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PREPARATORY PROJECT OF DISTRIBUTION OF LOAD OF THE ROUTERS IN AN INTRANET BASED ON TECHNOLOGY GLBP
(Case of General of Carieres and the Mines GECAMINES)

Kalela S. Mwepu[1], Kabwela H.Kalonji[2], Madiondo H. Kabamba[3], Leya N. Mwenge[4],

[1]Higher Institut Applied Technics of Lubumbashi, Industrial Computing department, Democratic Republic of Congo
[2]Higher Institut Applied Technics of Lubumbashi, Industrial Computing department, Democratic Republic of Congo
[3]Higher Institut Applied Technics of Lubumbashi, Industrial Computing department, Democratic Republic of Congo
[4]Higher Institut Applied Technics of Lubumbashi, Electromechanic department, Democratic Republic of Congo
Corresponding Author Email Id: samkalela@gmail.com

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ABSTRACT
The router being equipment network allowing the interconnection of various networks plays of office the role of the gateway (point entrance and of output) of the infrastructure network. Being given that this last concentrates all Traffic towards the external network this last requires or must have good a perfomance material (memory size, resistances to the breakdowns, etc...) and logic (protocol to configure to ensure the availability and to avoid the congestion of the **gateway**) [1].

In this work, there was some discussion about checking the performances and the quality of services which the data-processing network of Gécamines offers by using the two routers and the two providers of access to Internet (FAI) which is: Intersys and Microrom whose commutation between the two is carried out using protocol VRRP [2].

To arrive there, we started:

- By modelling existing architecture network of Gécamines by presenting its wide area network (WAN) while bringing out the gateway and by presenting its principle of operation based on the protocol VRRP which presents an imperfection with regard to the balancing of load.

- Then using simulator GNS3 we proposed and configured an architecture wide area network (WAN) of the company all while bringing out there the gateway which will be this time Ci made up of three routers who will jointly set up a group GLBP which will have like objective the balancing of load.

We obtained the following results:

- In the case of two routers, we noted that when one of the routers becomes nonoperational, all the hosts connected above will lose their connectivities.

- In the case of three routers, we noted that if one of the routers is nonoperational, the hosts connected above will be dealt with by one of two routers remaining according to the rule of distribution of load steady by protocol GLBP.

After analysis and interpretation of the results obtained, we noted that the quality of service that the gateway of Gécamines made up of two routers offers is not good point of considering availability of the services and thus creates the congestion in the network when one of routers breaks down.

Have regard with what precedes, we thus suggest with the Gécamines company using three routers on the level of his **gateway** all while configuring protocol GLBP there, which is synonymous with three Provider of Access to Internet (FAI) so:

- To improve the availability of the services;
- To balance the load from the data flow point of view (Traffic);
- And finally, to increase the performances of the data-processing infrastructure.

GENERAL INTRODUCTION

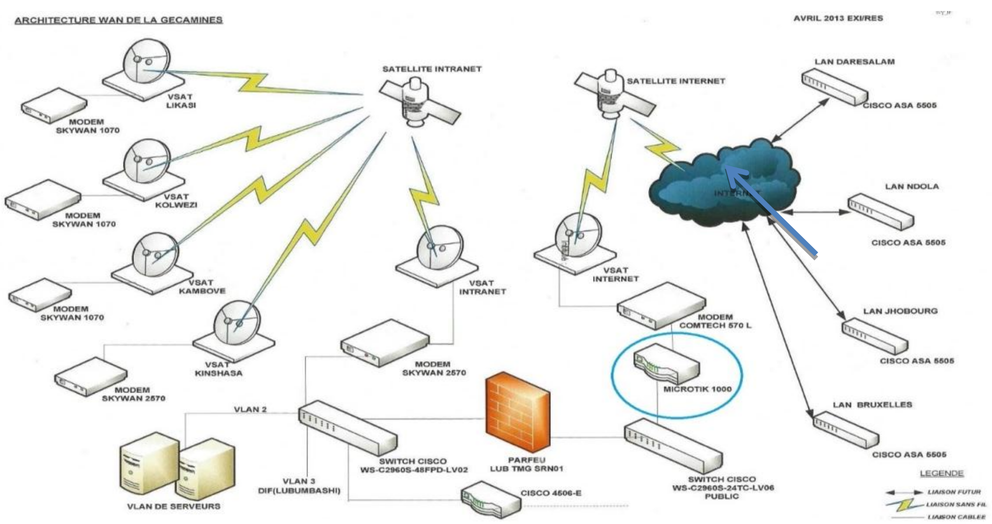
With the projection of data processing, the Internet noblement facilitated various activities of the life because nowadays almost all is carried out by its skew. Considering the facility which the Internet offers, several services are employed within a company constituting of the loads to the **gateway** of output from where the deceleration of connection Internet. In this case the loads must have set out again in order to guarantee a good availability of the services. It is in this meaning that in this work I make a point of speaking ***about the burden-sharing of the routers in an Intranet based on technology GLBP*** (Gateway Load Balancing Protocol).

