(54) Title: DISTRIBUTED ENHANCED TELECOMMUNICATIONS SERVICES PLATFORM AND METHOD
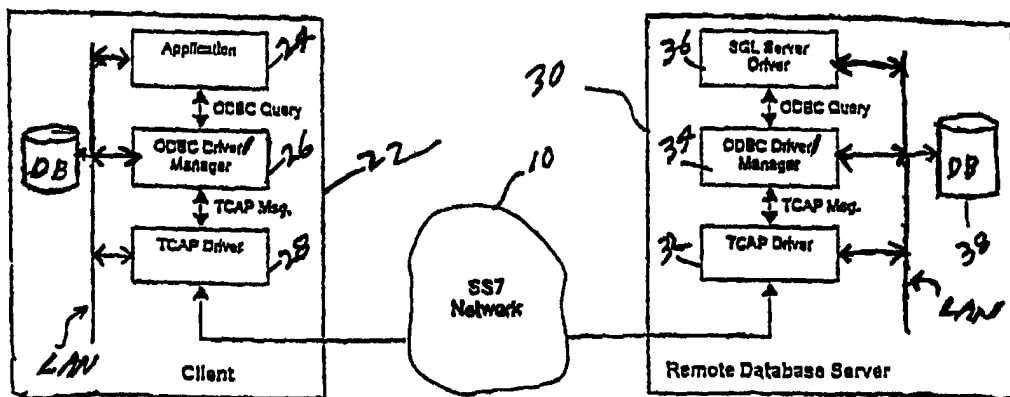
(57) Abstract

A system and method of communication between the various components of an enhanced services telecommunications system including the enhanced services platform, telephone switch and distributed database by way of protocols which are standard for the components but incompatible with each other. In one embodiment, the ODBC database protocol message is encapsulated into the TCAP formatted message of the SS7 system for communication between the enhanced services system server at the switch and the distributed database with which it operates. This permits communication between the distributed portions of a database system using a standard database format which is incompatible with the message format of the telephone system.

DISTRIBUTED ENHANCED TELECOMMUNICATIONS SERVICES

PLATFORM AND METHOD

BACKGROUND OF THE INVENTION

The present invention relates to communication between the components of a telephone network and more particularly to a system and method of communicating using standard but incompatible protocols.

Telephone systems are installed throughout the world. It is currently in vogue to add enhanced services platforms to such existing systems, and these enhanced service platforms require access to databases, generally distributed databases.

The communications between a database and its server are generally carried out in one of several database languages which may be incompatible with the protocol of the existing telephone system. So long as the communication between database and its server is limited to a local area network, the protocol of the database communication is generally not a problem. However, the distribution and sharing of these databases among the telephone switches requires that the database data be formatted in the protocol of the telephone system if the telephone system is to be used for communication between the servers and the remote database.

This presents a particular problem when the telephone switch is to be provided with an enhanced services platform such a prepaid telephone calling card system in which significant amounts of data must be communicated between the various and often widely distributed parts of the enhanced services system over the telephone system.

In many parts of the world, communication between spaced apart telephone switches and a database is accomplished over wide area network or WAN systems. To avoid the delays associated with the transmitting of large blocks of data through the telephone switches, frame relays are often used. However, many existing telephone systems desirous of enhanced services do not have an extensive frame relay system in place, and there is considerable expense associated with the installation of such a frame relay system.

Another prior art system known as the Signaling System 7 is also quite common. However, the protocols associated with such systems are generally incompatible with the formatting protocol associated with the transfer of data from the databases to the switch servers over the telephone lines.

Accordingly, it is an object of the present invention to provide a novel system and method for communicating the data required for the operation of an enhanced telephone service over an existing telephone system where the standard protocol for the management of databases and the transfer of data is incompatible with the standard format of the installed telephone system.

It is another object of the present invention to provide a novel system and method for sending database formatted information over preexisting telephone lines using the telephone system format for the communications.

It is yet another object of the present invention to provide a novel system and method of communicating between the various distributed parts of an enhanced services platform.

These and many other objects and advantages of the present invention will be readily apparent to one skilled in the art to which the invention pertains from a perusal of the claims, the appended drawings, and the following detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic drawing of a conventional SS7 system with multiple spaced telephone switches to which enhanced service platforms have been attached.

Figure 2 is a schematic drawing illustrating system data flow.

DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to Figure 1, a Signaling System 7 ("SS7") system is schematically illustrated as having the SS7 network 10 to which are connected a database 18 associated with running the SS7 system and a number of telephone switches 12, 14 and 16 such as the Harris Corporation 20/20 telephone switch. The telephone switch 12 may include an enhanced services platform 20 such as the Harris Corporation prepaid telephone system described in application Serial No. 60/048,437 filed June 2, 1997 ("HPP"), the disclosure of which is hereby incorporated herein by reference.

