(54) Title: SELECTING IPX/IGX NODES IN A MULTI-DOMAIN ENVIRONMENT

(57) Abstract: A method is disclosed for connecting a customer representative to a customer switch within a telecommunications network having a plurality of switch domains, each switch domain including a plurality of switches each having a corresponding switch name. At least one of the switches is a gateway switch. The method includes receiving a switch name corresponding to a selected customer switch and displaying a listing of switches residing within a first one of the switch domains. A determination is then made on whether the received switch resides in a first switch domain. A list of gateway switches residing within the selected switch domain is also provided. And from this list a gateway switch is selected in accordance with its availability. A connection is thereafter made via the gateway switch to the received switch. If the received switch is determined not to be resident in the displayed switch listing, a further listing of switches of another switch domain is displayed. A determination is next made on whether the received switch resides within the now displayed switch domain. This process is repeated until a match is made or until it is determined that the received switch is not resident in any of the switch domains.

SELECTING IPX/IGX NODES IN A MULTI-DOMAIN ENVIRONMENT

Field of the Invention

This invention relates to information switching in a communications network and, in particular, to performing tests upon switches within such communications network.

Background of the Invention

Telecommunications networks include multiple links or trunks interconnected by nodes or switches. The interconnecting switches are typically high speed digital switches using known protocols. Digital switches used for this purpose include, for example, the well known internetwork packet exchange switches (IPX) and its wider bandwidth version IGX switches.

Communication using IPX/IGX switches is performed by way of routers over access links using switching protocols such as the conventional Frame-Relay protocol. Switches manufactured by the Stratacom Company are but one example of this type of high speed digital switch. Such IPX/IGX switches are connected with other IPX/IGX switches in conventional telecommunication networks. One example of such a network of interconnected switches is the Concert Frame Relay Service network.

In a modern telecommunication networks such as the Concert Framed Relay Service network, the IPX/IGX switches are divided into a relatively small number of switch domains. Each switch domain is provided with a number of gateway switches which must be used in order to gain access to the IPX/IGX switches within the switch domain. Thus, in order to access a selected IPX/IGX switch organized in this manner, one must have information with respect to the switch domain in which the selected switch resides, as well as information with respect to which switches residing within the domain are designated as the gateway switches of the domain.

When IPX/IGX switches fail, customers often call customer service representatives within one of the service organizations that provide a first line support for the

communications network. These service organizations include global product support

organizations or global virtual network organizations. The customer service representatives

in these organizations must attempt to immediately solve the reported problem. When they

fail, the customer problem is turned over to other types of support organizations. The

resolution of the customer problem is therefore delayed. This delay can undermine customer

satisfaction.

In order to deal with some of the problems reported by customers, it is sometimes

necessary to access an IPX/IGX switch associated with the customer reporting the problem.

Specific procedures must then be applied in order to troubleshoot the customer switch and

assist the customer.

However, prior to the instant invention, it is often difficult or impossible for a

customer service representative to know or determine the switch domain in which the

customer switch resides. Furthermore, even if the customer service representative does know

the domain whereat the customer switch resides, it nonetheless can be time consuming to

determine which of the many switches within the domain is being used as the gateway switch

for gaining access to the customer switch.

Therefore, it is desirable to provide a method that enables a user in a first line support

of a telecommunications network to establish a connection with the switch of a customer

having problem with his telephone service.

Furthermore, such a method should not require any information not customarily or

readily available in order to establish the connection.

Additionally, in order to facilitate the operation performed by the user, it is desirable

to assist a user to gain access to a gateway switch in the domain in which the customer switch

resides.