Being conscious of the tasks of an administrator network in a company, we chose this subject which imports us as a researcher to accomodate certain knowledge of administration network. This subject reveals our concern to propose a burden-sharing between the routers in Gécamines for the high availability of the services what enables us to look further into my knowledge on technology GLBP.

OBSERVATION

Like let us know we it, the correct operation of the companies requires a strict availability of access to the Internet and that in a rigorous strategy of stability. It is the reverse of what we could note in Gécamines where there is a cut of the services when one of the equipment of interconnection breaks down and a slowness from connection Internet when good numbers of users are connected or requested a connection. For that, because of the certain principal objectives of service of security in Gécamines: the high availability of connection Internet, the persistence of the equipment network, Certains mechanisms of maintenance must installation to ensure the user's needs.

Network architecture WAN of Gécamines



Such is the **gateway** of output of Gécamines. This level, there are two Microtic routers is two providers of access to Internet (FAI) playing the role of routing of the traffics. Microcom with a band-width of 3Mb and Intersys 10Mb in dedicated tape. The two routers mitigate nonthe availability of service by facilitating the redundancy when one of the two routers is inaccessible. In spite of that there is always slowness of connection Internet when the good number of users reach the entrepreneur**i**al resources to discharge their tasks.

Structure physical of the gateway of Gécamines

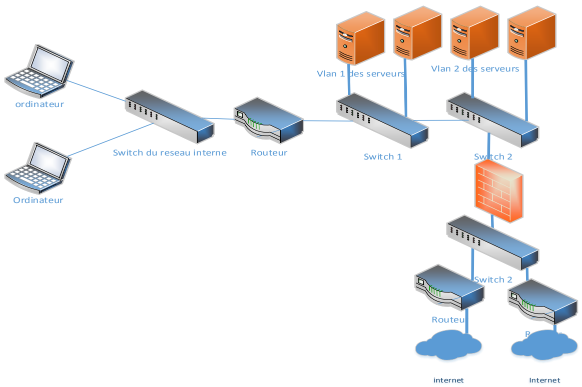


Figure 2: Structure physical of the **gateway** of Gécamines.

As architecture Ci-high shows it, the **gateway** consists of two Microtik routers whose to guarantee the continuity of service at the time of a failure of the one of these two routers, standard protocol VRRP (Virtual router Redundancy Protocol) is used. What does not make it possible to set out again the load in order to avoid the overload of traffic which entrainerait the congestion in the network. This study of the **gateway** of output of Gécamines caused our concern which consists in guaranteeing an excellent continuity of the services while bringing a high availability of this last from where speed of processing of service.

METHODS AND MATERIAL

1. METHODS

To lead to good port our search, we used the various methods which are:

- The method signal down network design which is an approach of analysis and hierarchical design of the corporate networks indicates the various stages and levels to respect to conceive the networks which meet the needs and with the technical objectives of the customer by beginning higher level of the model of reference OSI to low the level of a concept was useful to me for undertaking my search well and leading to the result [3].

- SADT (System Analysis and Technic Design) is a method of functional analysis and project management which describes the system that aims at the project, its tasks and its interactions [4]. It appeared significant to me for the analysis of protocol GLBP.

