FirewallD is frontend controller for iptables used to implement persistent network traffic rules. It provides command line and graphical interfaces and is available in the repositories of most Linux distributions. Working with FirewallD has two main differences compared to directly controlling iptables:

1. FirewallD uses *zones* and *services* instead of chain and rules.
2. It manages rulesets dynamically, allowing updates without breaking existing sessions and connections.

Note
FirewallD is a wrapper for iptables to allow easier management of iptables rules–it is **not** an iptables replacement. While iptables commands are still available to FirewallD, it's recommended to use only FirewallD commands with FirewallD.

This guide will introduce you to FirewallD, its notions of zones and services, and show you some basic configuration steps.

Installing and Managing FirewallD

FirewallD is included by default with CentOS 7 but it's inactive. Controlling it is the same as with other systemd units.

1. To start the service and enable FirewallD on boot:

```
sudo systemctl start firewalld
sudo systemctl enable firewalld
```

   To stop and disable it:

```
sudo systemctl stop firewalld
sudo systemctl disable firewalld
```

4. Check the firewall status. The output should say either `running` or `not running`.

```
sudo firewall-cmd --state
```

6. To view the status of the FirewallD daemon:

```
sudo systemctl status firewalld
```

   Example output:

```
firewalld.service - firewalld - dynamic firewall daemon
 Loaded: loaded (/usr/lib/systemd/system/firewalld.service; enabled; vendor preset:
enabled)
 Active: active (running) since Thu 2019-08-08 15:11:24 IST; 23h ago
   Docs: man:firewalld(1)
 Main PID: 2577 (firewalld)
 CGroup: /system.slice/firewalld.service
         └─2577 /usr/bin/python -Es /usr/sbin/firewalld --nofork --nopid
```

8. To reload a FirewallD configuration:

```
sudo firewall-cmd --reload
```

Configuring FirewallD

Firewalld is configured with XML files. Except for very specific configurations, you won't have to deal with them and **firewall-cmd** should be used instead.
Configuration files are located in two directories:

- `/usr/lib/FirewallD` holds default configurations like default zones and common services. Avoid updating them because those files will be overwritten by each firewalld package update.
- `/etc/firewalld` holds system configuration files. These files will overwrite a default configuration.

Configuration Sets

Firewalld uses two *configuration sets*: Runtime and Permanent. Runtime configuration changes are not retained on reboot or upon restarting FirewallD whereas permanent changes are not applied to a running system.
By default, `firewall-cmd` commands apply to runtime configuration but using the `--permanent` flag will establish a persistent configuration. To add and activate a permanent rule, you can use one of two methods.

1. Add the rule to both the permanent and runtime sets.

```
2. sudo firewall-cmd --zone=public --add-service=http --permanent
3. sudo firewall-cmd --zone=public --add-service=http
```

4. Add the rule to the permanent set and reload FirewallD.

```
5. sudo firewall-cmd --zone=public --add-service=http --permanent
6. sudo firewall-cmd --reload
```

> **Note**
> The reload command drops all runtime configurations and applies a permanent configuration. Because firewalld manages the ruleset dynamically, it won't break an existing connection and session.

Firewall Zones

Zones are pre-constructed rulesets for various trust levels you would likely have for a given location or scenario (e.g. home, public, trusted, etc.).
Different zones allow different network services and incoming traffic types while denying everything else. After enabling FirewallD for the first time, *Public* will be the default zone.
Zones can also be applied to different network interfaces. For example, with separate interfaces for both an internal network and the Internet, you can allow DHCP on an internal zone but only HTTP and SSH on external zone. Any interface not explicitly set to a specific zone will be attached to the default zone.

To view the default zone:

```
sudo firewall-cmd --get-default-zone
```

To change the default zone:

```
sudo firewall-cmd --set-default-zone=internal
```

To see the zones used by your network interface(s):

```
sudo firewall-cmd --get-active-zones
```

Example output:

```
public
  interfaces: eth0
```

To get all configurations for a specific zone:

```
sudo firewall-cmd --zone=public --list-all
```

Example output:

```
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: eth0
  sources:
  services: ssh dhcpv6-client http
  ports: 12345/tcp
  protocols:
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
```

To get all configurations for all zones:

```
sudo firewall-cmd --list-all-zones
```

Example output:

```
trusted
 target: ACCEPT
 icmp-block-inversion: no
 interfaces:
 sources:
 services:
 ports:
 protocols:
 masquerade: no
 forward-ports:
 source-ports:
 icmp-blocks:
 rich rules:

...

work
  target: default
  icmp-block-inversion: no
  interfaces:
  sources:
  services: ssh dhcpv6-client
  ports:
  protocols:
  masquerade: no
  forward-ports:
```

```
  source-ports:
  icmp-blocks:
  rich rules:
```

Working with Services

FirewallD can allow traffic based on predefined rules for specific network services. You can create your own custom service rules and add them to any zone. The configuration files for the default supported services are located at `/usr/lib/firewalld/services` and user-created service files would be in `/etc/firewalld/services`.