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SUMMARY OF THE INVENTION

A method is disclosed for connecting a user terminal to a customer switch within a telecommunications network that has a plurality of switch domains, each switch domain having a plurality of switch including customer switches and at least one gateway switch. The switches each have a switch name. The method includes obtaining a switch name corresponding to a received switch and displaying a listing of switches residing within a first switch domain. A switch domain is selected by determining whether the obtained switch resides within a first switch domain in accordance with the displayed switch listing and the switch name. From a provided list of gateway switches residing within the selected switch domain, a gateway switch is selected for establishing a connection t to the obtained switch. The selection of the gateway switch from a plurality of gateway switches is done in accordance with their availability. This can be achieved by first grouping the plurality of gateway switches into a group ordered in a configuration such as a loop and then using a predetermined loop order to select the switch. If the received switch is determined not to be within the displayed switch listing, a further listing of switches residing within a second switch domain is displayed. A further determination is then made on whether the received switch resides within the second switch domain in accordance with the further displayed listing and the obtained switch name.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a preferred embodiment of the node selection method of the present invention;

Fig. 2 is a computer screen showing a display of an exemplary IPX/IGX switch domain menu;

Figs 3A-E are representative of computer files containing exemplary listings of IPX/IGX switches organized according to the switch domain in which the IPX/IGX switches reside;

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Fig. 4 is a computer screen showing a video display of an exemplary IPX/IGX switch

domain menu; and

Fig. 5 is a computer screen showing commands that can be used in the node selection

method of Fig 1.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to Fig. 1, there is shown a first domain determination method of the

present invention. The method of the present invention is advantageously applied to a

telecommunications network having a plurality if IPX/IGX switches with the IPX/IGX

switches being divided into switch domains. A telecommunications network wherein the first

domain determination method can be advantageously applied is set forth for example in

"Method And Article of Manufacture For Communication To Telecommunications Switches,

Such As IPX Switches", U.S. Patent Application S.N. 08/914,537 filed on August 8, 1997,

the disclosure of which being incorporated by reference herein. The operations of the

inventive domain selection method can be performed by a processor having conventional

memory which is coupled to the switches of a telecommunications network.

In particular, the inventive domain determination method can be used by a user who

may be a customer service representative in an organization serving as a first line of support

for customers of the telecommunication network. By way of the inventive domain selection

method, the user could establish a virtual connection with the site of a customer who had

lodged a complaint about his telephone service, so that the customer could assist the service

representative in promptly resolving the complaint.

Referring now to Fig. 2, there is shown a IPX/IGX switch domain menu 10 of the

presents invention for use within a telecommunications network. IPX/IGX switch domain

menu 10 can be used by the customer service representative of the support organization to

locate a particular IPX/IGX switch in the telecommunications network for the purpose of

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establishing a virtual connection with a customer in response to a report of a problem by the customer.

When a problem is received from a customer, the customer service representative usually knows the name of the IPX/IGX switch of the customer. However, in order to perform certain troubleshooting procedures, the representative has to know which domain includes the selected switch. Thus, the customer service representative can use the inventive domain determination method to determine the correct domain based upon the knowledge of the customer switch as shown in step 2 of Fig. 1.

In the exemplar case wherein the switches of a telecommunications network are divided into five switch domains, a IPX/IGX switch domain menu 10 having an entry for each of the five switch domains is displayed. This permits the user of menu 10 to select the correct switch domain if he knows the domain wherein the selected switch resides. However, -usually the user does not have this knowledge.

Referring now to Figs. 3A-E, there are shown switch listing files 20-60. Each switch listing file 20-60 corresponds to a domain in a multi-domain telecommunications network. A listing of all switches residing in their corresponding domains is contained within each switch listing file 20-60. The information regarding which switches are in each domain is collected prior to execution of the inventive method.

For the exemplar case in hand, if the user does not know which of the five switch domains listed in IPX/IGX switch domain menu 10 includes the customer switch, the user would enter an N prompt on switch domain menu 10. When the N prompt is entered, a display of at least one switch listing file 20-60 is provided. In a preferred embodiment of the invention, at least two switch listing files 20-60 could be displayed simultaneously.

Thus, as shown in step 3 of Fig. 1, switch listing files 20, 30 are displayed in response to the user entering a prompt such as for example the N prompt. Switch listing file 20 includes a

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substantially complete listing of the names of the IPX/IGX switches resident in domain 1,

while switch listing file 30 includes a substantially complete listing of the names of the

IPX/IGX switches resident in domain 2. Since the user would normally know the name of

the selected customer switch it is possible for the user to review switch listing files 20, 30 to

determine whether the customer switch is resident within domain 1 or domain 2, per decision

step 4. The customer switches within each of the switch domains may be arranged in an

alphabetical order.

