CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

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Project Number

S1221

Project Title

Internetworking between Private Servers: Transparent Reverse Network Address Translation

Abstract

Objectives/Goals

This project created and tested a method to transparently route Internet Protocol (IP) traffic from the public Internet to hosts behind a network address translator (NAT). Most homes and businesses have a single public IP address, behind which sits an entire private network. When an unsolicited IP message is received at the public address, it is not currently possible to determine which of the many computers behind this public address to forward the message to.

Methods/Materials

To perform testing, a network was set up. There was a private segment and a public segment, with a NAT router in between. A program was designed and written that setup temporary connection paths through the NAT router. The novel aspect is that the destination is deduced just-in-time through the use of DNS hints. Six standard applications used to test the effectiveness of the program: SSH, telnet, VNC, WWW, SMTP, and NTP.

Results

A novel approach was discovered to dynamically determine which of the many private hosts a NAT should forward unsolicited requests from the Internet. This is accomplished transparently, meaning that existing applications are unaware that any reverse NAT is occurring. This has many practical applications, including replacing corporate VPNs, file transfers, or setting up public game servers. Best of all, this method is the simplest and easiest method to provide access for system administrators on the public internet who maintain remote computers on a business' private network.

Conclusions/Discussion

The trick here is to know which machine to send the request to. This is the first time this has been done using a general-purpose method. This method was successfully tested a second time, rewritten for industry standard Cisco routing equipment instead of an open-source Linux router proving its broad applicability.

Summary Statement

An algorithm for performing transparent Internet access to private networks.

Help Received

Parents helped review writings; Father mentored in understanding of network technology and issues.