To view the default available services:

```
sudo firewall-cmd --get-services
```

As an example, to enable or disable the HTTP service:

```
sudo firewall-cmd --zone=public --add-service=http --permanent
sudo firewall-cmd --zone=public --remove-service=http --permanent
```

Allowing or Denying an Arbitrary Port/Protocol

As an example: Allow or disable TCP traffic on port 12345.

```
sudo firewall-cmd --zone=public --add-port=12345/tcp --permanent
sudo firewall-cmd --zone=public --remove-port=12345/tcp --permanent
```

Port Forwarding

The example rule below forwards traffic from port 80 to port 12345 on **the same server**.

```
sudo firewall-cmd --zone="public" --add-forward-port=port=80:proto=tcp:toport=12345
```

To forward a port to **a different server**:

1. Activate masquerade in the desired zone.

```
2. sudo firewall-cmd --zone=public --add-masquerade
```

3. Add the forward rule. This example forwards traffic from local port 80 to port 8080 on *a remote server* located at the IP address: 198.51.100.0.

```
4. sudo firewall-cmd --zone="public" --add-forward-port=port=80:proto=tcp:toport=8080:
   toaddr=198.51.100.0
```

To remove the rules, substitute `--add` with `--remove`. For example:

```
sudo firewall-cmd --zone=public --remove-masquerade
```

Constructing a Ruleset with FirewallD

As an example, here is how you would use FirewallD to assign basic rules to your Linode if you were running a web server.

1. Assign the *dmz* zone as the default zone to eth0. Of the default zones offered, dmz (demilitarized zone) is the most desirable to start with for this application because it allows only SSH and ICMP.

```
2. sudo firewall-cmd --set-default-zone=dmz
3. sudo firewall-cmd --zone=dmz --add-interface=eth0
```

4. Add permanent service rules for HTTP and HTTPS to the dmz zone:

```
5. sudo firewall-cmd --zone=dmz --add-service=http --permanent
6. sudo firewall-cmd --zone=dmz --add-service=https --permanent
```

7. Reload FirewallD so the rules take effect immediately:

```
8. sudo firewall-cmd --reload
```

If you now run `firewall-cmd --zone=dmz --list-all`, this should be the output:

```
dmz (default)
  interfaces: eth0
  sources:
  services: http https ssh
  ports:
  masquerade: no
  forward-ports:
  icmp-blocks:
  rich rules:
```

This tells us that the **dmz** zone is our **default** which applies to the **eth0 interface**, all network **sources** and **ports**. Incoming HTTP (port 80), HTTPS (port 443) and SSH (port 22) traffic is allowed and since there are no restrictions on IP versioning, this will apply to both IPv4 and IPv6. **Masquerading** and **port forwarding** are not allowed. We have no **ICMP blocks**, so ICMP traffic is fully allowed, and no **rich rules**. All outgoing traffic is allowed.

Advanced Configuration

Services and ports are fine for basic configuration but may be too limiting for advanced scenarios. Rich Rules and Direct Interface allow you to add fully custom firewall rules to any zone for any port, protocol, address and action.

Rich Rules

Rich rules syntax is extensive but fully documented in the firewalld.richlanguage(5) man page (or see `man firewalld.richlanguage` in your terminal). Use `--add-rich-rule`, `--list-rich-rules` and `--remove-rich-rule` with firewall-cmd command to manage them.
Here are some common examples:

Allow all IPv4 traffic from host 192.0.2.0.

```
sudo firewall-cmd --zone=public --add-rich-rule 'rule family="ipv4" source address=192.0.2.
0 accept'
```

Deny IPv4 traffic over TCP from host 192.0.2.0 to port 22.

```
sudo firewall-cmd --zone=public --add-rich-rule 'rule family="ipv4" source address="192.0.2
.0" port port=22 protocol=tcp reject'
```

Allow IPv4 traffic over TCP from host 192.0.2.0 to port 80, and forward it locally to port 6532.

```
sudo firewall-cmd --zone=public --add-rich-rule 'rule family=ipv4 source address=192.0.2.0
forward-port port=80 protocol=tcp to-port=6532'
```

Forward all IPv4 traffic on port 80 to port 8080 on host 198.51.100.0 (masquerade should be active on the zone).

```
sudo firewall-cmd --zone=public --add-rich-rule 'rule family=ipv4 forward-port port=80 prot
ocol=tcp to-port=8080 to-addr=198.51.100.0'
```

To list your current Rich Rules in the public zone:

```
sudo firewall-cmd --zone=public --list-rich-rules
```

iptables Direct Interface

For the most advanced usage, or for iptables experts, FirewallD provides a direct interface that allows you to pass raw iptables commands to it. Direct Interface rules are not persistent unless the `--permanent` is used.
To see all custom chains or rules added to FirewallD:

```
firewall-cmd --direct --get-all-chains
firewall-cmd --direct --get-all-rules
```

Discussing iptables syntax details goes beyond the scope of this guide. If you want to learn more, you can review our iptables guide.

Iptables

iptables is an application that allows users to configure specific rules that will be enforced by the kernel's netfilter framework. It acts as a packet filter and firewall that examines and directs traffic based on port, protocol and other criteria. This guide will focus on the configuration and application of iptables rulesets and will provide examples of ways they are commonly used.