1. MATERIAL

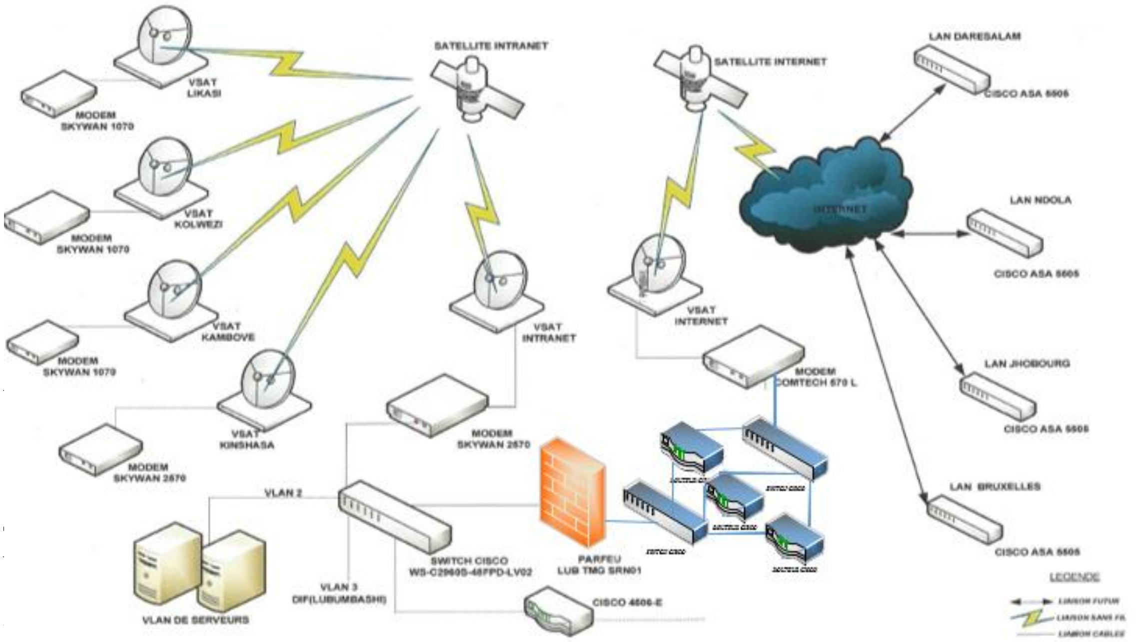
To manage to concretize result of this work, we will use the application GNS3 which is a powerful software of simulation of the networks of firm Cisco. This software will enable us to carry out standard architecture to implement, carry out the various tests or tests and to present finally the captures of screens making it possible to simulate the operation of the solution suggested [5].

REULTAT
NEW IV.1.LA STRUCTURES OF THE GATEWAY
IV.1.1 the need for general for the careers and the mines

Gécamines being a company congolaise whose its principal reason is to examine a ground in order to discover mineral layers there, the marketing of the mineral substances in a rough state or after processing is really fundamental.

With the mission which the data-processing department of Gécamines is guaranteeing for the marketing of the mineral substances, ***the need for the high availability of access to the Internet is powerful*** because the company lays out the external people receiving benefits and partners who must follow the evolution of this one. Therefore in-house, connection Internet must be permanent to inspire the personnel of divisions with an aim of making it achieve the goals of the company.

IV.1.2. the architecture of the new solution



Because of extended from architecture WAN (Wide Area Network) of Gécamines, we were constrained to present the simulation of the new solution corresponding to architecture below:

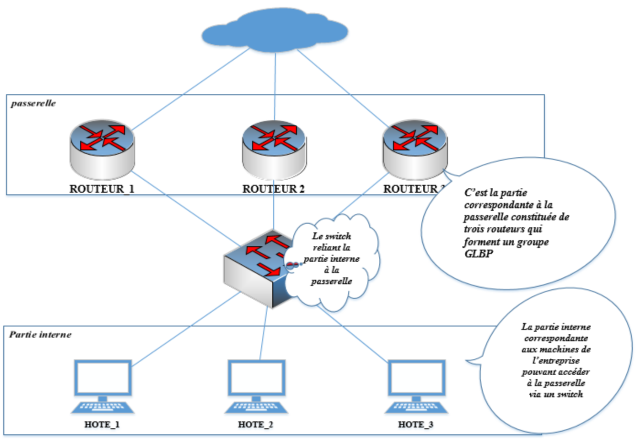


Figure 4: Physical representation of architecture to be simulated.

