries like:

▪ Lister des utilisateurs du domaine MIpTel.dz

```
"SELECT *
FROM OPENROWSET( 'AdsDsoObject' ,'User ID=sa; Password= ●●●●●●;ADSI','
SELECT SAMAccountName,givenName,sn,mail,telephoneNumber,company
FROM "" LDAP://MIPTEL/DC=miptel,DC=dz """)
WHERE ObjecClass="User"';
```

▪ Lister des Groupes du domaine MIpTel.dz

```
"SELECT *
FROM OPENROWSET( 'AdsDsoObject' ,'User ID=sa; Password= ●●●●●●;ADSI','
SELECT cn
FROM "" LDAP://MIPTEL/DC=miptel,DC=dz """)
WHERE ObjecClass="Group"';
```

The solution in conjunction with the Active Directory cannot go through an intermediary tool that stores data in an AD database (GAV approach) over the performance of the AD are slower than the motor relationship.

The request will be decomposed into sub queries

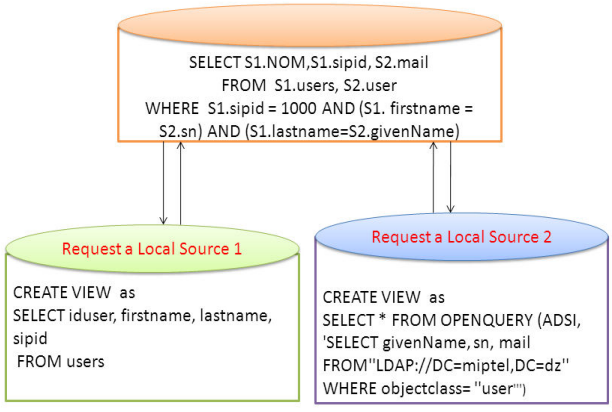

Fig. 4 Decomposition of the global query

4. Module reconstruction

This module builds the response of local requests sent by the mediator; the order of query execution is local at the same time the reconstruction is done gradually. The number assignment is SIP at the telephony server 3CX where a registered user of the latter is defined by its name, SIP number and an entry in the directory addition to the full name you will find the phone number, email, company and address. The user retrieves the SIP number after the integration of sources via a join at the end the final result is displayed in a table where it can add in contacts or call.

Main algorithm

```
BEGIN
1. Break down the query into sub queries
        For each query Qi (i from 1 to n)
          2. Location of the source data
          3. Rewrite the query overall local request
          4. Run the query in its local source
          5. Redial the response of the local query
        end for
6. Recomposition of the final response
        For each query response local
          7. make the join between the responses of local requests
          8. the result is stored in the Dataset final
        end for
END
```

IV. Evaluation

Data is stored on the database server 3CX (PostgreSQL) and the LDAP Active Directory running on a Pentium 4, 3 GHz with 3Gb of RAM in Windows server 2003 R2. The console consists of the SIP client and the mediator are deployed on a Pentium 4 1Ghz with 1Gb of RAM on Windows XP SP2 connected to data sources via a link 100Mb / s. For measurements, we used the class "DateTame", this class provides methods that provide real time, the name, the overhead and the user.

A Cost of a query

We want to show the cost of a request initiated from the SIP client "MIPTEL" by varying the number of tuples present in the directory and the database 3xc.

The time measured in milliseconds by the number of tuples results is shown for an integrated approach to type LAV.

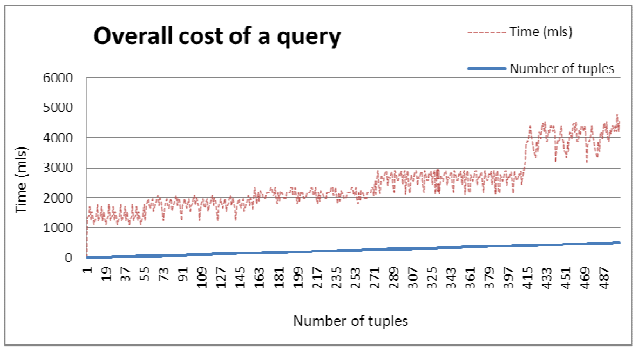

Fig. 5 Cost of a query

We note that the query execution time is almost minimal for the first few hundred tuples after the operation becomes more expensive.

B Time of each phase:

The cost of an execution model can be expressed in terms of execution time (observed time between the launch of the application until the results).

- Cost of communication: induced connection time between client and sources
- Cost of mediator-induced reformulation of the time, execution and query building.
- Cost of the adapter: induced time location and time to connect to data sources.

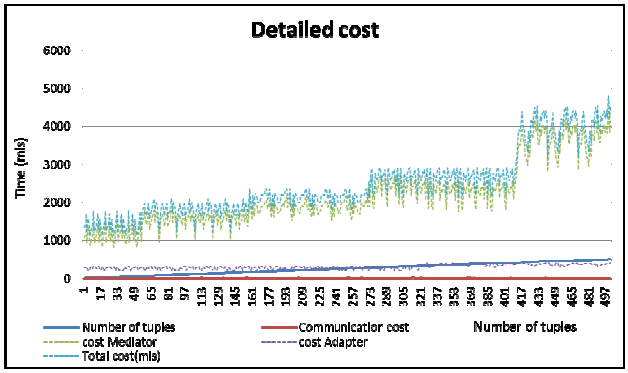

Fig. Time of each phase

The communication phase is almost negligible compared to the execution time of the request to the adapter and the execution time of the mediator. Phase of adaptation is less expensive than the mediator; it is this phase which takes more execution time by comparing it with the overall time consumed during execution.

