ISSN: 0974-2115
www.jchps.com Journal of Chemical and Pharmaceutical Sciences

An Intelligent Address Stamping, Tunnel Mode Posting Protocol and Algorithms for DNS

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ABSTRACT

Current research describes a solitary sufficient method to access the websites instantaneously devoid of wait in the web. On investigating available practices, novel research was performed on DNS reply to improvise web performance. Exponential developments of Internet end up in raised network bandwidth utility ending up in network bottleneck namely clogging and rise latency. Demand on bandwidth needs prolonged venture in link and switch capacity. Latency is known as the time that gets elapsed among sending object's request and getting the response of that and seems much costlier in shooting up the accessible network capacity. When web traffic rises, betterment of web performance has turn out to be a demanding issue. Experienced data transmission through the current network is essential to reduce the users waiting time.

In overcoming this, numerous techniques has been executed and efficiently used by the latest websites like Compression, Content simplification, Load balancing, Web server pushing, Intelligent routers, Web caching Web pre-fetching Object packaging, Bandwidth management, Optimization of HTML Codes, Traffic dispersion etc… although this overheads have not been solved efficiently. Current research targets the decline network bottleneck and access time of website in a greater scale on analyzing the performance of the DNS.

KEY WORDS: DNS, Network Bottleneck, Address Stamping, Posting, Routing, Website Access.

1. INTRODUCTION

In Exponential development of Internet end up in rise network bandwidth utility leading to network bottleneck namely clogging and raise latency. Bandwidth demand needs prolonged asset in capacity of link and switch. Latency is known to be time elapsed among sending object request and response receivable of that which is much costlier in increasing the accessible network capacity. As web traffic goes up, improvising the web performance has seems to a demanding issue. Efficient data transmission via the accessible network is essential to reduce the users waiting time.

The technique Content simplification for latency reduction helps to reduce page complexity .Optimization of HTML tags could be done to reduce the webpage size to be transmitted. But much reduction can't be obtained. Compression helps in reducing the redundant bits within a single transfer. Compression ratio relies on the compression algorithm and file size to be compressed. This technique reduces only temporal or spatial redundancy. In Web server pushing, web server pushes documents to a place nearer the client site. But the web content provider finds it difficult in knowing the appropriate place of pushing documents. Load balancing helps in reducing the server overload. If any server is overloaded, its jobs have been shared by other under loaded servers. It monitors available health servers and create decisions of routing the traffic to optimize availability and performance. Work distribution within the available servers and work balancing is intricate. Bandwidth management is required in declining web traffic and congestion that could be efficiently kept away by organizing bandwidth properly. If infinite bandwidth exists; bandwidth management is not required. Intelligent router declines congestion by vigorously routing the web traffic and takes place reliable service on failure of few routers. Its choices of dynamic decisions in opting the route relying on the present work load on network. A brilliant agent overviews actions of user and vigorously decides on accessing web sites by internet traffic analyzes. It overviews traffic of web and states the bandwidth status handling to browser. Once the traffic stated by the intelligent agents are lesser than the threshold, later browser could prefetch the predicted references earlier it is referenced, ensuing in lower latencies. Stoppage in network way in bandwidth consumption and network bottleneck are declined by these agents. Object packaging helps to reduce the server side overhead, if requested files are reduced. Multiple files will be packed in a single object package for efficient transmission. A web browser will unpack the files in the receiving side and display it. Traffic dispersion converts burst nature of web traffic into sub burst (separate files) for reducing congestion. Each sub burst is directed to different routes. Optimization of HTML Codes reduces the web page size waits transmition. Optimization is generated by WYSIWYG programs. In Web caching, frequently accessed cacheable objects can be stored in cache for accessing it in future instead of going to web server. This technique reduces bandwidth consumption, latency reduction and congestion. In Web pre-fetching, latency is reduced by finding the anticipated sites and fetching it before actually required.

Still when numerous techniques exist, not even a scheme is sufficient to access the web sites instantaneously lacking wait in the web. On investigating the accessible techniques, an innovative examination performed on DNS functionality and few modifications has been performed in raising the access time in web to begin with and dropping the bottleneck on networks was done to enhance web performance.

