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Welcome,

Welcome to Case Communications first Newsletter of 2007. We wish all of our readers a prosperous New Year and look forward to bringing you interesting and amusing news, and articles over the next twelve months.

Survey reveals more businesses moving to Linux

According to research carried out by Saugatuck Technology and Business Week Research Services, twenty five percent of enterprises will be running mission-critical business applications on Linux platforms by 2009.

[More]

Fedora Linux support comes to an end

Support for the Fedora Linux distribution is being wound down.

[More]

new group forms to promote 'Open-Source' software in mobile devices

A new group has formed with the goal of creating an 'Open-Source' platform for mobile phone, and this month they announed the name of their foundation as the 'LiMO Foundation'

[More]

HP Making higher margins from Open Source in some cases.

HP Claims higher margins from 'Open-Source' than proprietary software in some cases, due to the support costs associated with migration.
[More]

An Overview of Linux IP tables Firewall

The Linux application IP Tables provides a very powerful firewalls and is present in most Linux based Routers. This techncial takes look at IP tables and how they work within our routers.

[More]

Microsoft is struggling to make an impact on the 'Search Engine' marketplace.

Microsofts Financial Chief reported on Thursday that he is 'not happy' with their continuing to loose marketshare in the search engine business to industry rival Google.
[More]

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Survey reveals more businesses moving to Linux

According to research carried out by Saugatuck Technology and Business Week Research Services, twenty five percent of enterprises will be running mission-critical business applications on Linux platforms by 2009.

The survey took acocunt of more than 130 firms and also found that 45% of the enterprises plan to be using Linux to run critical applications by 2011. By the end of 2007 18% will be using Linux for key applications. Saugatuck said take up of Linux and Open-Source software had now reached critical mass.

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Fedora Linux support comes to an end

The volunteers supporting the software, posted a notice on the Fedora site saying "The current model for supporting maintenance distributions is being re-examined. In the meantime, we are unable to extend support to older Fedora Core releases as we had planned."

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New group forms to promote 'Open-Source' software in mobile devices

The group to be know as the Limo Foundations was originally formed six months ago with the goal of creating an ‘Open-Source; platform for mobile phones. Its members include Motorola, NEC, Panasonic Mobile Communications, Saumsung electronics, NTT DoCoMo and Vodafone

The LiMo Foundation should not be confused with an organisation called LiPS (Linux Phone Standards), which boasts participants such as manufatcurers Texas Instruments, ZTE and Freescale, operators France Telecom (owners of Orange), Telecom Italia and Software vendors Trolltech, Palmsource Inc and Mc Afee

With a similar goal to the LipS Forum, the goal of the not-for-profit LiMO Foundation is to blend scalability with the best development practices from the mobile community to create an innovative new busines smodel, “According to a statement issued in January 2007.

The foundation intends to do this by providing an API specification, architecture, references to an open-source code, new source code-based reference implementation components and specifications for referenced third party software.

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HP Making higher margins from Open Source in some cases.

HP's open source and Linux chief technology officer Bdale Garbee said that open source margins are sometimes higher than for Microsoft-based solutions. "In some cases, the margin can be greater to us because we can provide a more complete solution to customers," said Garbee, speaking at the LinuxWorld event in London.

Garbee went on to say that organisations that migrate to open source from a primarily Microsoft environment might need more training and support.

While much has been made of the cost-savings associated with open source software, the news that HP could be realising greater profits from the technology will add to the debate on the true cost of ownership of open source.

However, Garbee added that organisations which have skills in Unix could often pick up the necessary skills. "A lot of the fundamental skills for managing a Unix environment apply very well to the Linux platform, because Linux is like Unix in many ways," he said.

Despite the benefits, persuading an organisation to adopt open source often takes a lot of effort on HP's part, Garbee admitted.

"The sales and procurement cycles are long: it's usually a major technology overhaul to decide whether it is technically feasible and to review processes," he said. "But the revenue has a long tail as well. HP can afford to invest and pursue longer life cycle projects, which some of the smaller vendors can't afford to do."

HP is urging businesses to embrace open source, claiming the market for non-proprietary standards is growing fast.