The HPP prepaid system 20 may include a local area network or LAN to which is connected a voice application server or VAS, a database DB, a database server DBS, and one or more other servers (not shown). The switch 14 may include all of the system elements of the HPP 20, but may not include the data

base DB shown in the HPP 20, as one or more distributed

databases may be shared by all of the HPPs in the system.

These databases may be located with the HPP 20 or otherwise

distributed throughout the SS7 system, and may be co-located

with the SS7 system database 18.

In the normal operation of the SS7 system, one of the

switches 12, 14 or 16 will need to communicate with a remote

database such as the database 18. The standard for such

communication in the SS7 system is the Message transfer Part

("MTP") into which is encapsulated into the Signaling

Connection and Control Part ("SCCP") used to establish

communication between the servers of at the various points of

the SS7 system.

Encapsulated within the SCCP is the Transaction

Capabilities Part or TCAP protocol, which formatting includes a

standard TCAP header, a TCAP operation code, and a "database

query" or message which may include either an "Invoke" or

question and a "Return Result" or response. The TCAP header

identifies the point in the SS7 system to which the message is

addressed, and the TCAP operation code identifies the specific

application server to which the remainder of the TCAP message,

i.e., the database query, is addressed.

In an enhanced services system having a distributed

database, the protocol used by the database server at any one

of the switches 12, 14 or 16 to communicate with the database

18 may be one of several standard database protocols such as

the Open Data Base Connectivity or ODBC, a protocol which is

incompatible with the protocol of the SS7 system. To address

this problem, the system of the present invention encapsulates

within the TCAP formatted message, the database queries

(Invokes and Return Results) communicated between the database

server at one point in the SS7 system to the database 18 at

another point in the SS7 system.

The TCAP formatted message includes either a global or

local operation code. One of the presently unused TCAP local

operation codes may be used to designate an ODBC application

server ("ODBC App.") at a particular point in the SS7 system.

The presence of the ODBC operation code in the TCAP message

will cause the ODBC Application running on the database server

at the database 18 point in the SS7 system to receive and

decapsulate the ODBC message therefrom so that the database may

respond in the appropriate manner.

By encapsulating the ODBC formatted message in the TCAP

formatted message, the incompatible ODBC formatted message

becomes transparent to the SS7 system and may be transmitted

between the database servers and the database over the trunks

of the SS7 system.

Where for example as shown in Figure 1, the HPP system 20

includes a database associated specifically with the server at

a telephone switch, the communication between the database

server and the database may be by local area network rather

than over the SS7 system. Because the database server and

database are on the same LAN, they may communicate with each

other in ODBC formatted messages without the necessity for

encapsulation in to a TCAP formatted message.

However, it is often desirable to communicate between the
database server at one point in the SS7 system and a database
at another point in the SS7 system. With reference to Figure
2, a client 22 at one point in a SS7 system may include an
application 24, an ODBC driver/manager 26 and a TCAP driver 28.
In operation, the application 24 initiates a database query in
ODBC format. This Invoke is applied to the ODBC driver/manager
26 where it is encapsulated into the TCAP format and applied to
the TCAP driver 28 for transmission to the SS7 system network
10.

When the TCAP message is received at a remote database
server 30, it is applied through the TCAP driver 32 to the ODBC
driver/manager 34 where the Invoke is converted into the ODBC
format and communicated to the SQL or database driver 36 which
controls the database 38. The process is reversed in
communicating the Return Results from the database to the
server. In this manner, the application 24 at the client 22
may communicate with the database 38 at the remote database
server 30 in the standard ODBC format using the standard, but
ODBC incompatible, TCAP format of the SS7 system network.

While preferred embodiments of the present invention have
been described, it is to be understood that the embodiments
described are illustrative only and the scope of the invention
is to be defined solely by the appended claims when accorded a
full range of equivalence, many variations and modifications
naturally occurring to those of skill in the art from a perusal
hereof.

WHAT IS CLAIMED IS:

1.   In a Signaling System 7 ("SS7") telephone system
including:

(i) a plurality of spaced telephony switches each of which

has an enhanced services platform including a voice

application server,

(ii) at least one database; and

(iii) telephone trunks interconnecting the plurality of

telephone switches by the transactional capabilities part

("TCAP") protocol of the SS7 system,

a method of communicating between the enhanced services

platforms and the databases using a database format

incompatible with the TCAP format comprising the steps of:

(a)   formatting a database message in open database

connectivity ("ODBC") protocol;

(b)   encapsulating the ODBC protocol formatted message in

the TCAP protocol message;

(c)   transmitting the TCAP message encapsulated ODBC

protocol message over the trunks of the SS7 system from one

point to another; and

(d)   decapsulating the ODBC protocol message.

