The VIPA Zone: Virtualize Your IP Addresses for Uptime

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Thursday, September 13, 2012

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Submitted for your approval

- Pronunciation
- What is VIPA?
- Benefits
  - Redundancy
  - Failover
  - Load Balancing
  - Joining networks
- Creating VIPA
- Advertising the VIPA
  - Proxy ARP
  - RIP2
What is VIPA?

- In most of the “IT World” a system has an IP address
- IBM i has multiple interfaces
- Virtual IP Address is a feature of IBM i, AIX, z/OS
- IP address not associated with a specific interface
Benefits

- Benefits
  - Redundancy
  - Failover
  - Load Balancing
  - Joining networks

Redundancy

- VIPA is not tied to a single interface
- Client targets VIPA which is in turn associated with one or more interfaces
- If one of the associated interfaces should fail, the VIPA still works using the remaining interface(s)
Failover

- In an HA/DR scenario, you might have a primary and a secondary server
- These could be in different locations and on different networks
- A VIPA can be configured to “move” between these servers
- Users only target one system
- Key to automatic failover with clustering

Failover

- Eliminates this situation:

PROD  DR
Load Balancing

- **Inbound load balancing**
  - Requires router that is capable of route directives
  - A function of the router
- **Outbound**
  - Set up Schowler routes
  - Doesn’t require VIPA, but works with it
- **Details to follow**

Joining networks
Creating VIPA

- Note: this is IPv4. Some IPv6 functionality added in IBM i 6.1 (see InfoCenter)
- System i Navigator
**Subnet mask**

255.255.255.255 means only one host on this network – more later!
“Classic” Interface (green screen)

Add TCP/IP Interface (ADDTCPIFC)

MTU

VIPA doesn’t have an interface, so this does not matter as much. Best practice: make it the same as largest MTU of any interface VIPA could be using.

Associated local interface

Proxy ARP – specify physical interface (more later)
RIP2 – generally *NONE
Creating the VIPA

• For outbound connections, remote system sees the current physical interface as the source address
• To show them the VIPA, on each physical interface enter the VIPA in the “associated local interface” parameter
• http://www-912.ibm.com/s_dir/slkbase.NSF/0/0c34610c614c7f0f86256fcb006a5435?
  OpenDocument

Advertising the VIPA

• Could create a manual route to the VIPA on every router

OR

• Advertise the VIPA
  – Proxy ARP
  – RIP2

COMMON
Proxy ARP

- Every NIC has a unique MAC address
- Router keeps track of all MAC addresses and associated IP’s on it’s subnet
- VIPA’s have no MAC address because they have no permanent interface
- When looking for an IP, a machine looks in it’s ARP cache and if it doesn’t find it, it makes an ARP (Address Resolution Protocol) call

Proxy ARP

- Request hits router for the VIPA
- Router doesn’t know the MAC address, so it makes an ARP request
- Interface currently associated with VIPA answers with its MAC address

I’m Spartacus!
Proxy ARP

• Generally, VIPA for Proxy ARP is in the same address space as the subnet it’s on

Example:

• Subnet: 10.3.1.0/24 (mask 255.255.255.0)
• Host addresses: 10.3.1.1 – 10.3.1.254
• VIPA 10.3.1.11/32 (mask 255.255.255.255)

Cisco LAM

• Cisco’s Local Area Mobility function in IOS
• Supported starting in V5R4
• Allows migration of from one subnet to another

Details:

**Preferred interfaces**

- Starting V5R4, list of interfaces associated with VIPA
- If first fails, next one on list is used
- **Tips and Techniques for Using TCP/IP on i5/OS**

**RIP2**

- Allows moving of VIPA from one subnet to another and back
- Great for DR scenarios
- Enable RIP2 (Routing Information Protocol 2)
- Must be enabled on routers as well
• Prod system in New Jersey 10.2.4.10
• DR system in California 10.1.3.10
• Create VIPA 192.168.1.10 on both systems
• Active on Prod, inactive on DR
• If have clustering, switch handled automatically
  [Link](http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/index.jsp?topic=/rzaig/rzaigapplicationswitchover2.htm)

• Proxy ARP box unchecked, no associated interfaces
• Advertise with Router Daemon (RouteD)
• WRKRTDCFG
• System i Navigator
  – Network -> Servers -> TCP/IP, right-click RouteD and select Properties
**IBM i5/OS IP Networks: Dynamic**


