

Exploring DNS Security

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Abstract

The security of common internet protocols is an important issue when considering how to satisfy the requirements of security and privacy as technology becomes more integral to our daily lives. The components required to simulate a DNS lookup were implemented in Java. This simulation was used to attempt a common DNS cache poisoning attack, and explore methods for improving the security of DNS protocol.

I. INTRODUCTION

One of the most important requirements of any communication network, such as the internet or the United States Postal Service, is the ability to uniquely identify and locate participants of the network. This requirement is often met by assigning some form of address to participants: to determine the location to which an outgoing letter should be delivered, the sender must specify country of the recipient, what part of the country they live in, and finally the specific street/number combination at which the recipient resides. This system, however, was designed for human comprehension, and could be more concisely represented by numerical coordinates if readability was not an issue. A similar issue arises when considering the numerical Internet Protocol addresses (IP addresses) used to identify computers and resources connected to the internet: IP addresses are convenient for use in networking protocols, but are difficult for humans to memorize. The Domain Name System (DNS) is in place to allow individuals or companies to register readable domain names (www.google.com) that can be mapped to the IP addresses needed to locate certain computers on the network, and is fundamental to the functionality of the internet.

The specific DNS protocol we examine in this report is referred to as a client lookup, as

this protocol is vulnerable to an attack known as cache poisoning. A client lookup is initiated whenever an application on a client's computer sends a request that requires a domain name to be translated to an IP address. The application will first send a request to a domain name resolver, which will check its cache of recent lookups for a response to the request. If the cache contains an appropriate response, the resolver will return it to the sender of the request; if not, the resolver will send the request to the root name server. The root name server will check its cache, and either return a cached response, or tell the DNS resolver the location of the next name server it should query. This process is repeated until the resolver receives a final response, which it will cache and return to the client.

The ultimate goal of a cache poisoning attack is to trick the domain name resolver into caching an incorrect IP address, creating a false association between a domain name, like "www.google.com," and the location of the domain's servers. This in turn can divert users who try to visit the domain name in question to a malicious website. The process by which this attack is carried out begins with an attacker transmitting queries to the domain name resolver. The attacker then sends responses to the resolver that ordinarily come from name servers, but these responses have IP addresses that do not correspond to the domain name

requested. The resolver will accept and cache these responses. Anyone who attempts to visit domains with compromised IP's before the cached responses expire will be directed to a computer of the attacker's choice.

II. IMPLEMENTATION

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Text requiring further explanation¹.

III. RESULTS

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¹Example footnote

Table 1: Example table

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First name	Last Name	Grade
John	Doe	7.5
Richard	Miles	2

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IV. DISCUSSION

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ii. Subsection Two

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REFERENCES

- [Figueredo and Wolf, 2009] Figueredo, A. J. and Wolf, P. S. A. (2009). Assortative pairing and life history strategy - a cross-cultural study. *Human Nature*, 20:317–330.