Domain Name Service

Establishing Redundancy with the PowerLink-IV*plus*

The intent of this paper is to give the reader a brief introduction to how the Domain Name System works and how redundancy is accomplished when utilizing the PowerLink as the DNS authoritative server at the client's site. It is not the intent of this paper to be a complete technical description of the Domain Name System. For additional reading on the Domain Name System refer to DNS and BIND, 3rd Edition

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An Overview of the DNS:

The Domain Name System is a hierarchical system that provides the IP address, when queried and given the Universal Resource Locator (URL), that corresponds to the target site. (i.e. www.astrocorp.com is at IP address 192.168.1.1).

At the top of the tree structure there are thirteen "root" Domain Name Servers that have the primary and secondary IP addresses of all of the DNS Authorities for all domains on the Internet. The DNS Authority is the server that contains the specific IP address or addresses for a given URL. At the bottom of the tree structure there are caching name servers that lookup and store records for local queries.

When a domain name is registered on the Internet, the primary and secondary address of its DNS Authority are placed in all 13 "root" Domain Name Servers on the Internet. The address of the site that corresponds to the URL is kept updated in the DNS Authoritative server designated for that site.

A typical sequence for a DNA lookup would involve a user's machine sending a URL name to the caching server that was designated in the configuration of that machine. If the caching server did not have the IP address for that URL, or if the Time To Live had expired, it would query the local "root" Domain Name Server and receive the address of the DNS Authority for that URL. It would then query the DNS Authority and be given the IP address, with a Time To Live (TTL) of the URL. This address would then be passed on to the requesting user and cached for future reference. The caching server could be given more than one IP address for the site and could then send addresses out in a round robin to facilitate traffic load balancing. Furthermore, if the Authoritative server could determine failure of any of the WAN lines to the site, it could remove that address from the round robin.

Changes of address for the DNS Authority at the "root" Domain Name Servers can take from 1 to 2 days to take effect and propagate through the Internet. Changes in destination IP addresses at the DNS Authority will take effect when the Time To Live expires at the caching name servers.

A Typical Network:

The diagrams below show a typical network depicting “mybusiness” site, mybusiness’ ISP, the Internet and a potential customer of mybusiness, “customer”.

The diagram below depicts a typical network configuration with the DNS Authority located at the ISP site. The sequence of events when “customer” initiates a query to browse the website “mybusiness.com” is as follows:

1. “Customer’s” browser will initiate a query to the caching DNS server, designated in its configuration file, requesting the IP address for “mybusiness.com”.

2. If the Caching DNS Server has a current address record for “mybusiness.com”, it will immediately return the IP address to “customer”. If the Caching server does not have an address record for “mybusiness.com”, it would request the record containing the addresses of the primary and secondary DNS authority for “mybusiness.com” from the “root name server”.