C. Cost of reconstruction

To assess the cost of reconstruction, we measure time recomposition queries in the mediator phase

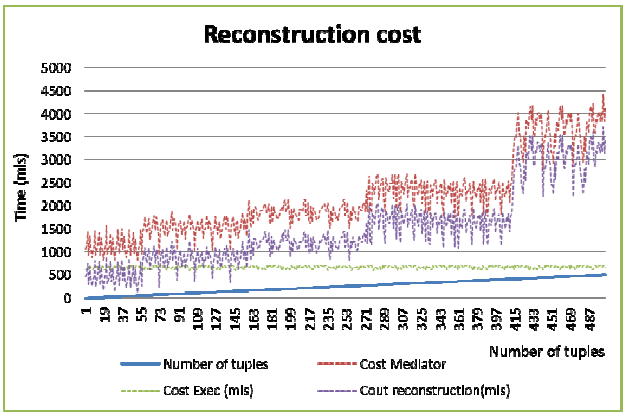

Fig. 7 Cost of reconstruction

The cost of query reformulation and translation is negligible compared to the total cost of the mediation.

The cost of reconstruction is very expensive especially when the tables are in two different structures.

D. Cost approach in GAV and LAV

We compare the cost in two distinct approaches, the approach taken as View Local LAV) and global approach (es Global View).

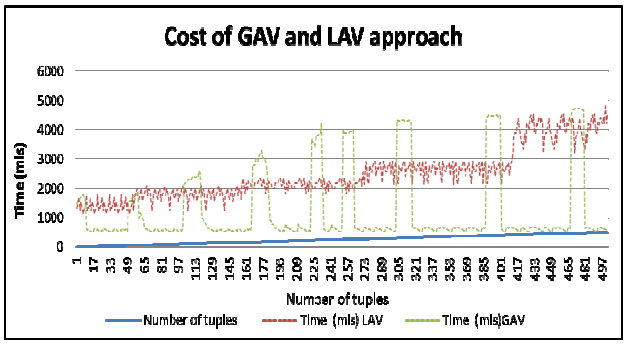

Fig. 8 Cost of GAV and LAV approach

Although the cost of a query in the global approach is less that in the LAV approach, the transformation of a query on the overall pattern matched the local schema is a simple operation performed by the manager of views. In the LAV approach, the query on the overall pattern should be rewritten according to the patterns of local sources [7]. A change on all local sources or causes a reconsideration of their plans of complete global schema which is very costly to the system especially with the increase of data.

The queries were performed to verify specific behaviors of the mediator and evaluate the overhead of our architecture mediation relational data and hierarchical system with a virtual approach TOIP (LAV).

V. Conclusion

Our work was to propose a mediation architecture allowing consumers to distribution transparency and heterogeneity. This integrating data structures and fundamentally different nature (relational, hierarchical) and allowing the decomposition of a query involving multiple sources of applications specific to these sources, then recompose to know the result.

The architecture proposed in our system TOIP is paid on a console incorporating the main services offered by a SIP client, such as call management, instant messaging, conference management ... etc ..., added to that a layer Ombudsman ensures the interaction / adapter between the information systems and hierarchical relationships.

This combination of technology systems and the systems TOIP mediation (mediators / adapters) showed a vision which appears today as an attractive solution in order to control the distribution and heterogeneity of data sources in business.

VI. Perspectives

A Extension

Many perspectives as theoretical and practical nature can be considered, we briefly be most interesting.

Our system can be expanded, it can support other data

models, our approach of integrating the system treats TOIP sources whose data are structured and organized (relational database) and semi-structured as a tree (LDAP Active Directory). The proposed mediation approach can expand the sources and XML Web since the LAV approach adopted it easy to add a data source: it does not affect the overall pattern.

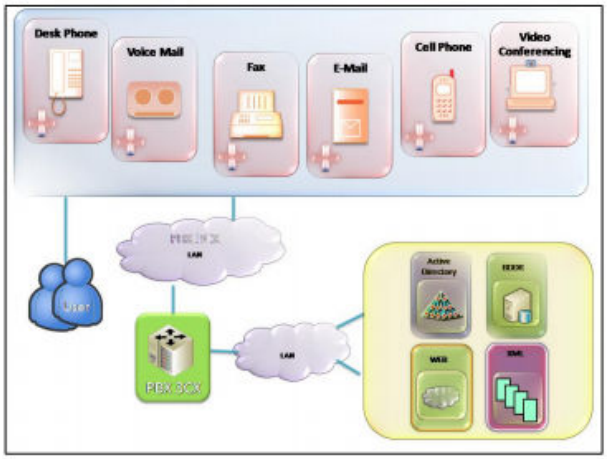

Fig.9 Extension of architecture

B PC to Mobile

It was in 2007 that VoIP has begun to colonize the mobile phones, Internet telephony will migrate from PC to mobile phone. The combination of wireless and voice over IP can provide the opportunity to free themselves from the tutelage of mobile operators historical prescribing the technical specifications of phones that connect to their networks. With the SIP standard, you can transfer a voice call over the Internet, SIP is an open standard, all mobile phones will have a SIP address and it will be possible to call VoIP software. The mobile version of the softphone MIPTEL is a simplified version designed for mobile devices, MIPTEL supports voice and other services: contacts, instant messaging, presence and call log,

Fig. 10 version mobile of softphone MIPTEL

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