"Interest in Linux is rampant," Garbee enthused. "Everyone is at least looking at it. Interest is very broad," he said, adding that the telecoms sector and governments were particularly interested.

HP's success in the public sector has been relatively muted so far and the company is unable to name any UK government organisations which have purchased its open source offerings.

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An Overview of Linux IP tables Firewall

Introduction

Prior to iptables, the predominant software packages for creating Linux firewalls were I'PChains' in Linux 2.2 and ipfwadm in Linux 2.0, which in turn was based on BSD's ipfw. Both ipchains and ipfwadm alter the networking code so they could manipulate packets, as there was no general packet-control framework until netfilter. Iptables preserves the basic ideas introduced into Linux with ipfwadm: lists of rules which each specified what to match within a packet, and what to do with such a packet. ipchains added the concept of chains of rules, and iptables extended this further into tables: one table was consulted when deciding whether to NAT a packet, and another consulted when deciding how to filter a packet. In addition, the three points at which filtering is done in a packet's journey were altered, so any packet only passes through one filtering point. Whereas ipchains and ipfwadm combine packet filtering and NAT (particularly three specific kinds of NATmasquerading, port forwarding and redirection), netflter makes it possible to separate packet operations into three parts: packet filtering, connection tracking, and Network Address Translation. Each part connects to the netfilter hooks at different points to access packets. The connection tracking and NAT subsystems are more general and more powerful than the stunted versions within ipchains and ipfwadm.
This split allowed iptables, in turn, to use the information which the connection tracking layer had determined about a packet: this information was previously tied to NAT. This makes iptables superior to ipchains because it has the ability to monitor the state of a connection and redirect, modify or stop data packets based on the state of the connection, not just on the source, destination or data content of the packet.

Stateful Firewall

A firewall using iptables this way is said to be a Stateful Firewall versus ipchains, which can only create a 'Stateless Firewall' (except in very limited cases). It can be said that ipchains is not aware of the full context from which a data packet arises, whereas iptables is, and therefore iptables can make better decisions on the fate of packets and connections. Iptables, the NAT subsystem and the connection tracking subsystem are also extensible, and many extensions are included in the base iptables package, such as the iptables extension which allows querying of the connection state mentioned above. Additional extensions are distributed alongside the iptables utility, as patches to the kernel Source Code along with a patch tool called patch-o-matic. A version of iptables for IPv6 was written, called ip6tables after the name of the administration tool.

Operational Summary

The netfilter framework allows the System Administrator to define rules for how to deal with network packets. Rules are grouped into chains—each chain is an ordered list of rules. Chains are grouped into tables—each table is associated with a different kind of packet processing. Each rule contains a specification of which packets match it and a target that specifies what to do with the packet if it is matched by that rule. Every network packet arriving at or leaving from the computer traverses at least one chain, and each rule on that chain attempts to match the packet. If the rule matches the packet, the traversal stops, and the rule's target dictates what to do with the packet. If a packet reaches the end of a predefined chain without being matched by any rule on the chain, the chain's policy target dictates what to do with the packet. If a packet reaches the end of a user-defined chain without being matched by any rule on the chain or the user-defined chain is empty, traversal continues on the calling chain (implicit target RETURN). Only predefined chains have policies. Rules in iptables are grouped into chains. A chain is a set of rules for IP packets, determining what to do with them. Each rule can possibly dump the packet out of the chain (short-circuit), and further chains are not considered. A chain may contain a link to another chain - if either the packet passes through that entire chain or matches a RETURN target rule it will continue in the first chain. There is no limit to how nested chains can be. There are three basic chains (INPUT, OUTPUT, and FORWARD), and the user can create as many as desired. A rule can merely be a pointer to a chain.

TABLES

There are three built-in tables, each of which contains some predefined chains. It is possible for extension modules to create new tables. The administrator can create and delete user-defined chains within any table. Initially, all chains are empty and have a policy target that allows all packets to pass without being blocked or altered in any fashion.

