

REVERSE MAP DELEGATION

Classless Reverse Map Delegation is defined by RFC 2317 which has Best Current Practice status and should be regarded as a definitive reference. Classless routing allows allocation of sub-nets on non-octet boundaries, that is, less than 256 addresses from a Class C address may be allocated and routed. The technique defined in the RFC is attributed to Glen A. Herrmannsfeldt.

Normal domain name mapping as we have seen maps the domain name to an IP address. This process is independent of the ISP or other authority that allocated the IP name space. If the addresses were to change then the owner of the domain that maps these addresses would be able to make the necessary changes directly with either the relevant registrar i.e. change the IP address of DNS's for the domain or change the zone file(s) that describe the domain.

The rule is that entities can be delegated only once in the domain name tree this includes IN-ADDR.ARPA. When a Class C subnet is assigned by an ISP or other authority, for example, 192.168.23.64/27 (a 32 IP address subnet) the responsibility for reverse mapping for the whole Class C address has already been assigned to the ISP or Authority. If you want to change the host names in the assigned subnet they must be notified to the authority for that Class C address.

Generally, this is unacceptable since such requests may encounter indifference, cost or questions. It is most desirable that responsibility for reverse mapping be delegated when the IP address subnet is assigned though this does require support and co-operation with the currently delegated reverse map authority (ISP or other organization).

The technique defined in RFC 2317 provides for such delegation to take place using CNAME Resource Records (rather than the more normal PTR Resource Records) in an expanded IN-ADDR.ARPA name space.

The IPv4 Reverse Map Generator can be used to generate all the necessary RRs or even just let you experiment with various delegation scenarios.

Note: RFC 2317 uses the CNAME RR to implement the solution as shown in the following zone file fragments. For reverse delegations of $\geq /24$ (for example $/24$ or $/26$ - essentially a sub Class C block) the CNAME solution is the most efficient and understandable. For reverse map delegations of $< /24$ (for example $/20$ or $/18$ - essentially a sub Class B or Class A block) the DNAME RR may also be used to provide the same functionality while creating a significantly smaller and more flexible configuration.

The following fragment shows our 192.168.23.64/27 subnet as a fragment of the reverse mapping zone file located at the ISP or other Authority that assigned the subnet:

```
$TTL 2d ; 172800 seconds
$ORIGIN 23.168.192.IN-ADDR.ARPA.
@      IN SOA  ns1.isp.com. hostmaster.isp.com. (
        2003080800 ; serial number
        3h       ; refresh
        15m      ; update retry
        3w       ; expiry
        3h       ; nx = nxdomain ttl
        )
      IN NS   ns1.isp.com.
      IN NS   ns2.isp.com.
; definition of other IP address 0 - 31
....
; definition of our target 192.168.23.64/27 subnet
; name servers for subnet reverse map
64/27  IN NS  ns1.example.com.
64/27  IN NS  ns2.example.com.
```

```
; IPs addresses in the subnet - all need to be defined
; except 64 and 95 since they are the subnets
; network and broadcast addresses not hosts/nodes
65      IN CNAME  65.64/27.23.168.192.IN-ADDR.ARPA. ;qualified
66      IN CNAME  66.64/27 ;unqualified name
67      IN CNAME  67.64/27
....
93      IN CNAME  93.64/27
94      IN CNAME  94.64/27
; end of 192.168.23.64/27 subnet
.....
; other subnet definitions
; which may be delegated or local
....
; local IP definitions
; CNAME and PTR RRs may be mixed in the same file
129     IN PTR  bill.isp.com.
....
```

The 64/27 construct is an artificial (but legitimate) way of constructing the additional space to allow delegation.

Prior to RFC 2181 '/' was not a legal character for a domain name or label so an alternate construct using '-' could be used instead, for example:

```
64-27      IN NS ns1.example.com.
```

Note: Only the zone file is changed at the ISP/Delegation Authority. No change is required to the named.conf file. Reason: If, say, the CNAME 65.64/27.23.168.192.IN-ADDR.ARPA is obtained during the search of the zone file 23.168.192.IN-ADDR.ARPA, DNS software will, as normal, attempt to follow the CNAME since the domain name part is within the current zone. In this case the NS RRs for 64/27 are encountered resulting in a referral to the name servers ns1.example.com and ns2.example.com being returned but with a CNAME (essentially a new query name) of, for instance, of 65.64/27.23.168.192.IN-ADDR.ARPA..

The zone file at the DNS serving the Reverse Map (ns1.example.com in the above example) looks like this:

```
$TTL 2d ; 172800
$ORIGIN 64/27.23.168.192.IN-ADDR.ARPA.
@      IN SOA  ns1.example.com. hostmaster.example.com. (
                2003080800 ; serial number
```

```

        3h      ; refresh
        15m     ; update retry
        3w      ; expiry
        3h      ; nx = nxdomain ttl
    )
    IN NS      ns1.example.com.
    IN NS      ns2.example.com.

; IPs addresses in the subnet - all need to be defined
; except 64 and 95 since they are the subnets
; network and broadcast addresses not hosts/nodes
65      IN PTR  fred.example.com. ;qualified
66      IN PTR  joe.example.com.
67      IN PTR  bill.example.com.
...
93      IN PTR  web.example.com.
94      IN PTR  ftp.example.com.

; end of 192.168.23.64/27 subnet

```

If the alternate construct using '-' is used the \$ORIGIN directive above would look as shown below:

```
$ORIGIN 64-27.23.168.192.IN-ADDR.ARPA.
```

Now you have to change your reverse map zone names in the named.conf file to reflect the above change. The following examples shows the reverse map declaration before and after the change to reflect the configuration above:

```
// before change the reverse map zone declaration would look
// something like this
zone "23.168.192.in-addr.arpa" in{
    type master;
    file "192.168.23.rev";
};
```

The above - normal - reverse map declaration resolves reverse lookups for 192.168.23.x locally and without the need for access to any other zone or DNS.

Change to reflect the delegated zone name.

```
// after change the reverse map zone declaration would look
// something like this
zone "64/27.23.168.192.in-addr.arpa" in{
// or zone "64-27.23.168.192.in-addr.arpa in {
    type master;
    file "192.169.23.rev";
};
```

Notes:

1. The above configuration will only resolve by querying the master zone for 23.168.192.IN-ADDR.ARPA and following down the delegation route to itself. If changes are not made at the ISP or issuing Authority, or have not yet propagated, then this configuration will generate 'nslookup' and 'dig' errors or incorrect results.
2. The above configuration, prior to full delegation from the parent or is test mode, cannot use the normal dig command. Thus, the following command will not work:

```
3. dig -x 192.168.23.66
```

Instead it will continue to show the result prior to the configuration change because the dig is following the official .arpa delegation route. Instead, you must force use of this new (local) domain by using the following command:

```
dig 66.64/27.168.192.IN-ADDR.ARPA
```

Source: <http://www.zytrax.com/books/dns/ch3/index.html#overview>