Plan of addressing of architecture to be simulated

The goal of the architecture to simulate is to show how the task of routing of the traffics set out again between the routers. It includes/understands a group GLBP made up of three routers for the distribution of load. The part interns made up of three hosts makes it possible to test the process of the distribution of load according to the method adopted for this purpose. Each host must be affected to a router by having MAC a virtual address of the router used to reach the external part [7]. For that the plan of addressing arises as follows:

Group 1 GLBP

Table 1: The plan of addressing of group GLBP

INTERNAL PART		EXTERNAL PART	
IP Address of the network interns	192.168.1.0/24	Adresse IP de l'extérieur	10.0.0.0/8
Host_1: - IP Address - **Gateway**	192.168.1.1/24 192.168.1.254	External Part interfaces fa0/0	10.0.0.1
Host_2: - IP Address - **Gateway**	192.168.1.2/24 192.168.1.254	External Part interfaces s0/1	1.0.0.5/8
Host_3: - IP Address - **Gateway**	192.168.1.3/24 192.168.1.254	External Part interfaces s0/2	2.0.0.6/8
Router_1: - IP Address	192.168.1.4/24	External Part interfaces s0/3	3.0.0.7/8
Router _2: - IP Address	192.168.1.5/24	External Interface of R1	1.0.0.4/8
Router _3: - IP Address	192.168.1.6/24	External Interface of R2	2.0.0.5/8
Address group GLBP	192.168.1.254	External Interface of R3	3.0.0.6/8

Emulation of architecture under GNS3

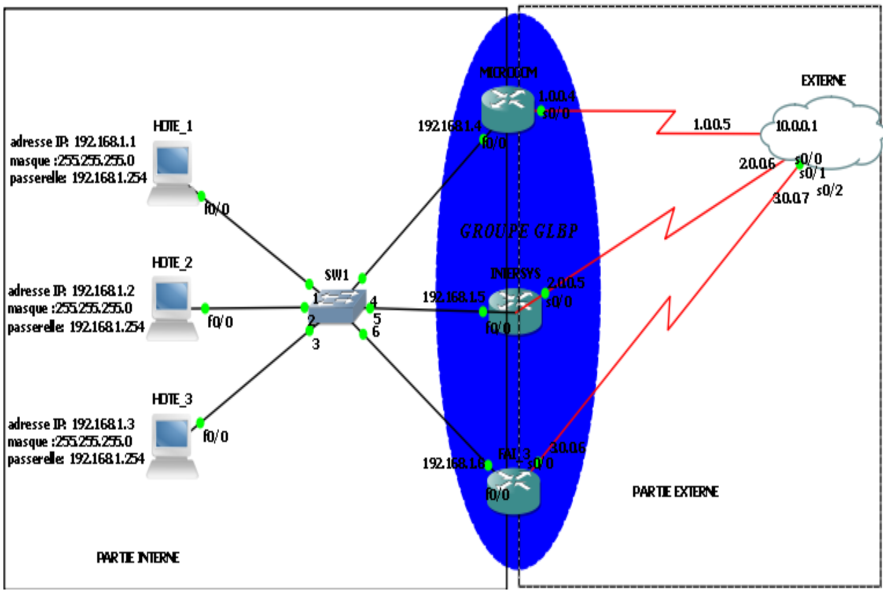


Figure 5: Representation architecture to simulate it under GNS3.

THE INTERFACES MACHINE OF THE EMULATION

In this part, the interfaces man machine are presented to describe the procedures of configuration of protocol GLBP. The method configured in this work is Round-Robin for the distribution of load [8]. While always referring in the plans of addressing presented at the paragraph precede, various stages are respected for good comprehension:

- Basic configuration: attribution of IP addresses to the interfaces of the router;
- Configuration of protocol GLBP to the routers;
- Configuration of the hosts;
- Test configuration;
- Configuration of track.

IV.2.1 basic Configuration

- **Attribution of IP addresses to the routers**

  - **Router 1 (router 1 in this work is named the name of the provider of access to Internet MICROCOM)**

```
MICROCOM#
MICROCOM#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
MICROCOM(config)#int fa0/0
MICROCOM(config-if)#ip address 192.168.1.4 255.255.255.0
MICROCOM(config-if)#no shut
MICROCOM(config-if)#int s0/0
MICROCOM(config-if)#ip address 1.0.0.4 255.0.0.0
MICROCOM(config-if)#exit
MICROCOM(config)#router os 1
MICROCOM(config-router)#network 0.0.0.0 255.255.255.255 area 0
MICROCOM(config-router)#
```

Figure 6: Attribution of IP address to Router 1

The figure above shows how one allotted IP addresses to the first router whom one names MICROCOM. Address 192.168.1.4 is given to the interface interns FastEthernet 0/0 and 1.0.0.4 with the external interface series 0/0 of the router.