2.   The method of Claim 1 wherein the step of

encapsulating the ODBC protocol message in the TCAP format

comprises the steps of:

(a) associating an available local operation code known to

the database server;

(b) formatting the ODBC format message into the TCAP

message format; and,

(c) using standard TCAP procedures to break apart messages longer than 272 octets.

3.   In a Signaling System 7 ("SS7") telephone system including:

(i)   a plurality of spaced apart telephony switches each of   which has an enhanced services platform including a voice

application server, and

(ii) telephone trunks capable of communication between the

plurality of telephone switches by the transactional

capabilities part ("TCAP") protocol,

the improvement comprising:

means for formatting a database message in open database connectivity ("ODBC") protocol;

means for encapsulating the ODBC protocol formatted message in the TCAP protocol;

means for transmitting the TCAP encapsulated ODBC protocol message over the SS7 trunks to a remote database; and

means for decapsulating the ODBC protocol at the database,

whereby ODBC formatted messages may be communicated from one of the spaced telephone switches to one or more of the databases in a TCAP message.

4.   The system of Claim 3 wherein at least one of the spaced apart telephone systems has a database associated therewith by way of a local area network.

5.   The system of Claim 3 wherein said means for encapsulating the ODBC format message in TCAP message format

comprises:

(a) means for allocating a local operation code known to the database server;

(b) means for formatting the ODBC formatted message into the TCAP message format; and,

(c) means for using standard TCAP procedures to break apart messages longer than 272 octets.

6.   In a system comprising a telephone switch, an network server and a multi-node enhanced services platform including a database, a method of supporting the multi-node enhanced services platform using standard telephone network protocols comprising the step of encapsulating a standard database protocol formatted message in a standard telephone network format message, the database protocol format being incompatible with the network protocol format, to effect the communication of database protocol formatted messages over the telephone network.