By default, the iptables tool is included with your Linode-supplied distribution. In order to use iptables, you will need root (sudo) privileges.

Use Linux iptables to Manage IPv4 Traffic

The iptables Command

Many options can be used with the iptables command. As stated above, iptables sets the rules that control network traffic. You can define different tables to handle these rules through chains, lists of rules that match a subset of packets. The table contains a variety of built-in chains, but you can add your own.

Basic iptables Parameters and Syntax

Before we begin creating rules, let's review the syntax of an iptables rule.

For example, the following command adds a rule to the beginning of the chain that will drop all packets from the address 198.51.100.0:

iptables -I INPUT -s 198.51.100.0 -j DROP

The sample command above:

Calls the iptables program

Uses the -I option for insertion. Using a rule with the insertion option will add it to the beginning of a chain and will be applied first. To indicate a specific placement in the chain, you may also use a number with the -I option.

The -s parameter, along with the IP address (198.51.100.0), indicates the source.

Finally, the -j parameter stands for jump. It specifies the target of the rule and what action will be performed if the packet is a match.

Parameter	Description
-p, --protocol	The protocol, such as TCP, UDP, etc.
-s, --source	Can be an address, network name, hostname, etc.
-d, --destination	An address, hostname, network name, etc.
-j, --jump	Specifies the target of the rule; i.e. what to do if the packet matches.
-g, --goto chain	Specifies that the processing will continue in a user-specified chain.
-i, --in-interface	Names the interface from where packets are received.
-o, --out-interface	Name of the interface by which a packet is being sent.
-f, --fragment	The rule will only be applied to the second and subsequent fragments of fragmented packets.
-c, --set-counters	Enables the admin to initialize the packet and byte counters of a rule.

Default Tables

Tables are made up of built-in chains and may also contain user-defined chains. The built-in tables will depend on the kernel configuration and the installed modules.

The default tables are as follows:

Filter - This is the default table. Its built-in chains are:

Input: packets going to local sockets

Forward: packets routed through the server

Output: locally generated packets

Nat - When a packet creates a new connection, this table is used. Its built-in chains are:

Prerouting: designating packets when they come in

Output: locally generated packets before routing takes place

Postrouting: altering packets on the way out

Mangle - Used for special altering of packets. Its chains are:

Prerouting: incoming packets

Postrouting: outgoing packets

Output: locally generated packets that are being altered

Input: packets coming directly into the server

Forward: packets being routed through the server

Raw - Primarily used for configuring exemptions from connection tracking. The built-in chains are:

Prerouting: packets that arrive by the network interface

Output: processes that are locally generated

Security - Used for Mandatory Access Control (MAC) rules. After the filter table, the security table is accessed next. The built-in chains are:

Input: packets entering the server

Output: locally generated packets

Forward: packets passing through the server

Basic iptables Options

There are many options that may be used with the iptables command:

Option	Description
-A --append	Add one or more rules to the end of the selected chain.
-C --check	Check for a rule matching the specifications in the selected chain.
-D --delete	Delete one or more rules from the selected chain.
-F --flush	Delete all the rules one-by-one.
-I --insert	Insert one or more rules into the selected chain as the given rule number.
-L --list	Display the rules in the selected chain.
-n --numeric	Display the IP address or hostname and post number in numeric format.
-N --new-chain <name>	Create a new user-defined chain.
-v --verbose	Provide more information when used with the list option.
-X --delete-chain <name>	Delete the user-defined chain.

Insert, Replace or Delete iptables Rules

iptables rules are enforced top down, so the first rule in the ruleset is applied to traffic in the chain, then the second, third and so on. This means that rules cannot necessarily be added to a ruleset with iptables -A or ip6tables -A. Instead, rules must be inserted with iptables -I or ip6tables -I.

Insert

Inserted rules need to be placed in the correct order with respect to other rules in the chain. To get a numerical list of your iptables rules:

```
sudo iptables -L -nv --line-numbers
```

For example, let's say you want to insert a rule into the basic ruleset provided in this guide, that will accept incoming connections to port 8080 over the TCP protocol. We'll add it as rule 7 to the INPUT chain, following the web traffic rules:

```
sudo iptables -I INPUT 7 -p tcp --dport 8080 -m state --state NEW -j ACCEPT
```

If you now run sudo iptables -L -nv again, you'll see the new rule in the output.

Replace

Replacing a rule is similar to inserting, but instead uses iptables -R. For example, let's say you want to reduce the logging of denied entries to only 3 per minute, down from 5 in the original ruleset. The LOG rule is ninth in the INPUT chain:

```
sudo iptables -R INPUT 9 -m limit --limit 3/min -j LOG --log-prefix "iptables_INPUT_denied: " --log-level 7
```

Delete

Deleting a rule is also done using the rule number. For example, to delete the rule we just inserted for port 8080:

```
sudo iptables -D INPUT 7
```

Caution

Editing rules does not automatically save them. See our section on deploying rulesets for the specific instructions for your distribution.