  - **Router 2 (router 2 in this work is named the name of the provider of access *to Internet INTERSYS)***

```
INTERSYS#
INTERSYS#confi t
Enter configuration commands, one per line.  End with CNTL/Z.
INTERSYS(config)#int fa0/0
INTERSYS(config-if)#ip address 192.168.1.5 255.255.255.0
INTERSYS(config-if)#no shut
INTERSYS(config-if)#int s0/0
INTERSYS(config-if)#ip address 2.0.0.5 255.0.0.0
INTERSYS(config-if)#no shut
INTERSYS(config-if)#exit
INTERSYS(config)#router os 1
INTERSYS(config-router)#network 0.0.0.0 255.255.255.255 area 0
INTERSYS(config-router)#
```

The figure above shows the second router is allotted an IP address is 192.168.1.5 and its mask 255.255.255.0 with the interface FastEthernet 0/0 and 2.0.0.5 with the interface série0/0. For the checking of the configuration of router 2, with the command ***Show running-config,*** there is the certainty if the configuration occurred well by the display from the address corresponding to the configured interface.

- **Router 3 (router 3 in this work is named FAI_3)**

```
FAI_3#
FAI_3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
FAI_3(config)#int fa0/0
FAI_3(config-if)#ip address 192.168.1.6 255.255.255.0
FAI_3(config-if)#no shut
FAI_3(config-if)#int s0/0
FAI_3(config-if)#ip address 3.0.0.06 255.0.0.0
FAI_3(config-if)#no shut
FAI_3(config-if)#exit
FAI_3(config)#router os 1
FAI_3(config-router)#network 0.0.0.0 255.255.255.255 area 0
FAI_3(config-router)#
```

Figure 8: Attribution of IP addresses to router 3

The third router is that which is proposed to be added for a high availability of the services to Gécamines. After the attribution of IP address, just like the routers previously configured the command ***show running-***

config their poster configuration carried out with the interfaces! address 192.168.1.6 is given to the interface Fastethernet 0/0 and 3.0.0.6 with the interface series 0/0.

- **Configuration of the external part**

The external part in connection with this work represents the Internet where the hosts must reach it, in this case the interface below shows its configuration.

```
EXTERIEUR#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
EXTERIEUR(config)#int s0/0
EXTERIEUR(config-if)#ip address 1.0.0.5 255.0.0.0
EXTERIEUR(config-if)#no shut
EXTERIEUR(config-if)#int s0/1
EXTERIEUR(config-if)#ip address 2.0.0.6 255.0.0.0
EXTERIEUR(config-if)#no shut
EXTERIEUR(config-if)#int s0/2
EXTERIEUR(config-if)#ip address 3.0.0.7 255.0.0.0
EXTERIEUR(config-if)#no shut
EXTERIEUR(config-if)#exit
EXTERIEUR(config)#router os 1
EXTERIEUR(config-router)#network 0.0.0.0 255.255.255.255 area 0
EXTERIEUR(config-router)#exit
EXTERIEUR(config)#int fa0/0
EXTERIEUR(config-if)#ip address 10.0.0.1 255.0.0.0
EXTERIEUR(config-if)#no shut
EXTERIEUR(config-if)#
```

Figure 9: Configuration of the external part

IV.2.2. Configuration of protocol GLBP to the routers

- Router 1, named MICROCOM is elected AVG of group GLBP, for that it is allotted a great priority and the method applied for the distribution of load is " ***Round-Robin*** " as the interface shows it below [9]:

```
MICROCOM#
MICROCOM#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
MICROCOM(config)#int fa0/0
MICROCOM(config-if)#glbp 1 ip 192.168.1.254
MICROCOM(config-if)#glbp 1 priority 200
MICROCOM(config-if)#glbp 1 preempt
MICROCOM(config-if)#glbp 1 name GECAMINES GLBP
MICROCOM(config-if)#glbp 1 load-balancing round-robin
MICROCOM(config-if)#
```

Figure 10: Configuration GLBP with router 1

- The router 2, named INTERSYS is the router Standby AVG of the group that means the second router with the highest priority, which takes over AVG in the event of its failure. The interface below shows its configuration:

```
INTERSYS#
INTERSYS#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
INTERSYS(config)#int fa0/0
INTERSYS(config-if)#glbp 1 ip 192.168.1.254
INTERSYS(config-if)#glbp 1 priority 150
INTERSYS(config-if)#glbp 1 preempt
INTERSYS(config-if)#glbp 1 name GECAMINES GLBP
INTERSYS(config-if)#glbp 1 load-balancing round-robin
INTERSYS(config-if)#
```