DNS functionality: The Domain Name System (DNS) is a dispersed system of hierarchy to name services, any resource or computers associated to a network or Internet that is private associating numerous information with domain names allocated to every participant. Significantly, it interprets names of domain which are significant to humans into the numerical (binary) identifiers connected with networking devices to locate and address these devices worldwide. A frequently utilized analogy in explaining the Domain Name System hands out as the Internet's "phone book" by interpreting hostnames of computer which is human-friendly into IP addresses. Taking an example, www.example.com translates to the addresses 192.0.32.10 (IPv4) and 2620:0:2d0:200:10 (IPv6). Domain Name System separates out the responsibility to assign names of domain and mapping it to IP addresses on allocating authoritative name servers for every domain. Authoritative name servers have been allocated to be accountable for their specific domains, likewise could allocate other name servers that are authoritative for their sub-domains whereas its functioning mechanism performed the distributed DNS and tolerant of fault and also assisted avoiding requirement for a sole central register for prolonging check along with updation.

Generally, Domain Name System too stocks up some information types namely the mail servers list which accepts email for a shared Internet domain. By contributing a worldwide, dispersed keyword-based redirection service, the Domain Name System is a necessary constituent of the Internet functionality. Domain Name System too defines the underpinnings that are technical corresponding to this service of database functionality. Hence it briefs the protocol of DNS, a thorough data structures specification and exchanges of communication utilized in DNS, as element of the Internet Protocol Suite (TCP/IP).

Best practices for speeding up Web site: Below quoted topics are some of the best ways for speeding up the website and to reduce the network overhead.

Reduce DNS Lookups: Domain Name System (DNS) correlates hostnames to IP addresses, similar to phonebooks which associates names of people along with phone numbers. On typing in your browser www.abcd.com, a DNS resolver which browser approaches send back that IP address of server. DNS holds a cost. It characteristically consumes 20-120 milliseconds for DNS to search for IP address for a known hostname. Nothing can be downloaded from browser from available hostname until look up of DNS (Fig 1) is finished.

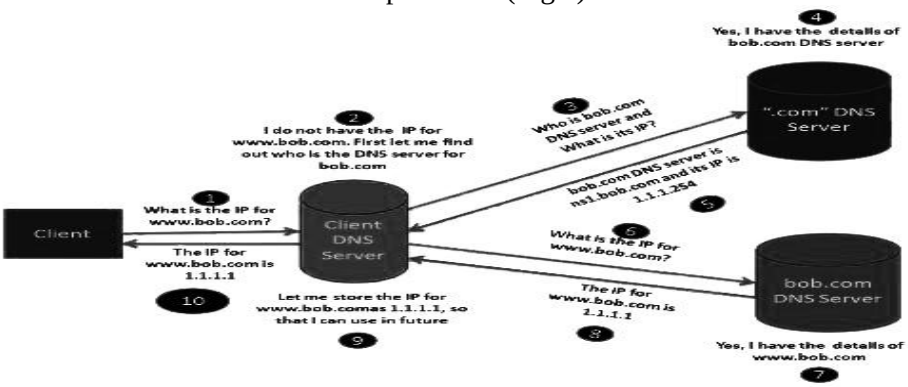

Fig. 1. DNS Lookup

Enhanced performance of DNS lookups is possible by cache which could takes place on a particular server that caches, preserved by local area network or user's ISP, along with caching occurrence in individual user's computer. Information on DNS sustains in the operating system's cache of DNS. Many browsers possess its individual caches, isolated from cache of operating system. Till browser holds a DNS record in its individual cache, it doesn't disturb with a record request to operating system. By default for 30 minutes Internet Explorer caches DNS lookups, as particular by the DNS Cache Timeout setting of registry. Firefox caches lookups of DNS for 1 minute; handled by the network. DNS Cache Expiration configuration setting (Faster fox changes this to 1 hour). On emptying client's DNS cache (for not only browser but also the operating system), DNS lookups quantity is equivalent to the unique hostnames number shared within the web page which incorporates hostnames utilized in the page's URL, images, script files, style sheets, Flash objects, etc. Lessening the amount of distinctive hostnames decreases the DNS lookups number.

Lessening distinctive hostnames number holds the prospective in lessening the number of downloading simultaneously which takes place in a page. Devoid of lookups of DNS cuts response times, however declining downloads that are parallel might shoot up times of response. Separating these components across at least two are our guidelines with hostnames not exceeding four resulting in a better compromise among declining lookups of DNS and permitting a great range of downloads that are parallel.

Use a Content Delivery: A content delivery network (CDN) seems to be a clumsier of web servers disseminated to users across numerous spot in delivering substance much professionally. Chosen server to deliver content to a particular user is usually depends on a network proximity measurement. Server possessing least network hops or quickest response time server is preferred is known as an example. Proximity of user to the web server impacts times of response. Web content deployment crosswise numerous, geographically detached servers would create fast loading of web pages from perspective of user.