- **FILTER TABLE**— This table is responsible for filtering (blocking or permitting a packet to proceed). Every packet passes through the filter table. It contains the following predefined chains, and any packet will pass through one of them:

  INPUT chain — All packets destined for this system go through this chain (hence sometimes referred to as *LOCAL_INPUT*)

  OUTPUT chain — All packets created by this system go through this chain (aka. *LOCAL_OUTPUT*)

  FORWARD chain — All packets merely passing through the system (being routed go through this chain.

- **NAT TABLE** — This table is responsible for setting up the rules for rewriting packet addresses or ports. The first packet in any connection passes through this table: any verdicts here determine how all packets in that connection will be rewritten. It contains the following predefined chains:

  PREROUTING chain — Incoming packets pass through this chain before the local routing table is consulted, primarily for DNAT (destination-NAT).

  POSTROUTING chain — Outgoing packets pass through this chain after the routing decision has been made, primarily for SNAT (source- NAT)

OUTPUT chain — Allows limited DNAT on locally-generated packets

- **MANGLE TABLE**— This table is responsible for adjusting packet options, such as 'Quality of Service' . All packets pass through this table. Because it is designed for advanced effects, it contains all the possible predefined chains:

PREROUTING chain — All packets entering the system in any way, before routing decides whether the packet is to be forwarded (FORWARD chain) or is destined locally (INPUT chain).

INPUT chain — All packets destined for this system go through this chain

FORWARD chain — All packets merely passing through the system go through this chain.

OUTPUT chain — All packets created by this system go through this chain

POSTROUTING chain — All packets leaving the system go through this chain.

In addition to the built-in chains, the user can create any number of user-defined chains within each table, which allows them to group rules logically.

Each chain contains a list of rules. When a packet is sent to a chain, it is compared against each rule in the chain in order. The rule specifies what properties the packet must have for the rule to match, such as the port number or IP Address. If the rule does not match then processing continues with the next rule. If, however, the rule does match the packet, then the rule's *target* instructions are followed (and further processing of the chain is usually aborted). Some packet properties can only be examined in certain chains (for example, the outgoing network interface is not valid in the INPUT chain). Some targets can only be used in certain chains, and/or certain tables (for example, the *SNAT* target can only be used in the POSTROUTING chain of the nat table).

Rule Targets

The target of a rule can be the name of a user-defined chain or one of the built-in targets `ACCEPT`, `DROP`, `QUEUE`, or `RETURN`. When a target is the name of a user-defined chain, the packet is diverted to that chain for processing (much like a Subroutine call in a programming language). If the packet makes it through the user-defined chain without being acted upon by one of the rules in that chain, processing of the packet resumes where it left off in the current chain. These inter-chain calls can be nested to an arbitrary depth.

The following built-in targets exist:

ACCEPT

This target causes netfilter to accept the packet. What this means depends on which chain is doing the accepting. For instance, a packet that is accepted on the INPUT chain is allowed to be received by the host, a packet that is accepted on the OUTPUT chain is allowed to leave the host, and a packet that is accepted on the FORWARD chain is allowed to be routed through the host.

DROP

This target causes netfilter to drop the packet without any further processing. The packet simply disappears without any indication of the fact that it was dropped being given to the sending host or application. This frequently appears to the sender as a communication timeout, which can cause confusion (though dropping undesirable inbound packets is often considered a good security policy, because it gives no indication to a potential attacker that your host even exists).

QUEUE

This target causes the packet to be sent to a queue in user space. An application can use the libipq library, which also is part of the netfilter/iptables project, to alter the packet. If there is no application that reads the queue, this target is equal to DROP.

RETURN

According to the official netfilter documentation, this target has the same effect of falling off the end of a chain: for a rule in a built-in chain, the policy of the chain is executed. For a rule in a user-defined chain, the traversal continues at the previous chain, just after the rule which jumped to this chain.

There are many extension targets available. Some of the most common ones are:

REJECT

This target has the same effect as 'DROP' except that it sends an error packet back to the original sender. It is mainly used in the INPUT or FORWARD chains of the filter table. The type of packet can be controlled thorough the '--reject-with' parameter. A rejection packet can explicitly state that the connection has been filtered (an ICMP connection-administratively-filtered packet), though most users prefer that the packet will simply state that the computer does not accept that type of connection (such packet will be a tcp-reset packet for denied TCP connections, an icmp-port-unreachable for denied udp sessions or an icmp-protocol-unreachable for non-tcp non-udp packets). If the '--reject-with' parameter hasn't been specified, the default rejection packet is always icmp-port-unreachable.