Figure 11: Configuration GLBP with router 2

- The router 3 named FAI_3 is allotted a priority lower than those of the other routers what wants to say that it is a AVF of the group just like the other routers for router the traffic.
  Its configuration is shown with the interface below:

```
FAI_3#
FAI_3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
FAI_3(config)#int fa0/0
FAI_3(config-if)#glbp 1 ip 192.168.1.254
FAI_3(config-if)#glbp 1 priority 100
FAI_3(config-if)#glbp 1 preempt
FAI_3(config-if)#glbp 1 name GECAMINES_GLBP
FAI_3(config-if)#glbp 1 load-balancing round-robin
FAI_3(config-if)#
```

Figure 12: Configuration GLBP with the router

- Checking of configuration GLBP After the configuration of protocol GLBP, the command ***show glbp*** allows to see how the configuration was carried out by enumerating the routers who set up group GLBP and addresses MAC of each router of the group as the figure shows it below where the command is carried out with the AVG of the group is Routeur 1:

```
FastEthernet0/0.2 - Group 1
  State is Active
    1 state change, last state change 00:00:14
  Virtual IP address is 192.168.1.254
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 0.760 secs
  Redirect time 600 sec, forwarder time-out 14400 sec
  Preemption enabled, min delay 0 sec
  Active is local
  Standby is 192.168.1.5, priority 150 (expires in 8.804 sec)
  Priority 200 (configured)
  Weighting 100 (default 100), thresholds: lower 1, upper 100
  Load balancing: round-robin
  IP redundancy name is "GECAMINES_GLBP"
  Group members:
    c202.1e4c.0000 (192.168.1.4) local
    c205.1ea4.0000 (192.168.1.6)
    c206.1ea4.0000 (192.168.1.5)
  There are 3 forwarders (1 active)
  Forwarder 1
    State is Listen
    MAC address is 0007.b400.0101 (learnt)
    Owner ID is c205.1ea4.0000
```

Figure 13: Checking of configuration GLBP

The figure above enumerates all that one configured with group GLBP, there are three routers who set up the group whose virtual address is shared between them. The AVG of the group has a high priority (200) and standby AVG has the priority raised after the AVG (150). The name of the group is GECAMINES_GLBP and the method applied is Round-Robin.

After having to display the router which sets up group GLBP, it is significant to see the MAC address of each router because with protocol GLBP, the routers share same virtual address IP but each router has his own MAC address as the figure shows it below:

```
  MAC address is 0007.b400.0101 (default)
  Owner ID is c20c.0914.0000
  Redirection enabled
  Preemption enabled, min delay 30 sec
  Active is local, weighting 100
  Arp replies sent: 1
Forwarder 2
  State is Listen
  MAC address is 0007.b400.0102 (learnt)
  Owner ID is c20d.1890.0000
  Redirection enabled, 597.540 sec remaining (maximum 600 sec)
  Time to live: 14399.588 sec (maximum 14400 sec)
  Preemption enabled, min delay 30 sec
  Active is 192.168.1.5 (primary), weighting 100 (expires in 8.292 sec)
  Arp replies sent: 1
Forwarder 3
  State is Listen
  MAC address is 0007.b400.0103 (learnt)
  Owner ID is c20e.1890.0000
  Redirection enabled, 599.512 sec remaining (maximum 600 sec)
  Time to live: 14398.104 sec (maximum 14400 sec)
  Preemption enabled, min delay 30 sec
  Active is 192.168.1.6 (primary), weighting 100 (expires in 7.972 sec)
--More--
```

Finally the interface above determines the MAC addresses of the routers of group GLBP:

- Router 1 having IP address 192.168.1.4 his MAC address is 0007.b400.0101
- Router 2 his MAC address is 0007.b400.0102
- And the third router his MAC address is 0007.b400.0103

- Checking of connection between the router of the group

The Ping ***command*** makes it possible to test the connection for that starting from router 1 one will test if he can reach the other routers of the group

```
MICROCOM>
MICROCOM>
MICROCOM>ping 192.168.1.5

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.5, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/112/192 ms
MICROCOM>
MICROCOM>ping 192.168.1.6

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/110/192 ms
MICROCOM>
```

The figure above proves that there is a connection between the routers of the group and they can communicate between them.