If the user does not find the customer switch in either domain 1 or domain 2, he

presses the Enter key. A display of further switch listing files ensues, as for example by the

display of switch listing files 40, 50, per step 5. As shown, switch listing file 40 includes a

substantially complete listing of the names of the IPX/IGX switches resident in domain 3,

while switch listing file 50 includes a substantially complete listing of the names of the

—IPX/IGX-switches resident in domain 4. Per step 6, the user can therefore review switch

listing files 40, 50 to determine whether the customer switch is resident within either domain

3 or domain 4.

If the user does not find the customer switch in the listings of domain 1 through

domain 4, he again presses the Enter key. The further use of the Enter key causes the display

of switch listing file 60 as shown in step 7. Switch listing file 60 includes a substantially

complete list of the names of the IPX/IGX switches resident in domain 5. The user can

therefore review switch listing file 60 to determine whether the customer switch is resident

within domain 5, per step 8.

If no match is found between the customer switch and any of the switches in the

exemplar five domains, the user is informed that no match exits per step 9. The user can then

select an appropriate option in command menu 80 to begin search for another switch, per step

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SUBSTITUTE SHEET (RULE 26)

Referring now to Fig 4, there is shown an exemplar IPX/IGX switch domain menu 70. IPX/IGX switch domain menu 70 can assist the user in establishing a virtual connection to the customer switch. A list of the five domains present within the telecommunication network is provided in IPX/IGX switch domain menu 70. When the user determines which of the five domains includes the customer switch as set forth above, he can use IPX/IGX switch domain menu 70 to select the correct domain a shown per step 12.

In the preferred embodiment each of the five domains can include five gateway switches for permitting access to the remaining switches of the domain. A list of the gateway switches of each of the five domains is maintained in order to facilitate access to the customer switch by the user. Thus, when the user selects a domain by means of IPX/IGX switch domain menu 70, a gateway switch within the selected domain can be automatically obtained for the user as shown in step 13.

Typically the gateway switches of a domain are coupled in a loop arrangement wherein they are accessed in a predetermined loop order until an available gateway switch is found. If none of the gateway switches is available after all have been tried, the inventive domain determination method will continue to attempt to access a gateway switch by circumnavigating around the loop until one of the gateway switches becomes available.

Referring now to Fig. 5, there is shown command menu 80 provided to the user via a video display. Command menu 80 is displayed if a match is found between the selected switch name and the switch names in a switch listing, such as for example switch listing file 20. Using command menu 80 the user can select a desired command and proceed to attempt to solve the customer problem. Thus, the user gains access to a gateway switch, as shown in step 14, and establishes a virtual connection to the customer switch, as shown in step 15.

In another embodiment, IPX/IGX switch domain menus 10, 70 are not required by the user to determine a domain and a gateway switch based upon a selected switch name provided by a customer. In this embodiment, the user can merely input the name of the

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selected user switch. The selected switch name is then compared by the processor of the network against the switch names within the switch listing file, for example switch listing file 20, without any display of switch listing 20 being necessary. If a match is found, the gateway switch is found.

In order to execute the command entered by the user from command menu 80, an attempt is made to connect to the first switch in the loop configured gateway switches of the first domain. If the first gateway switch of the loop is busy, access to the second gateway switch is attempted. When access is obtained using this method, the user is provided with a virtual terminal to the customer switch. When the virtual connection to the customer switch is established, the selected command is executed.

If no match is found between the selected switch name and the switch names in the switch listing file, the selected switch name is compared against the switch names within the next switch listing file, for example switch listing file 30, without any display of switch listing file 30 being necessary. If a match is found in the next switch listing file, a gateway switch is determined for the user and a virtual connection established. Otherwise the process of testing the text domain continues until a match is found or the user is informed that the selected switch name does not exist in memory, per step 8. The user can then attempt to establish the virtual connection by entering another switch name as shown in step 11.

If the user wants to view the nodes available in each of the domains while using the alternate embodiment, option N in the domain menu can be selected. Option N produces a display of the switch listing files, for example switch listing files 20-60. The correct domain can then be selected by the user by comparing the name of the user switch against the switches in the various domains as previously described.