LOG

This target logs the packet. This can be used in any chain in any table, and is often used for debugging (such as to see which packets are being dropped).

DNAT

This target causes the packet's destination address (and optionally port) to be rewritten for Network Address Translation. The '--to-destination' flag must be supplied to indicate the destination to use. This is only valid in the OUTPUT and PREROUTING chains within the nat table. This decision is remembered for all future packets which belong to the same connection, and replies will have their source address and port changed back to the original (ie. the reverse of this packet).

SNAT

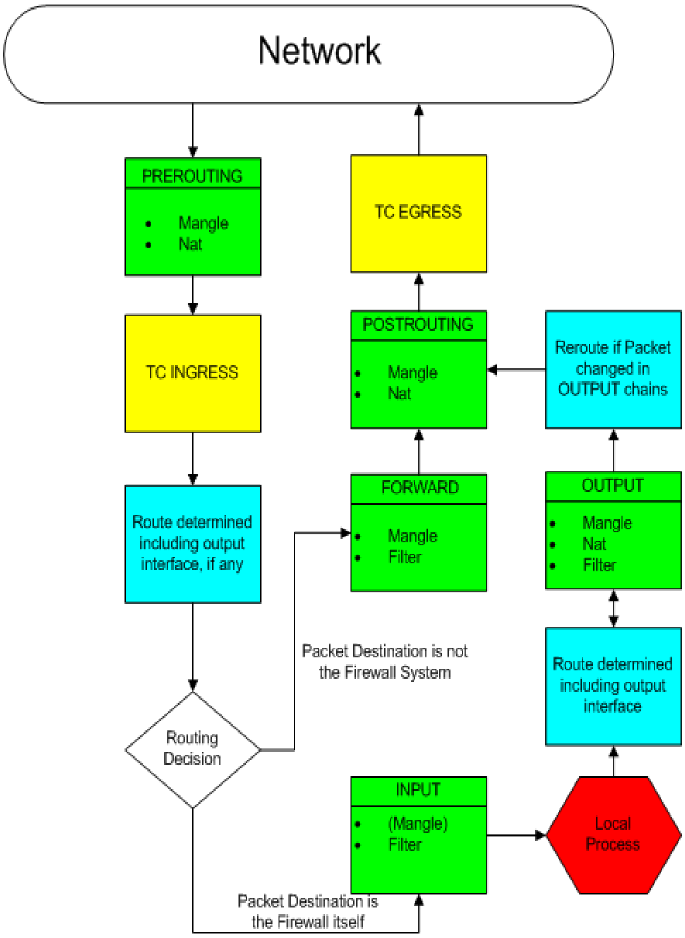
This target causes the packet's source address (and optionally port) to be rewritten for Network Address Translation.The '--to-source' flag must be supplied to indicate the source to use. This is only valid in the POSTROUTING chain within the nat table, and like DNAT, is remembered for all other packets belonging to the same connection.

MASQUERADE

This is a special, restricted form of SNAT for dynamic IP addresses, such as most ISPs (Internet Service Providers) provide for Modems or DSL users. Rather than change the SNAT rule every time the IP address changes, this calculates the source IP address to NAT to by looking at the IP address of the outgoing interface when a packet matches this rule. In addition, it remembers which connections used MASQUERADE, and if the interface address changes (such as reconnecting to the ISP), all connections NATted to the old address are forgotten.