IV.2.3 Configuration of the hosts

- **Host_1**

```
HOTE_1>
HOTE_1>en
HOTE_1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
HOTE_1(config)#no ip routing
HOTE_1(config)#ip default-gateway 192.168.1.254
HOTE_1(config)#int fa0/0
HOTE_1(config-if)#ip address 192.168.1.1 255.255.255.0
HOTE_1(config-if)#no shut
HOTE_1(config-if)#
```

- **Host_2**

```
HOTE_2>
HOTE_2>en
HOTE_2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
HOTE_2(config)#no ip routing
HOTE_2(config)#ip default-gateway 192.168.1.254
HOTE_2(config)#int fa0/0
HOTE_2(config-if)#ip address 192.168.1.2 255.255.255.0
HOTE_2(config-if)#no shut
HOTE_2(config-if)#
```

Figure 17: Attribution of IP address with the VPCS_2

Host_3

```
HOTE_3>
HOTE_3>en
HOTE_3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
HOTE_3(config)#no ip routing
HOTE_3(config)#ip default-gateway 192.168.1.254
HOTE_3(config)#int fa0/0
HOTE_3(config-if)#ip address 192.168.1.3 255.255.255.0
HOTE_3(config-if)#no shut
HOTE_3(config-if)#
```

Figure 18: Attribution of IP address with the VPCS_3

The configuration of the hosts is significant to test the distribution of load. Each Host has an individual address IP and an address IP of the **gateway** which corresponds to the virtual address shared between the routers of group GLBP. For that with the method of the distribution of load each Host is affected to a router to convey the traffics.

IV.2.3 Test of the configuration

After the configuration the test is significant to see the result of what one configured, in connection with this work, the test specifies if there is connectivity between the hosts interns and the external part by determining the MAC address of the router used by each host to reach it as shows it the following interfaces:

Host_1

```
HOTE_1>
HOTE_1>ping 10.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/113/176 ms
HOTE_1>
HOTE_1>show arp | include 192.168.1.254
Internet  192.168.1.254          1   0007.b400.0101  ARPA   FastEthernet0/0
HOTE_1>
```

The test carried out with the host_1 using the Ping ***command*** shows that there is a connectivity between this last and the external part having IP address 10.0.0.1. The virtual address of group GLBP is 192.168.1.254 and MAC of the router addresses it used to reach outside is 0007.b400.0101 corresponding to the first router connected to the Provider of Access to Internet MICROCOM.

Host_2

```
HOTE_2>ping 10.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 48/400/1200 ms
HOTE_2>
HOTE_2>show arp | include 192.168.1.254
Internet  192.168.1.254          0   0007.b400.0102  ARPA   FastEthernet0/0
HOTE_2>
```

Figure 20: Test host_2

For host_2 as interface shows it high, there is the connectivity of the host to the external part. The virtual address is 192.168.254 and MAC addresses it used for the access is 0007.b400.0102 corresponding to the second router of group GLBP connected to the Provider of Access to Internet INTERSYS.

- Host_3

```
HOTE_3#
HOTE_3#
HOTE_3#ping 10.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 88/128/236 ms
HOTE_3#
HOTE_3#show arp | include 192.168.1.254
Internet  192.168.1.254          12   0007.b400.0103  ARPA   FastEthernet0/0
HOTE_3#
```

Figure 21: Test Host_3

The Ping ***command*** of the hôte_3 towards 10.0.0.1 proves that there is connectivity and addresses MAC used by the host is 0007.b400.0103 corresponding to the third router connected to the Provider of Access to Internet FAI-3. By having always same virtual address IP is 192.168.1.254.

The test makes proof that the method applied for the distribution of load, round-Robin walks well because each host is affected to a router to reach the external part and that in turn as shows it the interfaces of high test Ci where only one virtual address is shared between the routers of group GLBP but each host has his virtual MAC address, with the result that there is a distribution of load between the routers.

The redirection of the MAC addresses in the event of the breakdown of one of the routers was not omitted in this work because that belonged to the operation of Protocol GLBP. the host using MAC the virtual address of the broken down router always keeps the same MAC address but which must be redirected with another router of group GLBP.