The above description of the preferred embodiments is provided to enable a person skilled in the art to make and use the present invention. The various modifications to these embodiments should be readily apparent to those skilled in the art, and the generic principles

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defined herein can be applied to other embodiments without the use of the inventive faculty.

Thus, the present invention is not intended to be limited to the embodiments shown herein but

is to be accorded the widest scope consistent with the principles and novel features disclosed.

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CLAIMS

1. A method of determining a switch domain from among a plurality of switch domains in a telecommunications network, each of said switch domains comprising a plurality of customer switches and at least one gateway switch, said method comprising the steps of:

    (1)   obtaining a switch name corresponding to a selected customer switch;

    (2)   displaying a listing of switches residing within one switch domain;

    (3)   determining whether said selected customer switch resides within said one switch domain by comparing said displayed switch listing with said obtained switch name;

    (4)   displaying a listing of switches residing within another switch domain if said selected customer switch does not reside within said one switch domain; and

    (5)   repeating step(3) and step(4) until said selected customer switch is found to reside within a switch domain or until all available switch domains have been reviewed.

2. The method of claim 1 wherein said telecommunications network includes a plurality of gateway switches residing in at least one of said switch domains of said plurality of switch domains, further comprising the steps of:

    providing a list of gateway switches residing within said selected switch domain; and

    selecting a gateway switch from said list of gateway switches for establishing a connection to the selected customer switch by way of said selected gateway switch.

3. The method of claim 2, further comprising the step of:

    selecting a gateway switch from among said plurality of gateway switches in accordance with the respective availability of said gateway switches.

4. The method of claim 3, wherein said gateway switches of said plurality of gateway switches form a loop, said method further comprising the step of:

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selecting a gateway switch from said loop of switches in accordance with a

predetermined order for each of said gateway switches forming said loop.

5.   The method of claim 2, further comprising the steps of:

displaying a listing of said switch domains;

indicating the selected switch domain within said listing of switch domains; and

providing a listing of gateway switches in the switch domain selected in said

indicating step.

6.   The method of claim 1, further comprising the step of:

displaying said listing of switches in response to a prompt by a user indicating that the

switch domain of said obtained switch name is not known.

7.   The method of claim 1, further comprising the steps of:

displaying the respective listings of switches residing within each of a plurality of

switch domains; and

determining whether said selected customer switch resides within a switch domain of

one of said plurality of switch domains.

8.   The method of claim 4, wherein said switches comprise IPX/IGX switches.

9.   In a telecommunications network having a plurality of switch domains, a method of

determining the switch domain wherein a customer switch is located and the

connection of said customer switch within said switch domain, comprising the steps

of:

obtaining a switch name corresponding to a selected customer switch;

comparing said obtained switch name with the names of the switches located in said

plurality of switch domains;

selecting a switch domain from said plurality of switch domains that contains said

selected customer switch; and

selecting a gateway switch from a plurality of gateway switches within said selected

switch domain to which said selected customer switch is connected.

10.   The method of claim 9, further comprising the step of:

providing a listing of gateway switches residing within said selected switch domain.

11.   The method of claim 9, wherein said plurality of gateway switches form a loop of

switches, further comprising the step of:

selecting a gateway switch from said loop of switches in accordance with a

predetermined ordering for said gateway switches forming said loop.

12.   The method of claim 10, further comprising the steps of:

displaying a listing of said plurality of switch domains;

indicating said selected switch domain within said listing of switch domains; and

providing said listing of gateway switches within said selected switch domain.

13.   The method of claim 9, wherein upon determining that said selected customer switch

is not included within one switch domain of said plurality of switch domains, further

comprising the steps of:

comprising the obtained switch name with the switch names of another switch

domain; and

determining whether said selected customer switch resides in said other switch

domain by comparing said obtained switch name with the names of switches in said

one switch domain.

14.   The method of claim 9, further comprising the steps of:

displaying respective listings of switches residing within said plurality of

corresponding switch domains; and

determining whether said selected customer switch resides within a switch domain of

said plurality of switch domains per listing in one of said respective listingf os aid

obtained switch name.