Minimize HTTP Requests: In internet (80%) the end-user response time around eighty is worn-out in front end itself that tied up to download every components corresponding to a page: scripts, images, lash, style sheets, etc. Dropping the components amount simultaneously declines the HTTP requests necessary in making page which is the key to earlier pages.

A method in reducing components amount in the page is to modify design of page. However is a way for building pages along the content that is richer in making up fast response times exists? Here exist few techniques to reduce HTTP requests number, even though until assisting designs in rich page. Combined files are a technique in reducing the HTTP requests number by associating every script into a solitary script and likewise associating every CSS into a sheet with single style. Associating files is highly difficult on varying scripts and style sheets from page to page, excluding creating current division of your process of release enhances time of response. Also cautious Image maps handling, Inline Images and CSS Sprites etc… would decline request of HTTP very much. Dropping HTTP requests amount in the web page is starting place which is highly significant guideline to improve website performance.

Avoid Redirects: Redirect tends to drop up the user experience and consumes time for server establishment. Once Insert is done to a redirect among user and HTML document holdup that is available in page because not anything in page could be provided and components cannot be downloaded awaiting arrival of document of HTML. Typically on linking an old web site to a new one is one more widespread usage for redirects. Others comprise linking various website parts and pointing the user depending on assured circumstances (type of browser, type of user account, etc.). Involving a pass on in connecting dual web sites is easy and demands small supplementary coding. Even though utilizing pass on in current condition drops developer's complexity that mortify experience of user.

Hypothesis: DNS functions as request and reply; i.e. to provide the IP address of the demanded domain name. Now in projected system usual role will be modified in some way. By using this way the web access time and network bottleneck will be vastly reduced. Also to implement this idea no additional jobs or DNS nature would not be disturbed. Here research criteria is, reply provided by DNS along with contacting server method after reply of DNS. While reply given by DNS this investigational work is projected and solutions were made. Here the general concept of the DNS is changed to

Existing DNS: Request → Reply

Proposed DNS: Request → Request

Proposed Reply for DNS: Request → Response (Virtual)

The above method is the simplest way of the proposal. Like this usual universal concepts would not conflict, on implementing would create the network to an intelligent/ gentle way.

HTTP request binding technique: Commonly client would create the HTTP request and it will do response. But by this way the DNS will contain GET ALL HTTP request string within it and application layer would connect HTTP request together with DNS respond. Usually DNS would reply IP of domain name that is requested; but procedure has been modified somewhat by connecting the HTTP request in location of reply of IP address.

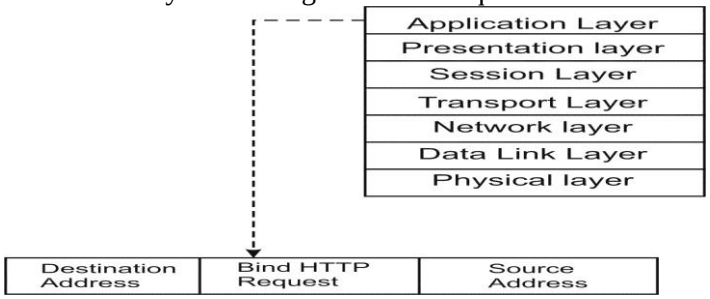

Fig. 2. Bind HTTP Request

Data link layer: Change made in improving web access is made with the Data Link Layer is Layer 2 of the seven-layer OSI model of computer networking, corresponding to, or is link layer part belonging to TCP/IP reference model. Protocol layer, which is a Data Link Layer which shifts data among neighboring nodes of network in an extensive area network or among nodes on the segment of similar local area network. Data Link Layer offers the practical and procedural way in transferring data among entities of network that would offer way of detecting and hopefully rectify errors which might takes place in the Physical Layer. Sub layers of the Data Link Layers are, a) Logical Link Control sub layer, b) Media Access Control sub layer.

Media Access Control: Media Access Control (MAC) data communication protocol sub-layer, referred to be the Medium Access Control, is a sub layer of the Data Link Layer particular in the seven-layer OSI model providing *addressing and channel access control mechanisms* making it promising for quite a few terminals or network nodes in communicating within a multi-point network, naturally a local area network (LAN) or metropolitan area network (MAN). Hardware which executes the MAC is known as a Medium Access Controller.

