netkit lab

bgp: stub-as

<table>
<thead>
<tr>
<th>Version</th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author(s)</td>
<td>G. Di Battista, M. Patrignani, M. Pizzonia, F. Ricci, M. Rimondini</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:contact@netkit.org">contact@netkit.org</a></td>
</tr>
<tr>
<td>Web</td>
<td><a href="http://www.netkit.org/">http://www.netkit.org/</a></td>
</tr>
<tr>
<td>Description</td>
<td>architecture of a stub network</td>
</tr>
</tbody>
</table>
a small internet

isp 1 ──isp 2 ──isp 3
    /   /   /
c 1 ──c 2 ──c 3 ──c 4 ──c 5

 backbone

 provider

 customer
customer classification

- **stub networks**
  - one link to a single isp

- **multi-homed stub network**
  - two or more links to the same isp
  - purposes: backup or load sharing

- **multi-homed network**
  - two or more links to different isps
  - purposes: backup or load sharing
stub networks

isp 1

isp 2

isp 3

c 1
c 2
c 3
c 4
c 5
stub network architecture

- one of the customer routers is chosen to be the default gateway
- the router is attached to a single router of the ISP with a link (possibly more than one)
- a single peering in which AS200 announces its route and accepts the default is enough
router as200r1 configuration

! router as200r1 (customer side)!
router bgp 200
network 200.2.0.0/16
neighbor 11.0.0.34 remote-as 20
neighbor 11.0.0.34 description Router as20r1
router as20r1 configuration

router as20r1 (isp side)
router bgp 20
network 20.1.1.0/24
network 0.0.0.0/0
neighbor 11.0.0.33 remote-as 200
neighbor 11.0.0.33 description Router as200r1
neighbor 11.0.0.33 default-originate
neighbor 11.0.0.33 prefix-list customerIn in
neighbor 11.0.0.33 prefix-list defaultOut out

ip prefix-list customerIn permit 200.2.0.0/16
ip prefix-list defaultOut permit 0.0.0.0/0
about **default-originate**

- in zebra, using `network 0.0.0.0/0` is enough to
  - place a default route in the local bgp routing table
  - announce it

- using **default-originate** for a specific neighbor
  - does not place a default route in the local bgp routing table
  - announces the default route to that neighbor, regardless of the presence of `network 0.0.0.0/0` in the local router configuration
about default-originate

- network 0.0.0.0/0 may be used at the top of the ISP hierarchy to originate the default route.
- network 0.0.0.0/0 should **not** be used at intermediate levels of the hierarchy. Otherwise, routers would prefer the locally originated default route and remove the one offered by their upstream from the forwarding table.
- using `default-originate` makes the default route appear as if it were originated by the upstream, even if it is not.
default-originate and route-maps

- a default route originated with `network 0.0.0.0/0` is handled like any other route
  - route-maps used with a specific neighbor are applied to the default route as well
- a default route originated with `default-originate` is processed by a different route-map:

```
neighbor <neighbor-ip> default-originate route-map <r-map-name> in
```

```
neighbor <neighbor-ip> default-originate route-map <r-map-name> out
```
stub as: lab

- start the lab

```bash
user@localhost:~$ cd netkit-lab_bgp-stub-as
user@localhost:~/netkit-lab_bgp-stub-as$ lstart
```

- check the bgpd configuration file

```bash
as20r1:~# less /etc/zebra/bgpd.conf
```

- check the bgpd log file

```bash
as20r1:~# less /var/log/zebra/bgpd.log
```
check the routing table of as20r1

<table>
<thead>
<tr>
<th>Destination</th>
<th>Gateway</th>
<th>Genmask</th>
<th>Flags</th>
<th>Metric</th>
<th>Ref</th>
<th>Use Iface</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.0.0.32</td>
<td>*</td>
<td>255.255.255.252</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0 eth0</td>
</tr>
<tr>
<td>11.0.0.4</td>
<td>*</td>
<td>255.255.255.252</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0 eth1</td>
</tr>
<tr>
<td>20.1.1.0</td>
<td>*</td>
<td>255.255.255.0</td>
<td>U</td>
<td>0</td>
<td>0</td>
<td>0 eth2</td>
</tr>
<tr>
<td>200.2.0.0</td>
<td>11.0.0.33</td>
<td>255.255.0.0</td>
<td>UG</td>
<td>0</td>
<td>0</td>
<td>0 eth0</td>
</tr>
</tbody>
</table>

Password: zebra

Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF, B - BGP, » - selected route, * - FIB route

C>* 11.0.0.4/30 is directly connected, eth1
C>* 11.0.0.32/30 is directly connected, eth0
C>* 20.1.1.0/24 is directly connected, eth2
C>* 127.0.0.0/8 is directly connected, lo
B>* 200.2.0.0/16 [20/0] via 11.0.0.33, eth0, 00:03:22
**stub as: lab**

- check the bgpd cli (command line interface)

```plaintext
as20r1:~# telnet localhost bgpd
......
User Access Verification

Password: zebra
bgpd> show ip bgp neighbors
BGP neighbor is 11.0.0.33, remote AS 200, local AS 20, external link
Description: Router as200r1
  BGP version 4, remote router ID 200.2.0.1
  BGP state = Established, up for 00:00:24
  Last read 00:00:23, hold time is 180, keepalive interval is 60 seconds
......
bgpd> show ip bgp
BGP table version is 0, local router ID is 20.1.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete

<table>
<thead>
<tr>
<th>Network</th>
<th>Next Hop</th>
<th>Metric</th>
<th>LocPrf</th>
<th>Weight</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>*&gt; 0.0.0.0</td>
<td>0.0.0.0</td>
<td>0</td>
<td>32768</td>
<td>i</td>
<td></td>
</tr>
<tr>
<td>*&gt; 20.1.1.0/24</td>
<td>0.0.0.0</td>
<td>0</td>
<td>32768</td>
<td>i</td>
<td></td>
</tr>
<tr>
<td>*&gt; 200.2.0.0/16</td>
<td>11.0.0.33</td>
<td>0</td>
<td>0</td>
<td>200 i</td>
<td></td>
</tr>
</tbody>
</table>

Total number of prefixes 3
bgpd> 
```
stub as: lab

- perform several pings on the routers
- terminate the lab

```
user@localhost:~/netkit-lab_bgp-stub-as$ lcrash
```