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15.   The method of claim 9, further comprising the step of:

connecting said selected customer switch to a customer service representative.

16.   In a telecommunications network having at least one processor and a plurality of switch domains, a system for determining a switch domain in which a customer switch is located, comprising:

a plurality of switches residing within each of said switch domains, said switches including customer switches and at least one gateway switch;

means for enabling a user to obtain customer switch name that corresponds to a selected customer switch;

means for displaying a listing of switches residing within one of said switch domains; and

means for determining whether said selected customer switch resides within said one switch domain by comparing the names of the switches on said displayed listing with said customer switch name.

17.   System of claim 16, further comprising:

means for connecting said user to said selected customer switch if it is determined that said customer switch resides within said one switch domain.

18.   System of claim 16, wherein said displaying means further displays a listing of switches residing within another of said switch domains if it is determined that said selected customer switch does not reside within said one switch domain; and

Wherein said determining means further determines if said selected switch resides. Within said other switch domain by comparing the switch listing of said other switch domain with said customer switch name.

19.   System of claim 16, wherein said switches comprise IPX/IGX switches.

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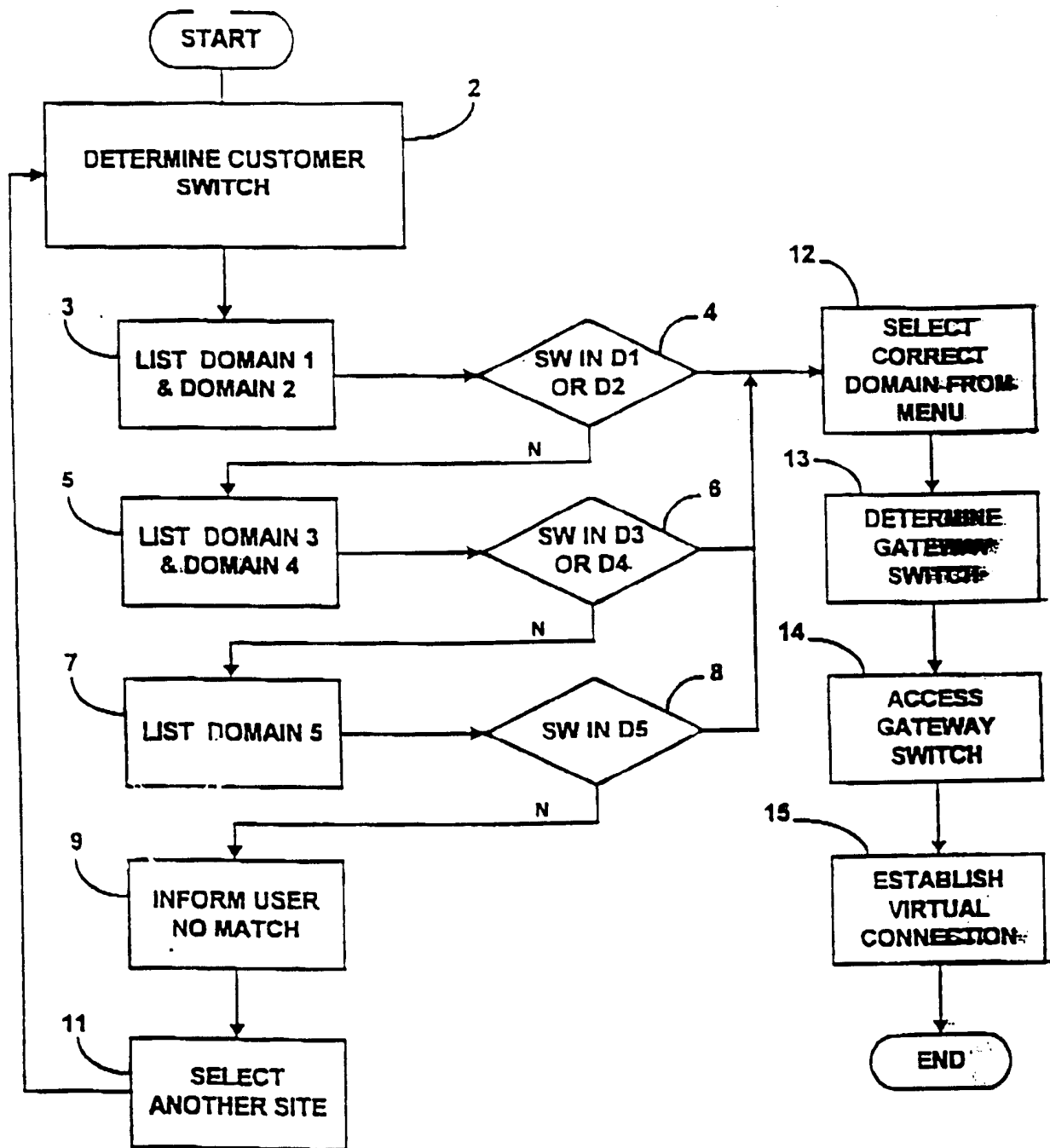
FIG. 1

```
    I Q X   D O M A I N   M E N U

           Version 7.b

        Please Select Domain

    1.  Domain1
    2.  Domain2
    3.  Domain3
    4.  Domain4
    5.  Domain5
    N.  Display Nodes Within Each Domain

    M C I   P A T E N T   P E N D I N G
```

