**Redundant Interconnect with Highly Available IP (HAIP) 简介**

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  从11.2.0.2开始，Oracle 的集群软件Grid Infrastructure(GI)中新增了Redundant Interconnect with Highly Available IP(HAIP)，以实现集群私网的高可用性和负载均衡。

  在11.2.0.2之前，私网的冗余一般是通过在OS上做网卡绑（如bonding, EtherChannel等）实现的，有了HAIP之后，无需使用网卡绑定就可以实现私网网卡的冗余。

  在安装GI的过程中，可以定义多个私网网卡来实现私网的冗余，如图：



Oracle Grid 
— Setti 
n g up 
Grid Infrastructur 
Specify Network Interface Usage 
ORACLE 
DATABASE 
Ooin,nload Softwoare Llpqates 
Installation Option 
Installation Type 
Product Languages 
Crid Plug and Play 
Cluster Node Information 
Network interface Osage 
Storaae Ootion 
OCR Storage 
Voting Disk Storage 
aperat'ngSvstem Croups 
Installation Location 
Prerequisite Checks 
Sum m arg 
Install Product 
Identify the planned use for each global interface shovun in the box belÜ%mas Public, Priuate, or Do Not 
use Private interfaces are used by Oracle Crid Infrastructure for internode traffi•2 
If there is more than one subnet associated with an then Change the interface's attributes to 
associate the interface name With the additionai subnets 
Interface Name 
Subnet 
Interface Type 
192168159 
192168254 
192 •68,254 
< Back 
u ate 
Next > 
Cancel 

  安装后，HAIP地址自动设置为169.254.\*.\*,这个地址**不可以手动设置**。HAIP 最少为１个，最多为４个(1块网卡，1个HAIP;2块网卡，2个HAIP; 3块及以上，4个HAIP), 均匀的分布在私网的网卡上。

案例：

1. 查看HAIP资源状态

$ crsctl stat res -t -init

NAME

TARGET  STATE        SERVER   STATE\_DETAILS  Cluster Resources

-------------------------------------------------------------------------------------------------

ora.cluster\_interconnect.haip

ONLINE  ONLINE        node2                      1

2.查看HAIP地址和分布情况。

#ifconfig -a

eth1      Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:66

          inet addr:192.168.254.32  Bcast:192.168.254.255  Mask:255.255.255.0

          inet6 addr: fe80::20c:29ff:fe4b:b766/64 Scope:Link

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

......

eth1:1    Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:66

          inet addr:169.254.31.199  Bcast:169.254.127.255  Mask:255.255.128.0  <=====HAIP address one.

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

          Interrupt:193 Base address:0x1800

eth2      Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:70

          inet addr:192.168.254.33  Bcast:192.168.254.255  Mask:255.255.255.0

          inet6 addr: fe80::20c:29ff:fe4b:b770/64 Scope:Link

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

......

eth2:1    Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:70

          inet addr:169.254.185.222  Bcast:169.254.255.255  Mask:255.255.128.0  <=====HAIP address two.

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

          Interrupt:169 Base address:0x1880

haip均匀的分布在两个私网网卡上。

3. 断掉网卡eth1之后。

eth2      Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:70

          inet addr:192.168.254.33  Bcast:192.168.254.255  Mask:255.255.255.0

          inet6 addr: fe80::20c:29ff:fe4b:b770/64 Scope:Link

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

          RX packets:3206 errors:0 dropped:0 overruns:0 frame:0

          TX packets:3916 errors:0 dropped:0 overruns:0 carrier:0

          collisions:0 txqueuelen:1000

          RX bytes:1474658 (1.4 MiB)  TX bytes:2838774 (2.7 MiB)

          Interrupt:169 Base address:0x1880

eth2:1    Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:70

          inet addr:169.254.185.222  Bcast:169.254.255.255  Mask:255.255.128.0 <=====HAIP address two.

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

          Interrupt:169 Base address:0x1880

eth2:2    Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:70

          inet addr:169.254.31.199  Bcast:169.254.127.255  Mask:255.255.128.0 <=====HAIP address one.

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

          Interrupt:169 Base address:0x1880

HAIP one 漂移到了网卡eth2上。

4. 网卡eth1恢复之后。

eth1      Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:66

          inet addr:192.168.254.32  Bcast:192.168.254.255  Mask:255.255.255.0

          inet6 addr: fe80::20c:29ff:fe4b:b766/64 Scope:Link

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

......

eth1:1    Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:66

          inet addr:169.254.31.199  Bcast:169.254.127.255  Mask:255.255.128.0 <=====HAIP address one.

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

          Interrupt:193 Base address:0x1800

eth2      Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:70

          inet addr:192.168.254.33  Bcast:192.168.254.255  Mask:255.255.255.0

          inet6 addr: fe80::20c:29ff:fe4b:b770/64 Scope:Link

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

......

eth2:1    Link encap:Ethernet  HWaddr 00:0C:29:4B:B7:70

          inet addr:169.254.185.222  Bcast:169.254.255.255  Mask:255.255.128.0 <=====HAIP address two.

          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

          Interrupt:169 Base address:0x1880

HAIP one 回到了网卡eth1上。

**注意：HAIP地址失败不会对ocssd产生影响，也就是说HAIP失败，不会导致节点重启。**

HAIP 对数据库和ASM的影响

数据库和ASM实例使用这个HAIP作为cluster interconnect,以下是alert.log的片段。

Cluster communication is configured to use the following interface(s) for this instance

  169.254.31.199

  169.254.185.222

cluster interconnect IPC version:Oracle UDP/IP (generic)

IPC Vendor 1 proto 2

Oracle数据库和ASM实例可以通过HAIP来实现私网通讯的高可用性和负载均衡。私网的流量会在这些私网网卡上实现负载均衡，

如果某个网卡出现了故障，它上面的HAIP会自动切换到别的可用的私网网卡上，从而不影响私网的通讯。

**注意：HAIP 是不允许被手动停止或禁用的，除非是由于某些版本或者平台不支持。**

关于HAIP的更多介绍，请参考My Oracle Support Note 文档1210883.1.

<https://blogs.oracle.com/database4cn/redundant-interconnect-with-highly-available-ip-haip>