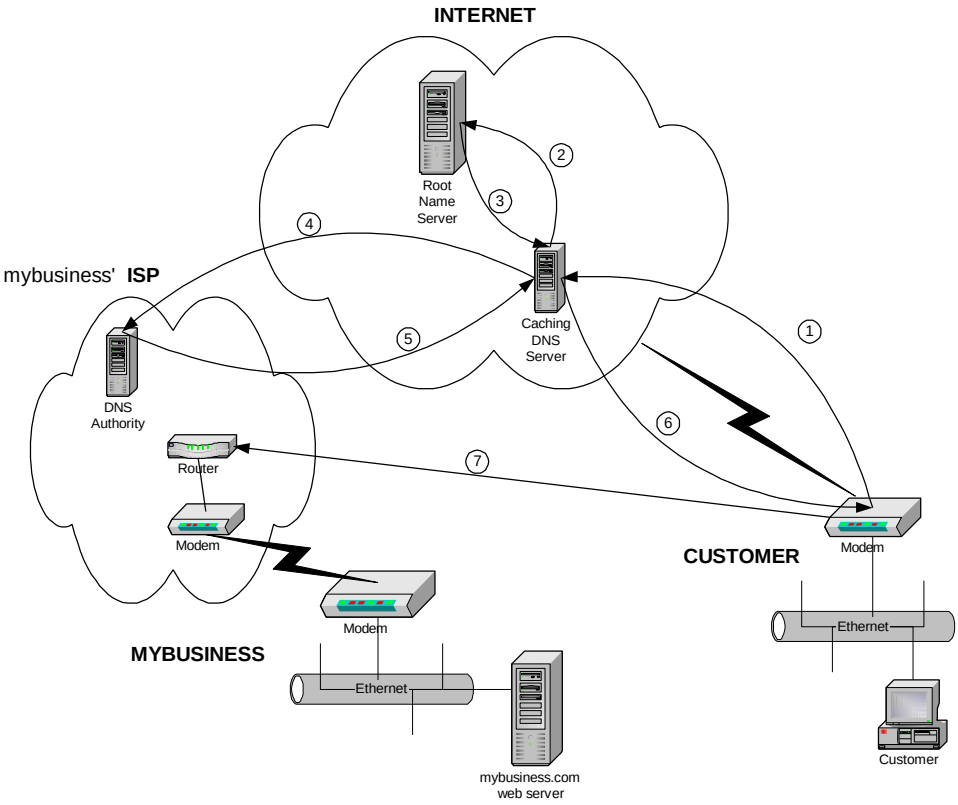
3. The “root name server” will be one of thirteen root name servers that service the World Wide Web. The record for “mybusiness.com” was loaded into all thirteen root name servers when “mybusiness.com” was registered as a domain name and must contain an IP address for a primary and secondary name server or DNS Authority for “mybusiness.com”. The root name server will return this record to the caching DNS server.

4. The caching DNS server will then request the Name Server record from the primary DNS authoritative server.

5. The DNS authority returns the Name Server record to the caching DNS server. This record contains the IP address of “mybusiness.com”, the Time to Live for certain parameters in the record and a sequence number to allow the caching DNS server to determine if the record has changed since it was last updated.

6. The Caching DNS server then sends the IP address of “mybusiness.com” to “customer”.

7. “Customer” then establishes communication with “mybusiness.com”.



Standard Network with
DNS Authority at ISP

A Network using the PowerLink:

Shown below is a diagram depicting the same network configuration as shown above with the PowerLink being utilized at "mybusiness" to aggregate 3 WAN lines for Internet access and performing the DNS Authoritative server function.

The sequence of events when "customer" initiates a query to browse the website "mybusiness.com" are the same as in the above example for steps 1,2 and 3 and proceed as follows:

