Tech Info Library

Apple Internet Router: WAN Network Options (2/93)

Revised: 2/4/93
Security: Everyone

Apple Internet Router: WAN Network Options (2/93)

==========

Article Created: 3 February 1993

TOPIC

This article describes additional Wide Area Network WAN network options found in the DialUp, and IP Tunnel Setup Port Info windows. These options include Network Hiding, Network Number Remapping, Clustering, Hop Count Reduction, Hop Count Weighting, and Backup Paths.

DISCUSSION

Half-routing and tunneling ports both support a variety of options that are not applicable to AppleTalk ports. These options are selected in the Options… dialog box.

Network Hiding

It may be desirable, for security reasons, that certain networks in an internet not be made visible to other internets connected to the tunnel. This is accomplished simply by not providing information about these "hidden" networks to other exterior routers during the routing information exchange. You can choose to hide no networks, a specific list of networks, or all networks except a specific list.

Network hiding has advantages and disadvantages.

Some advantages are:

- Security
- The amount of routing information passed into the tunnel (and hence into all the remotely-connected internets) can be greatly reduced.

Some disadvantages are:

- Lack of selectivity – there is no access through the tunnel to any nodes on hidden networks.

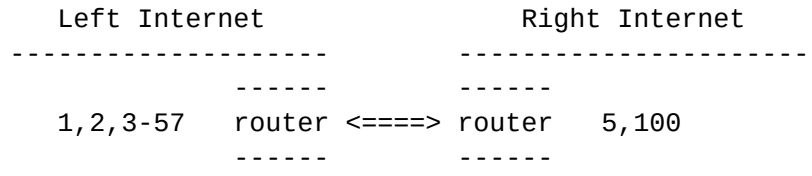
- A node on a hidden net will see all of the AppleTalk zones exported by all of the exterior routers on the tunnel, but will not be able to see any devices in these zones since those devices cannot respond to the node's NBP lookups.

Network Number Remapping

With AppleTalk WANs becoming larger and larger, we cannot safely assume that there will be no network number conflicts when connecting two or more WANs together. In fact, the large size of many WANs makes it more likely that there will be conflicts in such a case.

Network number remapping is a technique used to resolve network number conflicts between two networks without requiring reconfiguration of either one. Remapping is allowed on tunneling and half-routing ports only, not on AppleTalk ports.

As an example of the use of network number remapping, assume that one internet contains networks 1,2, and 3-57. If this internet is connected to another internet that contains network numbers 5 and 100, then a conflict would ordinarily result because network 5 exists in both internets.



With network number remapping, the Left router can be configured to remap network 5 into network 58 (or any other nonconflicting number). This allows the Left internet to see the Right internet's network numbers as 58,100.

At the same time, the Right router can be configured to remap networks 3-57 into networks 103-157. This allows the Right internet to see the Left internet's network numbers as 1,2,103-157.

Loop configurations are not allowed when remapping is active. Looking at the previous example again, see what would happen if there were a loop configuration here. Remapped network numbers would loop back to the router that performed the remapping in the first place. This time, they would be viewed as new networks, and could be remapped again, causing an infinite loop of remapping, broken only by hop count limitation.

Apple Internet Router attempts to detect such loops at startup, and will not activate a remapping port if it would create such a loop. If a loop is detected later, the remapping port will be brought down.

Network number remapping is enabled through the Options dialog. Here, you specify a network range to remap remote network numbers into.

In a WAN with more than one tunnel or half-routing link, network numbers may be repeatedly remapped as they travel across the WAN. This does not

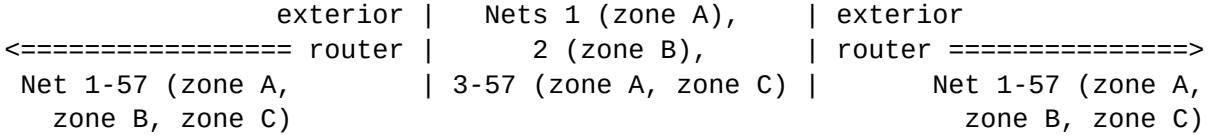
present a problem, since all the remapping information is handled locally, and it is transparent to the user.

