

# No New Privileges Flag

The `execve` system call can grant a newly-started program privileges that its parent did not have. The most obvious examples are `setuid/setgid` programs and file capabilities. To prevent the parent program from gaining these privileges as well, the kernel and user code must be careful to prevent the parent from doing anything that could subvert the child. For example:

- The dynamic loader handles `LD *` environment variables differently if a program is `setuid`.
- `chroot` is disallowed to unprivileged processes, since it would allow `/etc/passwd` to be replaced from the point of view of a process that inherited `chroot`.
- The `exec` code has special handling for `ptrace`.

These are all ad-hoc fixes. The `no_new_privs` bit (since Linux 3.5) is a new, generic mechanism to make it safe for a process to modify its execution environment in a manner that persists across `execve`. Any task can set `no_new_privs`. Once the bit is set, it is inherited across `fork`, `clone`, and `execve` and cannot be unset. With `no_new_privs` set, `execve()` promises not to grant the privilege to do anything that could not have been done without the `execve` call. For example, the `setuid` and `setgid` bits will no longer change the `uid` or `gid`; file capabilities will not add to the permitted set, and LSMs will not relax constraints after `execve`.

To set `no_new_privs`, use:

```
prctl(PR_SET_NO_NEW_PRIVS, 1, 0, 0, 0);
```

Be careful, though: LSMs might also not tighten constraints on `exec` in `no_new_privs` mode. (This means that setting up a general-purpose service launcher to set `no_new_privs` before executing daemons may interfere with LSM-based sandboxing.)

Note that `no_new_privs` does not prevent privilege changes that do not involve `execve()`. An appropriately privileged task can still call `setuid(2)` and receive `SCM_RIGHTS` datagrams.

There are two main use cases for `no_new_privs` so far:

- Filters installed for the `seccomp` mode 2 sandbox persist across `execve` and can change the behavior of newly-executed programs. Unprivileged users are therefore only allowed to install such filters if `no_new_privs` is set.
- By itself, `no_new_privs` can be used to reduce the attack surface available to an unprivileged user. If everything running with a given `uid` has `no_new_privs` set, then that `uid` will be unable to escalate its privileges by directly attacking `setuid`, `setgid`, and `fcap`-using binaries; it will need to compromise something without the `no_new_privs` bit set first.

In the future, other potentially dangerous kernel features could become available to unprivileged tasks if `no_new_privs` is set. In principle, several options to `unshare(2)` and `clone(2)` would be safe when `no_new_privs` is set, and `no_new_privs + chroot` is considerable less dangerous than `chroot` by itself.