View Your Current iptables Rules

IPv4:

```
sudo iptables -L -nv
```

IPv6:

```
sudo ip6tables -L -nv
```

On most distributions, iptables has no default rules for either IPv4 and IPv6. As a result, on a newly created Linode you will likely see what is shown below - three empty chains without any firewall rules. This means that all incoming, forwarded and outgoing traffic is allowed. It's important to limit inbound and forwarded traffic to only what's necessary.

```
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
```

```
 pkts bytes target     prot opt in     out     source               destination
```

```
Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
```

```
Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
```

Configure iptables

iptables can be configured and used in a variety of ways. The following sections will outline how to configure rules by port and IP, as well as how to blacklist (block) or whitelist (allow) addresses.

Block Traffic by Port

You may use a port to block all traffic coming in on a specific interface. For example:

```
iptables -A INPUT -j DROP -p tcp --destination-port 110 -i eth0
```

Let's examine what each part of this command does:

-A will add or append the rule to the end of the chain.

INPUT will add the rule to the table.

DROP means the packets are discarded.

-p tcp means the rule will only drop TCP packets.

--destination-port 110 filters packets targeted to port 110.

-i eth0 means this rule will impact only packets arriving on the eth0 interface.

It is important to understand that iptables do not recognize aliases on the network interface. Therefore, if you have several virtual IP interfaces, you will have to specify the destination address to filter the traffic. A sample command is provided below:

```
iptables -A INPUT -j DROP -p tcp --destination-port 110 -i eth0 -d 198.51.100.0
```

You may also use -D or --delete to remove rules. For example, these commands are equivalent:

```
iptables --delete INPUT -j DROP -p tcp --destination-port 110 -i eth0 -d 198.51.100.0
```

```
iptables -D INPUT -j DROP -p tcp --destination-port 110 -i eth0 -d 198.51.100.0
```

Drop Traffic from an IP

In order to drop all incoming traffic from a specific IP address, use the iptables command with the following options:

```
iptables -I INPUT -s 198.51.100.0 -j DROP
```

To remove these rules, use the --delete or -D option:

iptables --delete INPUT -s 198.51.100.0 -j DROP

iptables -D INPUT -s 198.51.100.0 -j DROP

Block or Allow Traffic by Port Number to Create an iptables Firewall

One way to create a firewall is to block all traffic to the system and then allow traffic on certain ports. Below is a sample sequence of commands to illustrate the process:

iptables -A INPUT -m state --state ESTABLISHED,RELATED -j ACCEPT

iptables -A INPUT -i lo -m comment --comment "Allow loopback connections" -j ACCEPT

iptables -A INPUT -p icmp -m comment --comment "Allow Ping to work as expected" -j ACCEPT

iptables -A INPUT -p tcp -m multiport --destination-ports 22,25,53,80,443,465,5222,5269,5280,8999:9003 -j ACCEPT

iptables -A INPUT -p udp -m multiport --destination-ports 53 -j ACCEPT

iptables -P INPUT DROP

iptables -P FORWARD DROP

Let’s break down the example above. The first two commands add or append rules to the INPUT chain in order to allow access on specific ports. The -p tcp and -p udp options specify either UDP or TCP packet types. The -m multiport function matches packets on the basis of their source or destination ports, and can accept the specification of up to 15 ports. Multiport also accepts ranges such as 8999:9003 which counts as 2 of the 15 possible ports, but matches ports 8999, 9000, 9001, 9002, and 9003. The next command allows all incoming and outgoing packets that are associated with existing connections so that they will not be inadvertently blocked by the firewall. The final two commands use the -P option to describe the default policy for these chains. As a result, all packets processed by INPUT and FORWARD will be dropped by default.

Note that the rules described above only control incoming packets, and do not limit outgoing connections.

Whitelist/Blacklist Traffic by Address

You can use iptables to block all traffic and then only allow traffic from certain IP addresses. These firewall rules limit access to specific resources at the network layer. Below is an example sequence of commands:

iptables -A INPUT -m state --state ESTABLISHED,RELATED -j ACCEPT

iptables -A INPUT -i lo -m comment --comment "Allow loopback connections" -j ACCEPT

iptables -A INPUT -p icmp -m comment --comment "Allow Ping to work as expected" -j ACCEPT

iptables -A INPUT -s 192.168.1.0/24 -j ACCEPT

iptables -A INPUT -s 198.51.100.0 -j ACCEPT

iptables -P INPUT DROP

iptables -P FORWARD DROP

In the first command, the -s 192.168.1.0/24 statement specifies that all source IPs (-s) in the address space of 192.168.1 are allowed. You may specify an IP address range using CIDR (Classless Inter-Domain Routing) notation, or individual IP addresses, as in the second command. The third command allows all incoming and outgoing packets that are associated with existing connections. The final two commands set the default policy for all INPUT and FORWARD chains to drop all packets.