For network number remapping to work, all network number references in each packet traveling between the two networks must be remapped before the packet enters the new network. This includes source and destination network numbers in the DDP header, network numbers carried in NBP and RTMP packets, and network numbers in ZIP query and response packets.

Note that this also includes network numbers obtained by clients of these protocols and carried as part of the DDP data field. It is impossible for routers to be aware of all such instances of network numbers in data, so remapping will not always work in these cases. For this reason, Apple advises against doing network management across remapped links, because network management data often contains network numbers. Instead, manage each internet separately.

Clustering

Clustering is a way of representing a portion of the internet as a single, multi-zone extended network. Clustering is available only on tunneling and half-routing ports, and then only when remapping is active. Like remapping, clustering is applied by an exterior router to network information it receives from other exterior routers. The clustering exterior router represents the remote internets to its own local internet as single, multi-zone extended networks.



For example, the internet shown in the center of the above diagram consists of three separate networks: two that each have a single network number and zone name (1, Zone A and 2, Zone B) and one that has a network number range and a zone list (3-57, Zone A, Zone C). With clustering active, this internet would be represented to other internets as a single extended network with network numbers 1-57 and the zone list Zone A, Zone B, Zone C.

Clustering imposes some limitations on network design. All the networks in a cluster must appear, from an RTMP point of view, to be the same number of hops away.

A more serious limitation is that representing a portion of the internet this way amounts to taking a snapshot of that portion and passing it to the rest of the internet. If the picture changes, the snapshots are generally not updated.

There are two possible cases where this can happen. First, if a new network comes up in the clustered portion, and its network number range is outside the cluster range, that network must be represented individually to the rest of the internet because the cluster range cannot easily be grown to include the new network.

Second, if a new network comes up within the cluster and its network number range is within the cluster range, then it automatically becomes part of the cluster. However, if its zone list contains a zone name not in the cluster's original zone list, that zone name will not appear in the cluster's zone list until the clustering routers are restarted.

Hop Count Reduction

When two internets are connected through a half-router or a tunnel, it is easy to see that the maximum distance across the resulting internet could easily exceed 15 hops. For this reason, Apple Internet Router tunneling and half-router ports allow you to turn on the hop count reduction feature, which appears in the Options dialog as "Allow more than 15 hops".

Hop count reduction is available only on tunneling and half-routing ports, and only when remapping is active. Remapping is a requirement because, for hop count reduction to be safe, there must be no loops across the hop count reduced link, and Apple Internet Router prevents loops in a remapped environment. If loops were allowed, a reduced hop count packet could travel forever on the network.

When hop count reduction is active on a port, all networks that are accessible out that port appear to be one hop away. This makes the remote networks accessible by all the networks in the local internet, regardless of their actual distance in hops.

Hop Count Weighting

When multiple paths are available between two networks, the network administrator may wish to direct traffic to a preferred path. This is especially important when one path includes a slow link or tunnel. Current AppleTalk protocols will choose the path with the fewest hops, without regard to the speed of the link. If two paths are equal hops, traffic will alternate between them at ten-second intervals.

Hop count weighting allows you to artificially increase the hop count for a half-routing port or tunnel by a number from 1 to 14. By weighting a link as a large number of hops, you can cause traffic to take an alternate route if one is available. This feature also allows you to implement a more accurate modeling of the internet when slow links are involved, by weighting links according to their speed (higher hop counts for slower links).

Hop count weighting may be used whether or not network number remapping is on. However, it may not be meaningful if remapping is on because there will be no loops or redundant paths in that case.

Backup Paths

Tunneling and half-routing ports can be designated as "backup paths" only when remapping is not on (since redundant paths are not allowed with remapping). If a port is designated as a backup path, then it will not be

used for data forwarding if an alternate route between the half-routers or tunneling routers is available.

The link will be used only for the exchange of routing information between the two half-routers. This exchange is necessary to determine when the backup path needs to be made active. Once a backup link becomes active, that link may continue to be used for some amount of data forwarding, even if the primary link comes back up. The link won't fully return to backup status until the router is restarted.

If a half-routing or tunneling port is designated as a backup port, a hop count weight may also be assigned for use if the port becomes active.

Tech Info Library Article Number:11488