RIP_INTERFACE 10.1.3.10 31 SUPPLY RIP2 FORWARD_COND 192.168.1.10
NOFORWARD 0.0.0.0 MASK 0.0.0.0 BLOCK 0.0.0.0 MASK 0.0.0.0

- Translation: for physical interfaces 10.3.1.10 and 10.3.1.11 (10.1.3.10/31) answer requests for VIPA 192.168.1.10
- COND – only if at least one of these physical interfaces is active
- BLOCK and NOFORWARD prevent other networks from being advertised

**Make sure network is setup for RIP2 and you won’t interfere with other RIP2**

**Start RouteD and set to start when TCP/IP starts**
- System i Navigator
- CHGRTDA


Fault Tolerance Configuration for the IBM System i Server Using Virtual IP

http://www-912.ibm.com/s_dir/SlKBase.nsf/1ac66549a2140218862568060002037a/6F5c2d316d97c9286256b140048c77070openDocument
Load Balancing

• Inbound load balancing
  – Requires router that is capable of route directives
  – A function of the router

• Outbound
  – Set up Schowler routes
  – Doesn’t require VIPA, but works with it

• Details to follow

Example

• VIPA 192.168.1.10
• Physicals 10.1.3.10 and 10.1.3.11
• Route Directives:

<table>
<thead>
<tr>
<th>Destination</th>
<th>Subnet Mask</th>
<th>Next Hop Gateway</th>
</tr>
</thead>
<tbody>
<tr>
<td>192.168.1.10</td>
<td>255.255.255.255</td>
<td>10.1.3.10</td>
</tr>
<tr>
<td>192.168.1.10</td>
<td>255.255.255.255</td>
<td>10.1.3.11</td>
</tr>
</tbody>
</table>
Load Balancing

- [http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/index.jsp?topic=/rzajw/rzajwviparr.htm](http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/index.jsp?topic=/rzajw/rzajwviparr.htm)

- Round Robin distribution
- Connection based, not load based
- Assumes all connections are about the same

Load Balancing

- Outbound
  - Set up Schowler routes
    Schowler Routes on the IBM iSeries
    [http://www-01.ibm.com/support/docview.wss?uid=nas1eb95209430bbcb7486256d170047484a](http://www-01.ibm.com/support/docview.wss?uid=nas1eb95209430bbcb7486256d170047484a)
  - Disable the automatic direct routes
    ADDTCPRT E RTEDEST('10.1.3.0') SUBNETMASK('255.255.255.0') NEXTHOP('10.1.3.10') BINDIFC('10.1.3.10') DUPRTEPTY(6)
    ADDTCPRT E RTEDEST('10.1.3.0') SUBNETMASK('255.255.255.0') NEXTHOP('10.1.3.11') BINDIFC('10.1.3.11') DUPRTEPTY(6)
  - DUPRTEPTY (duplicate route priority) of 6 is a “magic number.” Anything below 6 and Schowler routes are turned off.
Joining networks

• DON’T FALL INTO THE TWILIGHT ZONE!
  – Watch out for asymmetric routing
• Packets come in over one interface, but leave over another
• Fix with specific routes
• Use NETSTAT to plan
  – List Network Connections (QtocLstNetCnn) API
**Joining networks**

**Default routing**

- By default, a default route is bound only to the first eligible interface that comes up
- Others use first default route on system
- Each route should be created for each appropriate interface
Default routing

- To fix:

<table>
<thead>
<tr>
<th>Route Destination</th>
<th>Subnet Mask</th>
<th>Next Hop</th>
<th>Preferred Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>DFTROUTE</em></td>
<td><em>NONE</em></td>
<td>10.4.1.1</td>
<td>10.4.1.10</td>
</tr>
<tr>
<td><em>DFTROUTE</em></td>
<td><em>NONE</em></td>
<td>10.4.1.1</td>
<td>10.4.1.11</td>
</tr>
<tr>
<td><em>DFTROUTE</em></td>
<td><em>NONE</em></td>
<td>172.16.1.1</td>
<td>172.16.1.2</td>
</tr>
<tr>
<td><em>DFTROUTE</em></td>
<td><em>NONE</em></td>
<td>172.16.1.1</td>
<td>172.16.1.3</td>
</tr>
</tbody>
</table>
• System i News March 2010

*The Virtual IP Address (VIPA) Zone on IBM i*

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