Knowing that the hôte_1 uses the first router having 192.168.1.4 address IP and 0007.b400.1010 addresses MAC virtual, if one tries to stop the connection of the first router, the hôte_1 will keep the same virtual MAC address who in his turn will be assigned to another router available in group GLBP. After 600 seconds, the broken down router will be declared unusable and its virtual MAC address will not be used by the hosts. The figure below represents this process:

```
MICROCOM(config-if)#
MICROCOM(config-if)#
MICROCOM(config-if)#int fa0/0
MICROCOM(config-if)#shut
MICROCOM(config-if)#
*Mar  1 00:34:30.295: %GLBP-6-FWDSTATECHANGE: FastEthernet0/0.2 Grp 1 Fwd 1 stat
e Active -> Init
*Mar  1 00:34:30.299: %GLBP-6-STATECHANGE: FastEthernet0/0.2 Grp 1 state Active
-> Init
```

Figure 22: Interruption of the interface of router 1

After the interruption of the interface used by the hôte_1, this last is affected to another router by keeping the MAC address of the stopped router as the interface shows it below:

```
HOTE_1#
HOTE_1#
HOTE_1#ping 10.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/126/264 ms
HOTE_1#
HOTE_1#traceroute 10.0.0.1

Type escape sequence to abort.
Tracing the route to 10.0.0.1

  1 192.168.1.6 224 msec 12 msec 20 msec
  2 3.0.0.7 84 msec *  216 msec
HOTE_1#
```

Figure 23: Redirection of the hote_1

As figure Ci-high shows it, the interruption of the interface of the first router did not prevent with the host from rather reaching the external part there was the redirection. The host keeps the same MAC virtual address of the first router but the latter is redirected with IP address 192.168.1.6 correspondent with the third router.

Thus is made the burden-sharing between the routers of group GLBP and the automatic redirection intervenes in the event of failure of one of the routers of the group for the highest availability of the services.

IV.2.4 Configuration of track

The track compared to the operation of protocol GLBP plays a very capital role allow of them the internal interfaces routers to control the external interfaces so that there is not cut of the services in the event of failure of those. In this case the configuration of the track appears significant, and this present as shows it below the interfaces:

Router 1 (MICROCOM)

```
MICROCOM(config-if)#
MICROCOM(config-if)#exit
MICROCOM(config)#
MICROCOM(config)#track 1 int s0/0 line-protocol
```

```
INTERSYS(config)#
INTERSYS(config)#track 1 int s0/0 line-protocol
INTERSYS(config-track)#int fa0/0
INTERSYS(config-if)#glbp 1 weighting track 1 decrement 10
INTERSYS(config-if)#glbp 1 weighting 100 lower 95
INTERSYS(config-if)#
```

Figure 25: Configuration of the track to router 2

- Router 3 (FAI_3)

```
FAI_3(config)#
FAI_3(config)#track 1 int s0/0 line-protocol
FAI_3(config-track)#int fa0/0
FAI_3(config-if)#glbp 1 weighting track 1 decrement 10
FAI_3(config-if)#glbp 1 weighting 100 lower 95
FAI_3(config-if)#
```

Figure 26: Configuration of the track to router 3

CONCLUSION

Us arrived here at the end of our study of the preliminary draft of distribution of load of the routers (**gateway**) in an Intranet based on technology glbp.

In this work, there was some discussion about checking the performances or the quality of service which the data-processing network of Gécamines offers by using the two routers and the two providers of access to Internet (FAI) which is: Intersys and Microrom whose commutation between the two is carried out using protocol VRRP.

To arrive there, we started:

- By modelling existing architecture network of the company by presenting its wide area network (WAN) while bringing out the **gateway** and by presenting its principle of operation based on the protocol VRRP which presents an imperfection with regard to the balancing of load.

- then we proposed a wide network architecture (WAN) while bringing out there the **gateway** which will be this time Ci made up of three routers who will jointly set up a group GLBP which will have as objective the balancing of load of the users who will request an external access to the network.

We obtained the following results:

- In the case of two routers, we noted that when one of the routers becomes nonoperational, all the hosts connected above will lose their connectivities.

- In the case of three routers, we noted that if one of the routers is nonoperational, the hosts connected above will be dealt with by one of two routers remaining according to the rule of distribution of load steady by protocol GLBP.

After analysis and interpretation of the results obtained, we noted that the quality of service that the **gateway** of Gécamines made up of two routers offers is not reliable point of considering availability of the services and thus creates the congestion in the network when one of routers breaks down.
Have regard with what precedes, we thus suggest with the Gécamines company using three routers on the level of his **gateway** all while configuring protocol GLBP there, which is synonymous with three Provider of Access to Internet (FAI) so:

- To improve the availability of the services;
- To improve the reliability of the services ;
- To balance the load from the data flow point of view (Traffic);
- And finally, to increase the performances of the data-processing infrastructure.

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