MAC sub-layer behaves like an interface among the Logical Link Control (LLC) sub layer and physical layer of network. MAC layer imitates a full-duplex logical communication channel in a multi-point network which might contribute multicast, unicast or broadcast service of communication.

Address Stamping: Address stamping is performed in the MAC layer level since here the DNS is an assistant to post the HTTP request for the client. According to the hypothesis the reply shared by the DNS is the investigational hook for enhancing the performance of web. In the address stamping technique the requester (client) Address (IP) would be stamped in the source address (IP) and in part of destination the DNS resource return address (IP) will be placed.

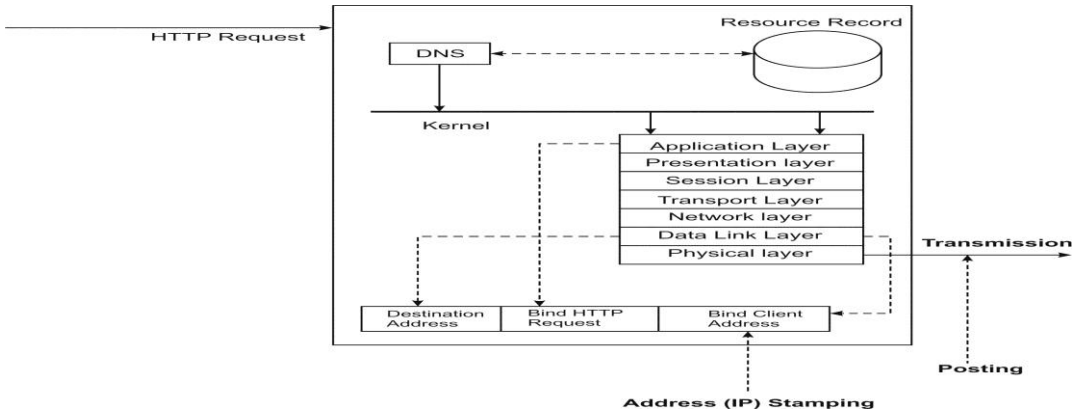

Fig.3.DNS Address Stamping

Source Address Stamping Algorithm: ALGORITHM Source_IP_Stamp (REQ_PACKETS)
ADDRESS →REQUEST_PACKETS.Address
REQ_PACKETS.HEADDER. Source. Address→ ADDRESS
PACKET → REQUEST_PACKETS.HEADDER + PACKETS

ENDSo when the packet delivered in the network it will travel to the Destination IP and the reply would straight forwardly prepared to the source IP (here the source is the client); In view of the fact that the source IP is stamped by the DNS MAC Layer when addressing is by the client as an alternative of the DNS address (IP). Similarly the DNS will receive the REQUEST and make a REQUEST, and virtually if the designation server makes a REPLY means the REPLY concept of the DNS will be achieved. Likewise the address of destination gets stamped by the MAC layer, the address of destination is the DNS resource record return IP address for the equivalent request of domain name.

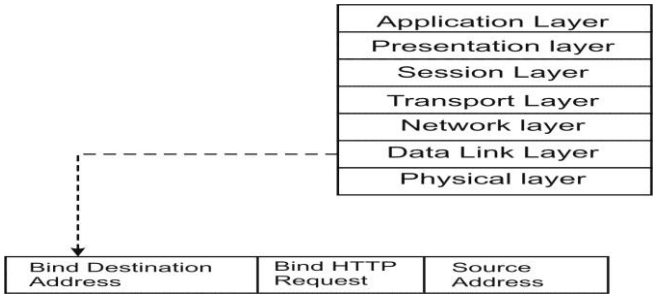

Fig.4.DNS Address Stamping

Destination Address Stamping Algorithm: ALGORITHM Destination_IP_Stamp (REQ_PACKETS)
ADDRESS →REQUEST_PACKETS.Address
REQUEST_PACKETS.HEADDER.Destination.Address→ ADDRESS
PACKET → REQUEST_PACKETS.HEADDER + PACKETS
END

Tunnel Mode Posting: The DNS have now stamped the source address (IP) and the destination address (IP) clearly by using the new technique. Now the data packets will be transmitted to the network, and now the packets can be identified by the source address and the destination address.