Use ip6tables to Manage IPv6 Traffic

When you're working with IPv6, remember that the iptables command is not compatible. Instead, there is an ip6tables command. The options such as append, check, etc. are the same. The tables used by ip6tables are raw, security, mangle and filter. The parameters such as protocol, source, etc. are the same. The syntax is essentially the same as IPv4. Sample syntax is below:

ip6tables [-t table] -N chain

To view what rules are configured for IPv6, use the command:

ip6tables -L

Configure Rules for IPv6

ip6tables works by using ports, specific addresses for blacklisting, protocols and so forth. The primary difference is that ip6tables can use extended packet matching modules with the -m or match options, followed by the module name. Below are some of the extended modules:

addrtype - Matches packets based on their address type. Some of the address types are:

Local

Unicast

Broadcast

Multicast

ah - Matches the parameters in the authentication header of IPsec packets.

cluster - You can deploy gateway and backend load-sharing clusters without a load balancer.

comment - Allows you to add a comment to any rule.

connbytes - Matches by how many bytes or packets a connection has transferred, or average bytes per packet.

This is not intended to be a complete or comprehensive list. You may review the full list of extended modules by using the man page:

man ip6tables

Below is a sample rule used in ip6tables:

limit the number of parallel HTTP requests to 16 for the link local network

ip6tables -A INPUT -p tcp --syn --dport 80 -s fe80::/64 -m connlimit --connlimit-above 16 --connlimit-mask 64 -j REJECT

ip6tables -A INPUT -p tcp -m tcp --dport 22 -j ACCEPT

This rule breaks down as follows:

The first line is a comment.

-A is for append.

INPUT is to add the rule to the table.

-p is for protocol, which is TCP.

--syn only matches TCP packets with the SYN bit set and the ACK, RST, and FIN bits cleared.

--dport is the destination port, which is 80.

-s is the source, which is the local address range fe80::/64.

-m is for match.

connlimit is the extended packet module name, which is connection limit.

--connlimit-above 16 means if the number of connections exceeds 16, only the first 16 will be used.

--connlimit-mask 64 means the group hosts are using a prefix length of 64.

-j is for jump, it tells the target of the rule what to do if the packet is a match.

REJECT means the packet is dropped.

Required Rules for Non-Static IPv6 Allocations

Below are the rules which are required for your IPv6 address to be properly allocated

ip6tables -A INPUT -p icmpv6 --icmpv6-type router-advertisement -m hl --hl-eq 255 -j ACCEPT

ip6tables -A INPUT -p icmpv6 --icmpv6-type neighbor-solicitation -m hl --hl-eq 255 -j ACCEPT

ip6tables -A INPUT -p icmpv6 --icmpv6-type neighbor-advertisement -m hl --hl-eq 255 -j ACCEPT

ip6tables -A INPUT -p icmpv6 --icmpv6-type redirect -m hl --hl-eq 255 -j ACCEPT

Basic iptables Rulesets for IPv4 and IPv6

Appropriate firewall rules depend on the services being run. Below are iptables rulesets to secure your Linode if you're running a web server.

Caution

These rules are given only as an example. A real production web server may require more or less configuration, and these rules would not be appropriate for a database, Minecraft or VPN server. Iptables rules can always be modified or reset later, but these basic rulesets serve as a demonstration.

IPv4

/tmp/v4

```
1 *filter
2
```

```
3 # Allow all loopback (lo0) traffic and reject traffic
4 # to localhost that does not originate from lo0.
5 -A INPUT -i lo -j ACCEPT
6 -A INPUT ! -i lo -s 127.0.0.0/8 -j REJECT
7
8 # Allow ping.
9 -A INPUT -p icmp -m state --state NEW --icmp-type 8 -j ACCEPT
10
11# Allow SSH connections.
12-A INPUT -p tcp --dport 22 -m state --state NEW -j ACCEPT
13
14# Allow HTTP and HTTPS connections from anywhere
15# (the normal ports for web servers).
16-A INPUT -p tcp --dport 80 -m state --state NEW -j ACCEPT
17-A INPUT -p tcp --dport 443 -m state --state NEW -j ACCEPT
18
19# Allow inbound traffic from established connections.
20# This includes ICMP error returns.
21-A INPUT -m state --state ESTABLISHED,RELATED -j ACCEPT
22
23# Log what was incoming but denied (optional but useful).
24-A INPUT -m limit --limit 5/min -j LOG --log-prefix "iptables_INPUT_denied: " --log-level 7
25
26# Reject all other inbound.
27-A INPUT -j REJECT
28
29# Log any traffic that was sent to you
30# for forwarding (optional but useful).
31-A FORWARD -m limit --limit 5/min -j LOG --log-prefix "iptables_FORWARD_denied: " --log-level 7
32
33# Reject all traffic forwarding.
```

```
34-A FORWARD -j REJECT
35
36COMMIT
```

Optional: If you plan to use Linode Longview or Linode's NodeBalancers, add the respective rule after the section for allowing HTTP and HTTPS connections:

```
# Allow incoming Longview connections from longview.linode.com
-A INPUT -s 96.126.119.66 -m state --state NEW -j ACCEPT


# Allow incoming NodeBalancer connections
-A INPUT -s 192.168.255.0/24 -m state --state NEW -j ACCEPT
```

IPv6

If you would like to supplement your web server's IPv4 rules with IPv6 as well, this ruleset will allow HTTP/S access and all ICMP functions.