PLEASE MAKE A NUMBER SELECTION or
TYPE [N] TO DISPLAY NODES WITHIN EACH DOMAIN:

FIG. 2

DOMAIN1 NODES

```
ASTA1   ASTA2   ASTA3   ATL51   BOG01   CAR01   CHTA1   CHTA2   CRY01   CRY02
DNBA1   DNGA2   DNBA3   DNGB1   DNBB2   DNLJA1  DOHA1   DOHA2   DOHA3   DOHGD1
DOHGN101        DOHB1   DOHB2   HLBA1   HLBA2   HLBA3   HLBGD1  HLBGN101
HLBGN102        HSJA1   HSJA2   HSJA3   HSJB1   HSJB2   IRVA1   MEX02   POBA1
PORA1   PORA2   POTGD1  POTGD102        POTGN101        POTGN102        POTN1
PYMA1   PYMA2   PYMA3   PYMB1   PYMB2   SACGD1  SACGN101        SCMA1   SCMA2
SCMA3   SCMB1   SCMB2   SMJ01   TOR02   TORG03
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FIG. 3A

DOMAIN2 NODES

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AMSG07  AMSG08  AMSG09  AMSG10  AMSG11  AMSG12  AMSG13  AMSGD202
AMSGN201 AMSGN202 BAYD282 BRUG04 BRUG05 BRUG06        BRUGN201 COPG03
CORGN201 DUB02   DUBG03  GENG02  HELG02  JBG01   JBG02   JBGG03
KEYD202 KEYGN201 LIS01   LISG02  LUX01   LYOG01  MAD04   MADG05
MADG06  MIL03   MILG05  MILG06  MILG07  OSLB03  PARG08  PARG09
PARGD202 ROM201  ROTG02  ROTG03  ROTG04  STKG04  STKG05  STKG06
STKGN201 TELG02  ZURG03  ZURG04
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PRESS ENTER TO CONTINUE...

FIG. 3B

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DOMAIN3 NODES

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ADL01	AUK01	AUKG02	BLRG01	BNE01	BOMG01	DDIG01	DOHG302
DOHGN301	FUK01	HIR01	HKGG04	HKGG05	HKGG06	HKGG07	HKGG308
JAK01	KLPG02	HELG01	HELG04	MNL01	MNLG02	NAG01	OSAG01
OSAG02	PER01	SACG302	SACGN301	SAP01	SEN01	SNG01	SNG02
SNG03	SNGG04	SNGG05	SNGG06	SOL01	SOL02	SYD01	SYD02
SYD03	SYD04	SYDG05	SYDG06	SYDG07	SYDG08	SYDG09	TAI01
TAI02	TOK01	TOK02	TOK03	TOK04	TOK05	TOKG06	TOKG07
TOKG08	TOKG09	HELG01					

FIG. 3C

DOMAIN4 NODES

50

ELT02	KEYD4	BRMGC2	LUT02	ELT01	CORGN401	KEYD402	NPMG02
BEL01	PTH01	COL04	COL03	KEY01	HANG04	KEYG04	SLOG05
BRM02	EDI01	CHE01	SLOG8B	SLOGC2	GLO01	HAN02	HAN01
GLOG03	KEYG05	GLAG02	BRMG04	MAI01	HANGC2	COL02	KEYGN402
KEYGN401	PTHG03	NOTG02	BRMGC1	LUTG04	BRN03	SLOGC1	BAY01
LUT03	LEBG03	HAN03	BAYD403	KEYGC2	COL01	CORGN403	ELTG04
CORGN402	EDI02	LEE01	SLOG04	SLO01	HANG01	CHE02	NPNG01
KEYGN403	KEYGC1	ABN01					

PRESS ENTER TO CONTINUE...

FIG. 3D

DOMAIN5 NODES

60

FRKGG602	KOL01	FRK02	DUSG05	FRKGN501	HANG01	HUNGN502	LEIG02
FRKG12	FRKGN502	FRK01	HUNG10	BERG03	HANG02	FRKG07	HUNGN501
DUSG07	BUD01	STU01	NUR003	FRKG08	FRKG13	BERG02	FRKG09
LEI01	HANG06	FRKG10	STUG03	YIEG03	FRKG11	STUG04	ATHG01
FRKG14	BER01	HUNG05	HUNG11	HUN01	HUNG08	PRA01	HAN01
DUSG2	MOGG01	HUNG08	STUG05	AMSG5	DUSG1	DUSG04	HANG07
BUCG01	NUR01	DUSG09	HUNG07	HANG03	HUNG09	HANG04	DUSG06
HANG05	NURG02	DUSG08					

PRESS ENTER TO CONTINUE...

FIG. 3E

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 _____
|                                       |
|      I G X   D O M A I N   M E N U     |
|                                       |
|             Version 7.b               |
|                                       |
|          Please Select Domain         |
|                                       |
| 1. Domain1                            |
| 2. Domain2                            |
| 3. Domain3                            |
| 4. Domain4                            |
| 5. Domain5                            |
| N. Display Nodes Within Each Domain   |
|                                       |
|  M C I   P A T E N T·  P E N D I N G  |
|_____|
```