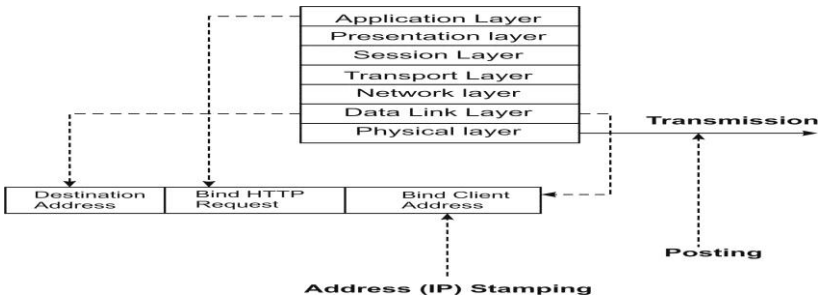

Fig. 5.DNS Address Stamping

In between this the DNS is an assistant for making communication. The DNS is just doing the reply process in another way that's all.

Overall Technique: Finally the new technique will look like the below Fig 6. First the client will make a HTTP request if finding the IP address now the DNS will take a look up as the existing technique available and retrieve the IP address of the domain name requested.

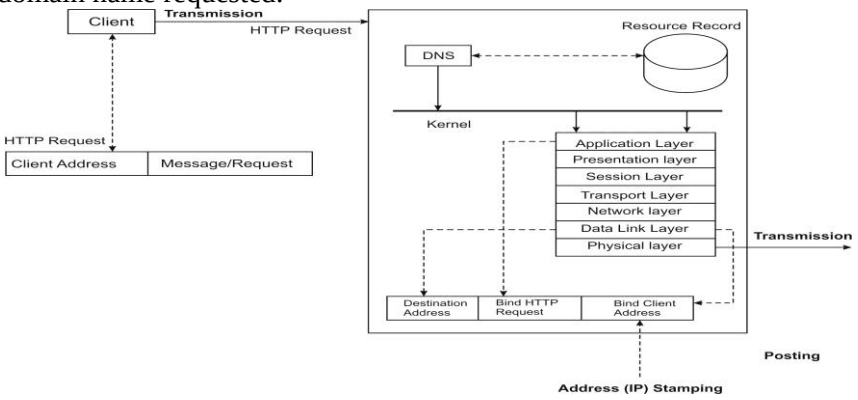

Fig. 7. New Technique

Then the DNS would perform the address stamping procedures and bind the HTTP request together with the reply.

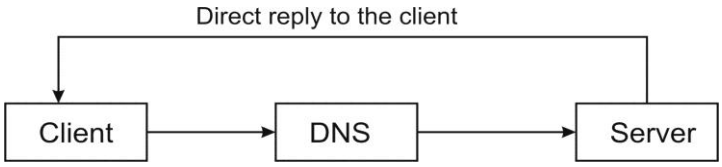

Fig. 6.Overall View

After that the reply exists is in HTTP request form that are performed by the client, later on nearing the server, the server would straight forwardly respond to the client.

ALGORITHM DNS_IP_STAMPING (REQ_PACKETS)
DNS_Resource_Return_IP→ SEARCH DNS.Resource_Record for REQUESTED DOMAIN Address
SOURCE_ADDRESS → REQ_PACKETS.ADDRESS
DESTINATION_ADDRESS →DNS.Resource_Record_RETURN_ADDRESS
PACKET.HEADDER.Source.Address→ SOURCE_ADDRESS
PACKET.HEADDER.Destination.Address→ DESTINATION_ADDRESS
PHYSICAL_Layer.DATA→DATALINK_Layer.PACKETS
END

Time Analysis

Steps in the Existing System: Time Taken for sending request/reply from

- Browser to DNS : say A→ 1
- DNS to Browser : say B→ 1
- Browser to Server : say C→ 1
- Server to Browser : say D→ 1

Therefore the total response time is

$\sum$ (Time) = $\sum$ (A+B+C+D) (1)

Time = A+B+C+D

Time =1+1+1+1 = 4

Proposed System Steps: Time Taken for sending request/reply from

- Browser to DNS : say A→ 1

- DNS to Server : say B→ 1
- Server to Browser : say C→ 1

Therefore the total response time is

∑ (Time) = ∑ (A+B+C) (2)

Time = A+B+C

Time =1+1+1 = 3

Fig.7.Time Analysis

2. CONCLUSION

Intelligent DNS Request Binding Technique has been planned to access web instantly, by analyzing the Response time required for the proposed technique is less than the existing system.

Advantages of the planned system.

- DNS would not deal any type of HTTP request
- However it would simply attach request on with regard to requester
- Additional reply and response would be performed by requester only
- So here the DNS functionality will not be distorted only reply to the browser will be denied and reply will be modified to a new type of request posting according to the need.

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