/tmp/v6

```
 1 *filter
 2
 3 # Allow all loopback (lo0) traffic and reject traffic
 4 # to localhost that does not originate from lo0.
 5 -A INPUT -i lo -j ACCEPT
 6 -A INPUT ! -i lo -s ::1/128 -j REJECT
 7
 8 # Allow ICMP
 9 -A INPUT -p icmpv6 -j ACCEPT
10
11# Allow HTTP and HTTPS connections from anywhere
12# (the normal ports for web servers).
13-A INPUT -p tcp --dport 80 -m state --state NEW -j ACCEPT
14-A INPUT -p tcp --dport 443 -m state --state NEW -j ACCEPT
15
16# Allow inbound traffic from established connections.
17-A INPUT -m state --state ESTABLISHED,RELATED -j ACCEPT
```

```
18
19# Log what was incoming but denied (optional but useful).
20-A INPUT -m limit --limit 5/min -j LOG --log-prefix "ip6tables_INPUT_denied: " --log-level 7
21
22# Reject all other inbound.
23-A INPUT -j REJECT
24
25# Log any traffic that was sent to you
26# for forwarding (optional but useful).
27-A FORWARD -m limit --limit 5/min -j LOG --log-prefix "ip6tables_FORWARD_denied: " --log-level 7
28
29# Reject all traffic forwarding.
30-A FORWARD -j REJECT
31
32COMMIT
```

Note

APT attempts to resolve mirror domains to IPv6 as a result of apt-get update. If you choose to entirely disable and deny IPv6, this will slow down the update process for Debian and Ubuntu because APT waits for each resolution to time out before moving on.

To remedy this, uncomment the line precedence ::ffff:0:0/96 100 in /etc/gai.conf.

Deploy Your iptables Rulesets

The process for deploying iptables rulesets varies depending on which Linux distribution you're using:

Debian / Ubuntu

UFW is the iptables controller included with Ubuntu, but it is also available in Debian's repositories. If you prefer to use UFW instead of iptables, see our guide: How to Configure a Firewall with UFW.

Create the files /tmp/v4 and /tmp/v6. Paste the above rulesets into their respective files.

Import the rulesets into immediate use:

sudo iptables-restore < /tmp/v4

sudo ip6tables-restore < /tmp/v6

To apply your iptables rules automatically on boot, see our section on configuring iptables-persistent.

CentOS / Fedora

CentOS 7 or Fedora 20 and above

In these distros, FirewallD is used to implement firewall rules instead of using the iptables command. If you prefer to use it over iptables, see our guide: Introduction to FirewallD on CentOS.

If you prefer to use iptables, FirewallD must first be stopped and disabled.

sudo systemctl stop firewalld.service && sudo systemctl disable firewalld.service

Install iptables-services and enable iptables and ip6tables:

sudo yum install iptables-services

sudo systemctl enable iptables && sudo systemctl enable ip6tables

sudo systemctl start iptables && sudo systemctl start ip6tables

Create the files /tmp/v4 and /tmp/v6. Paste the rulesets above into their respective files.

Import the rulesets into immediate use:

sudo iptables-restore < /tmp/v4

sudo ip6tables-restore < /tmp/v6

Save each ruleset:

sudo service iptables save

sudo service ip6tables save

Remove the temporary rule files:

sudo rm /tmp/{v4,v6}

CentOS 6

Create the files /tmp/v4 and /tmp/v6. Paste the rulesets above into their respective files.

Import the rules from the temporary files:

sudo iptables-restore < /tmp/v4

sudo ip6tables-restore < /tmp/v6

Save the rules:

sudo service iptables save

sudo service ip6tables save

Note

Firewall rules are saved to /etc/sysconfig/iptables and /etc/sysconfig/ip6tables.

Remove the temporary rule files:

sudo rm /tmp/{v4,v6}

Arch Linux

Create the files /etc/iptables/iptables.rules and /etc/iptables/ip6tables.rules. Paste the rulesets above into their respective files.

Import the rulesets into immediate use:

sudo iptables-restore < /etc/iptables/iptables.rules

sudo ip6tables-restore < /etc/iptables/ip6tables.rules

iptables does not run by default in Arch. Enable and start the systemd units:

sudo systemctl start iptables && sudo systemctl start ip6tables

sudo systemctl enable iptables && sudo systemctl enable ip6tables

For more info on using iptables in Arch, see its Wiki entries for iptables and a simple stateful firewall.

Verify iptables Rulesets

Check your Linode's firewall rules with the v option for a verbose output:

sudo iptables -vL

sudo ip6tables -vL

The output for IPv4 rules should show:

Chain INPUT (policy ACCEPT 0 packets, 0 bytes)

pkts bytes target prot opt in out source destination

0 0 ACCEPT all -- lo any anywhere anywhere

0 0 REJECT all -- !lo any loopback/8 anywhere reject-with icmp-port-unreachable

0 0 ACCEPT icmp -- any any anywhere anywhere icmp destination-unreachable

0 0 ACCEPT icmp -- any any anywhere anywhere icmp echo-request

0 0 ACCEPT icmp -- any any anywhere anywhere icmp time-exceeded

0 0 ACCEPT tcp -- any any anywhere anywhere tcp dpt:ssh state NEW

0 0 ACCEPT tcp -- any any anywhere anywhere tcp dpt:http state NEW

0 0 ACCEPT tcp -- any any anywhere anywhere tcp dpt:https state NEW

0 0 ACCEPT all -- any any anywhere anywhere state RELATED,ESTABLISHED

0 0 LOG all -- any any anywhere anywhere limit: avg 5/min burst 5 LOG level debug prefix "iptables_INPUT_denied: "