Diagrams

To better understand how a packet traverses the kernel netfilter tables/chains you may find this diagram useful:


Network
PREROUTING
Mangle
Nat
TC EGRESS
TC INGRESS
POSTROUTING
Mangle
Nat
Reroute if Packet changed in OUTPUT chains
Route determined including output interface, if any
FORWARD
Mangle
Filter
OUTPUT
Mangle
Nat
Filter
Packet Destination is not the Firewall System
Route determined including output interface
Routing Decision
INPUT
(Mangle)
Filter
Local Process
Packet Destination is the Firewall itself

Netfilter Packet Flow

Connection tracking

One of the important features built on top of the netfilter framework is connection tracking. Connection tracking allows the kernel to keep track of all logical network connections or sessions, and thereby relate all of the packets which may make up that connection. NAT relies on this information to translate all related packets in the same way, and iptables can use this information to act as a stateful firewall.

Connection tracking classifies each packet as being in of our states: NEW (trying to create a new connection), ESTABLISHED (part of an already-existing connection), RELATED (related to, but not actually part of an existing connection) or INVALID (not part of an existing connection, and unable to create a new connection). A normal example would be that the first packet the firewall sees will be classified NEW , the reply would be classified ESTABISHED and an ICMP error would be RELATED. An ICMP error packet which did not match any known connection would be INVALID.

The connection state is completely independent of any *TCP state*. If the host answers with a SYN ACK packet to acknowledge a new incoming TCP connection, the TCP connection itself is not yet established but the tracked connection is - this packet will match the state ESTABLISHED.

A tracked connection of a *stateless protocol* like UDP nevertheless has a connection state.

Furthermore, through the use of plugin modules, connection tracking can be given knowledge of application layer protocols and thus understand that two or more distinct connections are "related". For example, consider the FTP protocol. A control connection is established, but whenever data is transferred, a separate connection is established to transfer it. When the ip_conntrack_ftp module is loaded, the first packet of an FTP data connection will be classified `RELATED` instead of `NEW`, as it is logically part of an existing connection.

iptables can use the connection tracking information to make packet filtering rules more powerful and easier to manage. The "state" extension allows iptables rules to examine the connection tracking classification for a packet. For example, one rule might allow `NEW` packets only from inside the firewall to outside, but allow `RELATED` and `ESTABLISHED` in either direction. This allows normal reply packets from the outside (`ESTABLISHED`), but does not allow new connections to come from the outside to the inside. However, if an FTP data connection needs to come from outside the firewall to the inside, it will be allowed, because the packet will be correctly classified as `RELATED` to the FTP control connection, rather than a `NEW` connection.

IP Tables.

iptables is a user space application program that allows a system administrator to configure the netfilter tables, chains, and rules (described above). Because iptables requires elevated privileges to operate, it must be executed by user root, otherwise it fails to function. On most Linux systems, iptables is installed as /sbin/iptables. The detailed syntax of the iptables command is documented in its man page, which can be displayed by typing the command "man iptables".

Common options

In each of the iptables invocation forms shown below, the following common options are available:

`-t` *table* - Makes the command apply to the specified *`table`*. When this option is omitted, the command applies to the *filter* table by default.

`-v` - Produces verbose outputs

`-n` - Produces numeric output (i.e., port numbers instead of service names, and IP addresses instead of domain names)

`--line-numbers`

When listing rules, add line numbers to the beginning of each rule, corresponding to that rule's position in its chain.

Rule-specifications

Most iptables command forms require you to provide a rule-specification, which is used to match a particular subset of the network packet traffic being processed by a chain. The rule-specification also includes a target that specifies what to do with packets that are matched by the rule. The following options are used (frequently in combination with each other) to create a rule-specification.

Specifies the target of a rule. The target is either the name of a user-defined chain (created using the `-N` option), one of the built-in targets, `ACCEPT`, `DROP`, `QUEUE`, or `RETURN`, or an extension target, such as `REJECT`, `LOG`, `DNAT`, or `SNAT`. If this option is omitted in a rule, then matching the rule will have no effect on a packet's fate, but the counters on the rule will be incremented.

`-i [!]` *in-interface*
`--in-interface [!]` *in-interface*

Name of an interface via which a packet is going to be received (only for packets entering the INPUT, FORWARD and PREROUTING chains). When the '!' argument is used before the interface name, the sense is inverted. If the interface name ends in a '+', then any interface which begins with this name will match. If this option is omitted, any interface name will match.