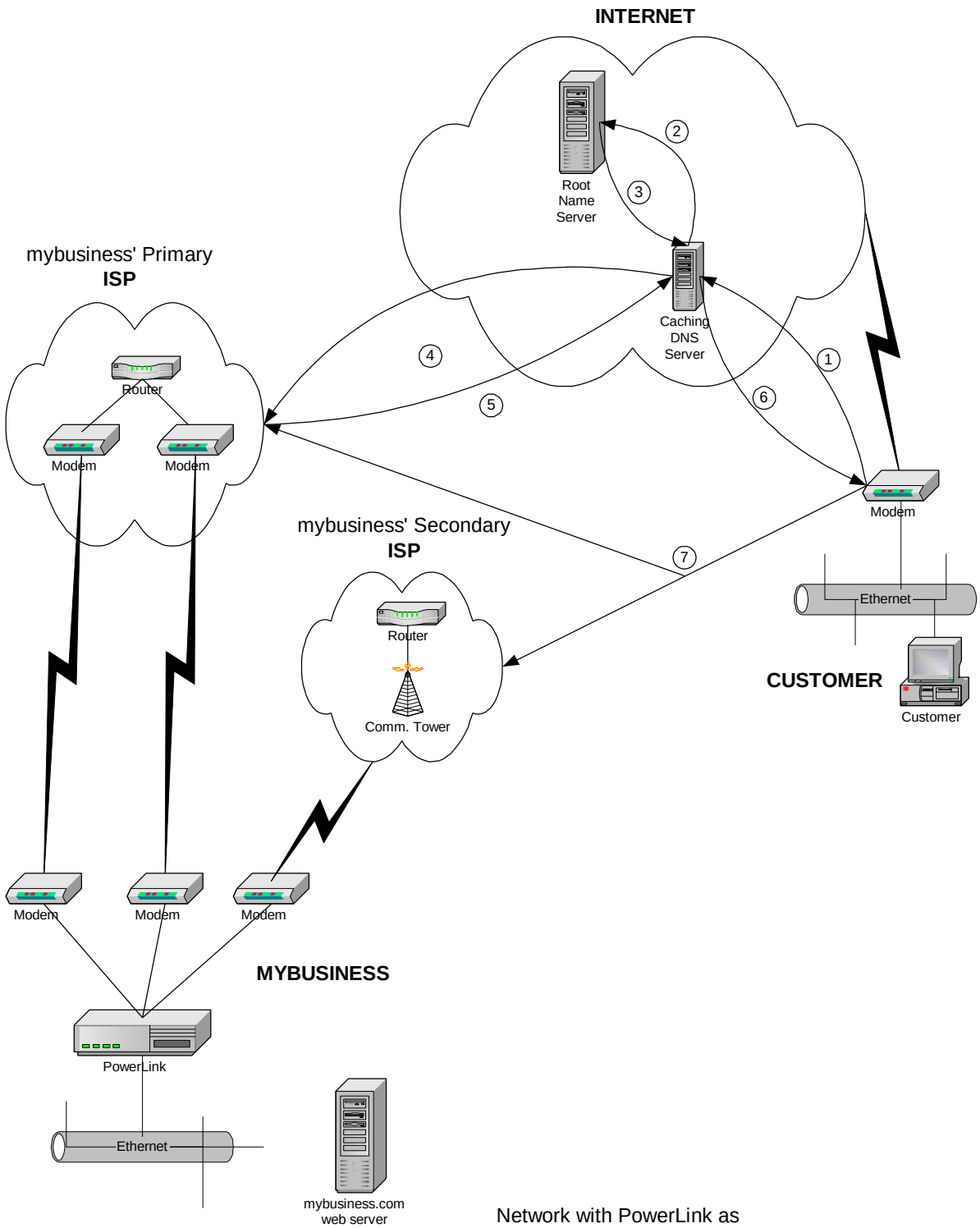
4. The caching DNS server will then request the Name Server record from the Primary DNS authoritative server, which is the PowerLink. If the Primary ISP or that link is down, the request will be made to the Secondary authoritative server via "customer's" secondary ISP. Note that this is still the PowerLink but will take place over the secondary WAN link.

5. The DNS authority (the PowerLink) returns the Name Server record to the caching DNS server. This record will contain the 3 IP addresses of "mybusiness.com", the Time to Live (TTL) for certain parameters in the record and a sequence number to allow the caching DNS server to determine if the record has changed since it was last updated. The TTL will be set short enough, such that the caching DNS server will look for updates on a regular basis, thus updating the Name Server record in a timely manner if a link fails. The query from the Caching DNS server to determine if the sequence number has changed is a small record and thus having a short TTL does not add significant overhead traffic since the complete record is only requested and sent if the sequence number has changed. The PowerLink will continuously monitor the links and if it detects that any of the links are down, it will remove that IP address from the Name Server record and change the sequence number.

6. The Caching DNS server then sends one of the IP addresses of "mybusiness.com" to "customer". The IP addresses for subsequent queries will be sent in "round robin", thus causing inbound sessions to "mybusiness" to be load balanced.

7. "Customer" then establishes communication with "mybusiness.com" over one of the three lines

Here is a diagram of the entire process with the PowerLink performing the DNS Authoritative Server functions:



Network with PowerLink as DNS Authority