PLEASE MAKE A NUMBER SELECTION or
TYPE (N) TO DISPLAY NODES WITHIN EACH DOMAIN:

FIG. 4

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 _____
|                                       |
| I P X / I G X   C O M M A N D  M E N U |
|                                       |
|             Version 9.a               |
|                                       |
| 1. Display IPX/IGX Information         |
| 2. Display Frame·Relay Port            |
| 3. Display IPX Log                     |
| 4. Display Port Status                 |
| 5. Display Break Out Box               |
| 6  Display Channel Config              |
| 7. Display Channel Stats               |
| 8. Display Connection                  |
| 9. Connect To Another IPX/IGX Site     |
| M. Manual Domain Site Selection Menu   |
| 0. Exit Program                        |
|                                       |
|  M C I   P A T E N T   P E N D I N G  |
|_____|
```

PLEASE MAKE A SELECTION:

FIG. 5

INTERNATIONAL SEARCH REPORT

	International application No. PCT/US00/24035

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04L 12/56

US CL :370/401

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. : 370/389, 400, 401

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

NONE

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

EAST

search terms: packet switch, domain, gateway

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,742,602 A (BENNETT) 21 April 1998, col. 2, line 25-col. 3, line 65.	1-19
A	US 5,825,772 A (DOBBINS et al) 20 October 1998, col. 8, line 4-col. 12, line 33.	1-19
A	US 5,920, 699 A (BARE) 06 July 1999, col. 19, line 35-col. 24, line 42.	1-19
A	US 5,933,412 A (CHOUDHURY et al) 03 August 1999, col. 6, line 21-col. 7, line 62.	1-19

☐ 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
13 OCTOBER 2000	21 DEC 2000

Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer SOON-DONG HYUN
Facsimile No. (703) 305-3230	Telephone No. (703) 308-0000

Form PCT/ISA/210 (second sheet) (July 1998)★