`-o [!]` *out-interface*
`--out-interface [!]` *out-interface*

Name of an interface via which a packet is going to be sent (for packets entering the FORWARD, OUTPUT and POSTROUTING chains). When the '!' argument is used before the interface name, the sense is inverted. If the interface name ends in a '+', then any interface which begins with this name will match. If this option is omitted, any interface name will match. of all the valid protocols could be found in the file /etc/protocols.

`-s [!]` *source*`[/`*prefix*`]`
`--source [!]` *source*`[/`*prefix*`]`

Matches IP packets coming from the specified source address. The source address can be an IP address, an IP address with associated network prefix, or a hostname. If '!' precedes the source, this matches all packets that are not coming from the specified source.

`-d [!]` *destination*`[/`*prefix*`]`
`--destination [!]` *destination*`[/`*prefix*`]`

Matches IP packets going to the specified destination address. The destination address can be an IP address, an IP address with associated network prefix, or a hostname. If '!' precedes the destination, this matches all packets that are not going to the specified destination.

`--destination-port [!] [`*port*`:`*port*
`--dport [!] [`*port*`:`*port*

Matches TCP or UDP packets (depending on the argument to the `-p` option) destined for the specified port or the range of ports (when the *port*`:`*port* form is used). If '!' precedes the port specification, this matches all TCP or UDP packets not destined for the specified port or port range.

`--source-port [!] [`*port*`:`*port*
`--sport [!] [`*port*`:`*port*

Matches TCP or UDP packets (depending on the argument to the `-p` option) coming from the specified port or the range of ports (when the *port*:*port* form is used). If '!' precedes the port specification, this matches all TCP or UDP packets not coming from the specified port or port range.

--tcp-flags [!] *mask comp*

Matches TCP packets having certain TCP protocol flags set or unset. The first argument specified the flags to be examined in each TCP packet, written as a comma-separated list (no spaces allowed). The second argument is a comma-separated list of flags which must be set within those that are examined. The flags are: SYN, ACK, FIN, RST, URG, PSH, ALL, and NONE. Hence, the option "`--tcp-flags SYN,ACK,FIN,RST SYN`" will only match packets with the SYN flag set and the ACK, FIN and RST flags unset.

--tcp-flags [!] mask comp

Matches TCP packets having certain TCP protocol flags set or unset. The first argument specified the flags to be examined in each TCP packet, written as a comma-separated list (no spaces allowed). The second argument is a comma-separated list of flags which must be set within those that are examined. The flags are: SYN, ACK, FIN, RST, URG, PSH, ALL, and NONE. Hence, the option "--tcp-flags SYN,ACK,FIN,RST SYN" will only match packets with the SYN flag set and the ACK, FIN and RST flags unset.

[!] --syn

Matches TCP packets having the SYN flag set and the ACK,RST and FIN flags unset. Such packets are used to initiate TCP connections. Blocking such packets on the INPUT chain will prevent incoming TCP connections, but outgoing TCP connections will be unaffected. This option can be combined with others, such as --source to block or allow inbound TCP connections only from certain hosts or networks. This option is equivalent to "--tcp-flags SYN,RST,ACK SYN". If the '!' flag precedes the --syn, the sense of the option is inverted.

Summary

IP Tables provides a powerful and flexible Firewall facility for communications equipment, whats more most vendors that provide Linux based routers provide IP Tables free of charge. Do we really need to invest additional money of a third party Firewall?

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Microsoft is struggling to make an impact on the 'Search Engine' marketplace.

Microsoft has said that its Internet services business will produce less sales growth over the next two quarters than the company had previously forecast.

Where it once forecast that revenue might grow by as much as 11 percent, the company now sees full-year sales growth in its Internet services business of just 3 percent to 8 percent.

Technology Business Research analyst Allan Krans said "Success continues to elude Microsoft in this market," in an e-mail interview. He went on to say that Microsoft is hardly alone, with other rivals also struggling to keep pace with Google.

"Given Google's large head start in the market and its ongoing momentum, we think it will be very difficult for Microsoft to have a real impact in the online search market during 2007," Krans said. "However, Microsoft continues to take a long-term approach to this market, and plans to keep the investment dollars flowing into its ad business."