0 0 REJECT all -- any any anywhere anywhere reject-with icmp-port-unreachable

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)

```
 pkts bytes target     prot opt in     out     source               destination

    0     0 LOG        all  --  any    any     anywhere             anywhere             limit: avg 5/min burst 5 LOG level debug prefix "iptables_FORWARD_denied: "

    0     0 REJECT     all  --  any    any     anywhere             anywhere             reject-with icmp-port-unreachable

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)

 pkts bytes target     prot opt in     out     source               destination
```

Output for IPv6 rules will look like this:

```
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)

 pkts bytes target     prot opt in     out     source               destination

    0     0 ACCEPT     all      lo     any     anywhere             anywhere

    0     0 REJECT     all     !lo     any     localhost            anywhere             reject-with icmp6-port-unreachable

    0     0 ACCEPT     ipv6-icmp    any     any     anywhere             anywhere

    0     0 ACCEPT     tcp      any    any     anywhere             anywhere             tcp dpt:http state NEW

    0     0 ACCEPT     tcp      any    any     anywhere             anywhere             tcp dpt:https state NEW

    0     0 ACCEPT     all      any    any     anywhere             anywhere             state RELATED,ESTABLISHED

    0     0 LOG        all      any    any     anywhere             anywhere             limit: avg 5/min burst 5 LOG level debug prefix "ip6tables_INPUT_denied: "

    0     0 REJECT     all      any    any     anywhere             anywhere             reject-with icmp6-port-unreachable

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)

 pkts bytes target     prot opt in     out     source               destination

    0     0 LOG        all      any    any     anywhere             anywhere             limit: avg 5/min burst 5 LOG level debug prefix "ip6tables_FORWARD_denied: "

    0     0 REJECT     all      any    any     anywhere             anywhere             reject-with icmp6-port-unreachable

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)

 pkts bytes target     prot opt in     out     source               destination
```

Your firewall rules are now in place and protecting your Linode. Remember, you may need to edit these rules later if you install other packages that require network access.

Introduction to iptables-persistent

Ubuntu and Debian have a package called iptables-persistent that makes it easy to reapply your firewall rules at boot time. After installation, you can save all your rules in two files (one for IPv4 and one for IPv6). If you've already configured and applied iptables rules, iptables-persistent will detect them automatically and allow you to add them to the appropriate configuration file.

Install iptables-persistent

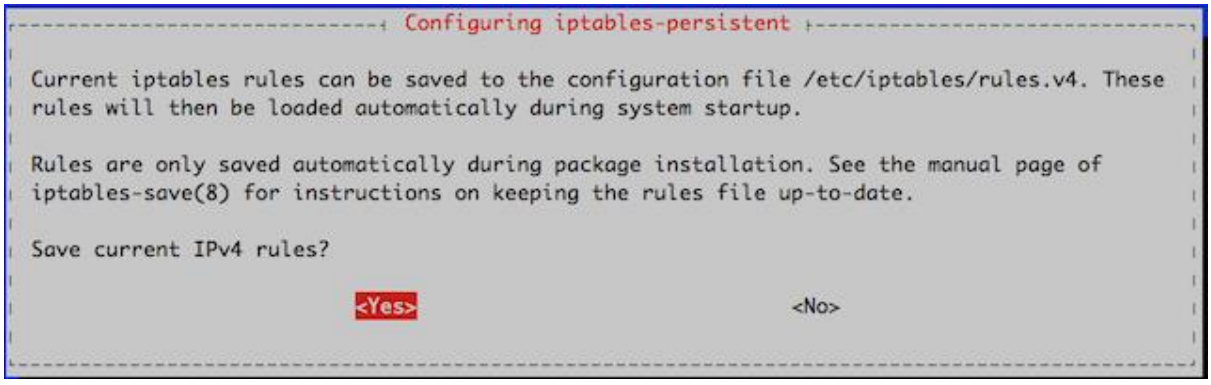
On Debian or Ubuntu use the following command to check whether iptables-persistent is already installed:

dpkg -l iptables-persistent

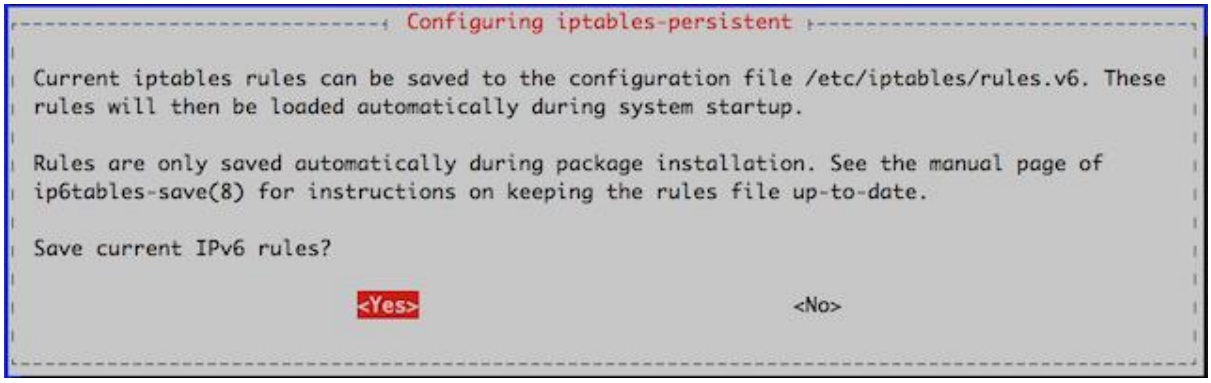
If dpkg returns that there are no matching packages, you will need to install the iptables-persistent package:

apt-get install iptables-persistent

During the installation, you will be prompted twice. The first prompt is asking if you would like to save your current IPv4 rules.



The second prompt is to save the rules configured for IPv6.



After the install is complete, you should see the iptables's subdirectory. Run the ls /etc/iptables command again to verify that your output resembles the following:

rules.v4 rules.v6

Use iptables-persistent

To view what rules are already configured on your server:

iptables -L

You should see output similar to:

Chain INPUT (policy ACCEPT)

target prot opt source destination

DROP all -- 198.51.100.0 anywhere

Chain FORWARD (policy ACCEPT)

target prot opt source destination

CHAIN OUTPUT (policy ACCEPT)

target prot opt source destination

The rules above allow anyone anywhere access to everything. If your output resembles this, you'll need to set rules that prevent unauthorized access.

iptables-persistent Rules

Use the rules.v4 or rules.v6 files to add, delete or edit the rules for your server. These files can be edited using a text editor to function as a proxy, NAT or firewall. The configuration depends on the requirements of your server and what functions are needed. Below is a file excerpt from both the rules.v4 and rules.v6 files:

/etc/iptables/rules.v4

```
1 # Generated by iptables-save v1.4.14 on Wed Apr  2 13:24:27 2014
2 *security
3 :INPUT ACCEPT [18483:1240117]
4 :FORWARD ACCEPT [0:0]
5 :OUTPUT ACCEPT [17288:2887358]
6 COMMIT
```

/etc/iptables/rules.v6

```
1 # Generated by ip6tables-save v1.4.14 on Wed Apr  2 13:24:27 2014
2 *nat
3 :PREROUTING ACCEPT [0:0]
4 :INPUT ACCEPT [0:0]
5 :OUTPUT ACCEPT [27:2576]
6 :POSTROUTING ACCEPT [27:2576]
```

7 COMMIT

While some rules are configured in these files already, either file can be edited at any time. The syntax for altering table rules is the same as in the sections Configure iptables and Configuring Rules for IPv6.

Save iptables-persistent Rules Through Reboot

By default, iptables-persistent rules save on reboot for IPv4 only. Therefore, if you are running both IPv4 and IPv6 together you will need to manually edit both the rules.v4 and rules.v6 files. On older systems, iptables-save was used to write the changes to the rules file. Now that iptables-persistent is an option, do not use the iptables-save > /etc/iptables/rules.v4 or iptables-save > /etc/iptables/rules.v6 commands as any IPv6 changes will be overwritten by the IPv4 rules.

To enforce the iptables rules and ensure that they persist after reboot run dpkg-reconfigure and respond Yes when prompted. (If you ever edit your saved rules in the future, use this same command to save them again.)

dpkg-reconfigure iptables-persistent

To verify the rules are applied and available after the system reboot use the commands:

iptables -L

ip6tables -L

Network Lock-out

When you're applying network rules, especially with both IPv4 and IPv6 and multiple interfaces, it is easy to lock yourself out. In the event you apply the rule and are unable to access your server, you may gain access through Lish in the Linode Manager. The following steps will guide you through using the graphical interface of your Linode to gain access to your server:

Connect to your Linode Manager.

Click on the Remote Access tab.

Under the section entitled "Console Access," click on the Launch Lish Console link.

Login with your root or sudo user name and password.

Remove any rules causing the connectivity issues.

Log out of the Lish window.

Attempt login via a regular SSH session.

This Lish console will function similarly to a regular SSH terminal session.

Troubleshooting: netfilter-persistent doesn't come back up on reboot.

If you have upgraded to Debian 8 from an earlier version, you may see a situation where netfilter-persistent fails to start during boot when using the Linode kernel. The console output will show similar to:

[FAILED] Failed to start Load Kernel Modules.

See 'systemctl status systemd-modules-load.service' for details.

[DEPEND] Dependency failed for netfilter persistent configuration

You can also use journalctl -xn to see that systemd can not load the loop module:

systemd-modules-load[3452]: Failed to lookup alias 'loop': Function not implemented

To fix this, comment out the line loop in /etc/modules:

sed -i 's/loop/#loop/g' /etc/modules

Then restart netfilter-persistent:

systemctl restart netfilter-persistent

It should then be running fine. Confirm with:

systemctl status netfilter-persistent

This issue does not occur in new deployments of Debian 8 because the loop line isn’t present in /etc/modules.