7.   In an enhanced services platform including a network server integrated with a telephony switch, said server having user interface administration tools, means for communicating open database connectivity ("ODBC") formatted non-circuit related data using the transactional capabilities part ("TCAP") protocol in a Signaling System 7 ("SS7") system.
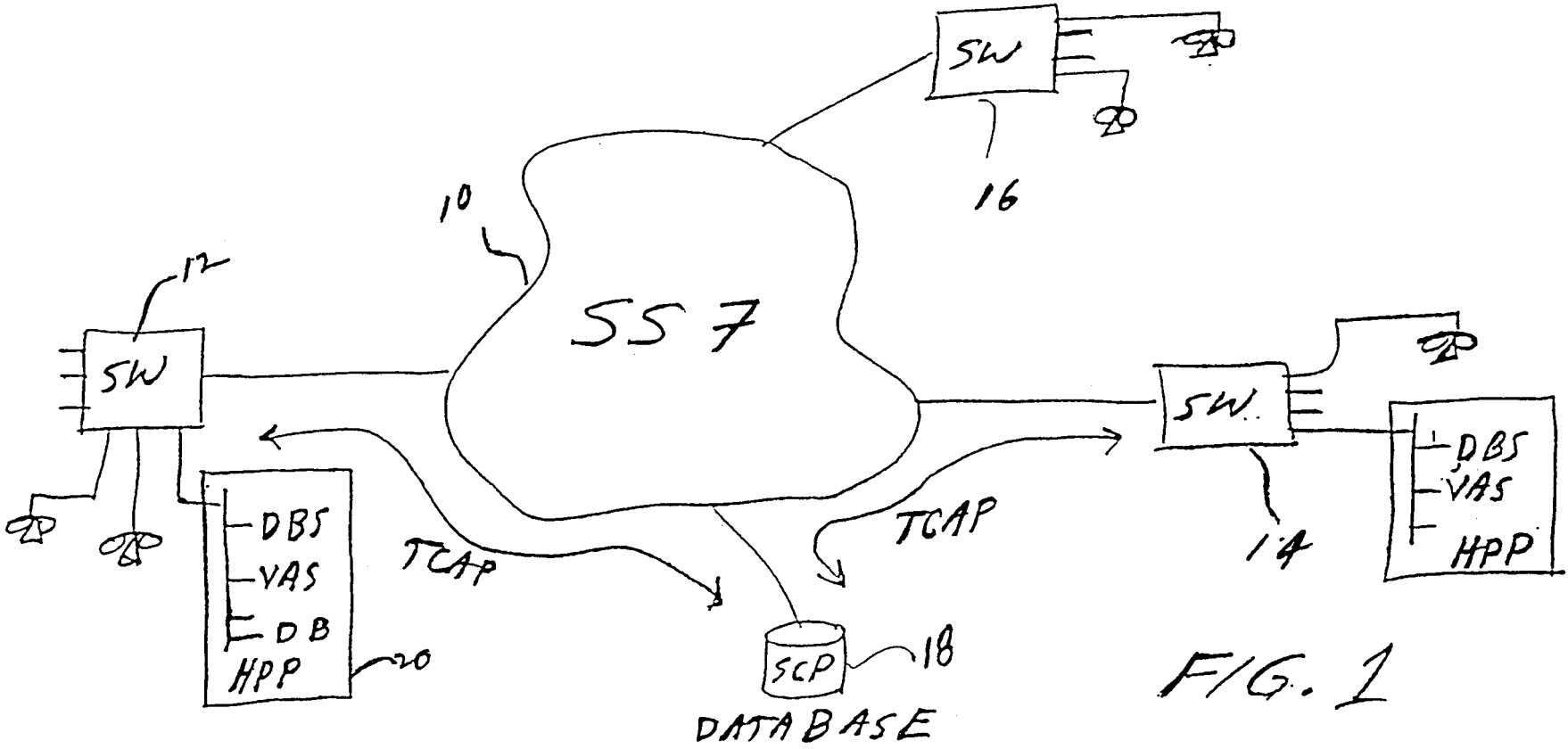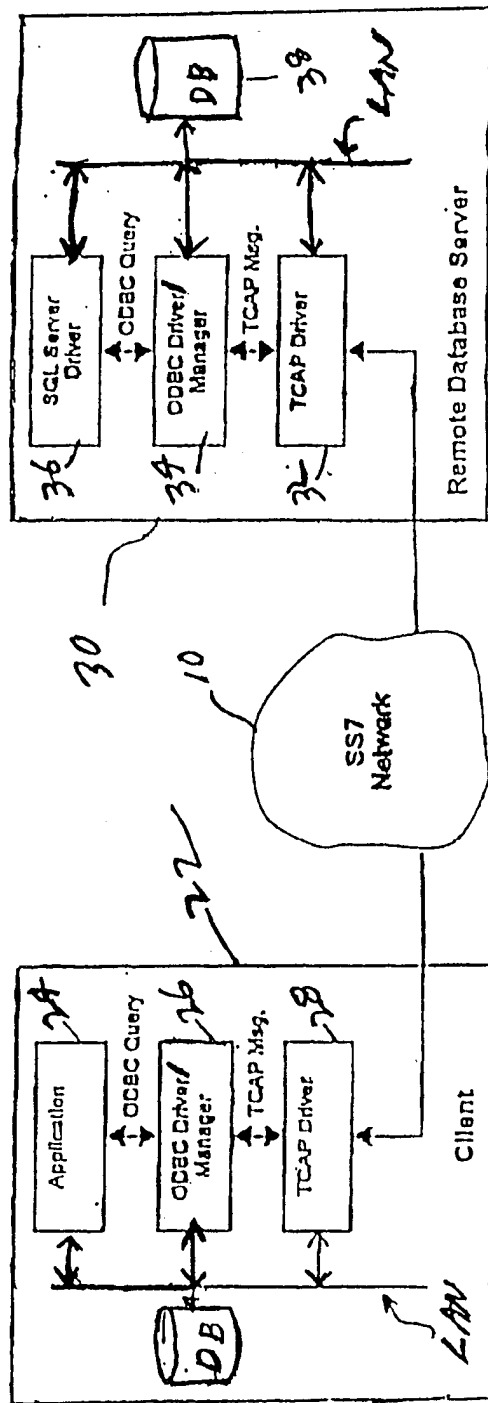
FIG. 1

FIG. 2

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04M 3/42, 7/00
US CL :370/401, 467; 379/207, 219, 230

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 370/385, 401, 426, 467, 496; 379/207, 219, 220, 229, 230

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US 5,706,286 A (REIMAN et al) 6 January 1998, Abstract and FIG 1.	1-7
Y,P	US 5,675,637 A (SZLAM et al) 7 October 1997, col 11, lines 16-49.	1-7

☐ Further documents are listed in the continuation of Box C.   ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance		
"E"	earlier document published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)		
		"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 AUGUST 1998	**13 OCT 1998**

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Form PCT/ISA/210 (second sheet)(July 1992)*