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WHAT IS SUID AND HOW TO SET SUID IN LINUX/UNIX?

Posted by Surendra Anne | Dec 29, 2011 | Administration | 30 💬 |

★★⯪☆☆

There are some other special permission apart from the normal file permissions read, write and execute which we set with chmod and chown commands. They are **SUID, SGID, Sticky Bit, ACL's, SUDO, SELinux** for granular file/folder management by Linux administrator. Today we will see

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ABOUT ME..!

My name is Surendra Kumar Anne. I hail from Vijayawada which is cultural capital of south Indian state of Andhra Pradesh. I am a Linux evangelist who believes in Hard work, A down to earth person, Likes to share knowledge with others, Loves dogs, Likes photography. At present I work at Bank of America as Sr. Analyst Systems and Administration. You can contact me at surendra (@) linuxnix dot com.

1) **What is SUID?**
2) **How to set SUID?**
3) **Where to use SUID?**

WHAT IS SUID AND HOW TO SET IT IN LINUX?

SUID (**S**et owner **U**ser **ID** up on execution) is a special type of file permissions given to a file. Normally in Linux/Unix when a program runs, it inherit's access permissions from the logged in user. SUID is defined as giving temporary permissions to a user to run a program/file with the permissions of the file owner rather that the user who runs it**. In simple words users will get file owner's permissions as well as owner UID and GID when executing a file/program/command.**

The above sentence is a tricky one and should be explained in-depth with examples.

LEARN SUID WITH EXAMPLES:

EXAMPLE1: PASSWD COMMAND

When we try to change our password we will use **passwd command,** which is owned by root. This **passwd command** file will try to edit some system config files such as /etc/passwd, /etc/shadow etc when we try to change our password. Some of these files cannot be opened or viewed by normal user only root user will have permissions. So if we try to remove SUID and give full permissions to this passwd command file it cannot open other files such as /etc/shadow file to update the changes and we will get permission denied error or some other error when tried to execute passwd command. So passwd command is set with SUID to give root user permissions to normal user so that it can update /etc/shadow and other files.

EXAMPLE2: PING COMMAND

Similarly if we take ping command, when we have to execute this command internally it should open socket files and open ports in order to send IP packets and receive IP packets to remote server. Normal users don't have permissions to open socket files and open

ports. So SUID bit is set on this file/command so that whoever executes this will get owner (Root user's) permissions to them when executing this command. So when this command start executing it will inherit root user permissions to this normal user and opens require socket files and ports.
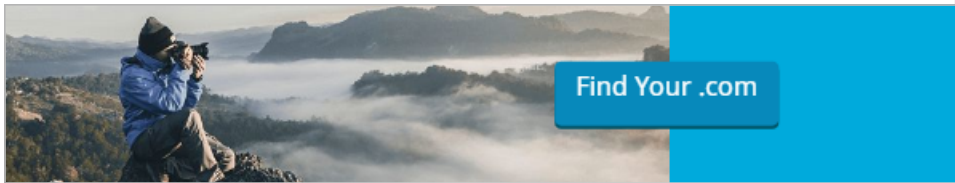
EXAMPLE3: CRONTAB AND AT COMMAND

When scheduling the jobs by using crontab or at command it is obvious to edit some of the crontab related configuration files located in /etc which are not writable for normal users. So crontab/at commands are set with SUID in-order to write some data.

HOW CAN I SETUP SUID FOR A FILE?

SUID can be set in two ways

> **1) Symbolic way (s, Stands for Set)**
> **2) Numerical/octal way (4)**

Use chmod command to set SUID on file: file1.txt

Symbolic way:

```
chmod u+s file1.txt
```

Here owner permission execute bit is set to SUID with +s

Numerical way:

```
chmod 4750 file1.txt
```

Here in 4750, four indicates SUID bit set, seven for full permissions for owner, five for read and execute permissions for group, and no permissions for others.

How can I check if a file is set with SUID bit or not?

Use ls –l to check if the x in owner permissions field is replaced by s or S

For example: Listing file1.txt before and after SUID set

Before setting SUID bit:

```
ls -l
total 8
-rwxr--r-- 1 xyz xyzgroup 148 Dec 22 03:46 file1.txt
```

After setting SUID bit:

```
ls -l
total 8
-rwsr--r-- 1 xyz xyzgroup 148 Dec 22 03:46 file1.txt
```

SOME FAQ'S RELATED TO SUID:

A) WHERE IS SUID USED?

1) Where root login is required to execute some commands/programs/scripts.

2) Where you don't want to give credentials of a particular user, but want to run some programs as the owner.

3) Where you don't want to use SUDO command, but want to give execute permission for a file/script etc.

B) I AM SEEING 'S' I.E. CAPITAL 'S' IN THE FILE PERMISSIONS, WHAT IS THAT?

After setting SUID to a file/folder if you see 'S' in the file permission area that indicates that the file/folder does not have executable permissions for that user on that particular file/folder.

For example see below example

```
chmod u+s file1.txt
ls -l
-rwSrwxr-x 1 surendra surendra 0 Dec 27 11:24 file1.txt
```

If you want to convert this S to s then add executable permissions to this file as show below

```
chmod u+x file1.txt
ls -l
-rwsrwxr-x 1 surendra surendra 0 Dec 5 11:24 file1.txt
```

you should see a smaller 's' in the executable permission position now.

SUID WITH EXECUTE PERMISSIONS:

SUID WITHOUT EXECUTE PERMISSIONS:

C) HOW CAN I FIND ALL THE SUID SET FILES IN LINUX/UNIX.

```
find / -perm +4000
```

The above find command will check all the files which are set with SUID bit (4000).

D) CAN I SET SUID FOR FOLDERS?

Yes, you can if it's required (you should remember one thing that Linux treats everything as a file)

E) WHAT IS SUID NUMERICAL VALUE?

It has the value 4.

Please comment your thoughts about SUID usage in your company.

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SURENDRA ANNE

Mr Surendra Anne is from Vijayawada, Andhra Pradesh, India. He is a Linux/Open source supporter who believes in Hard work, A down to earth person, Likes to share knowledge with others, Loves dogs, Likes photography. He works as Devops Engineer with Taggle systems, an IOT automatic water metering company, Sydney . You can contact him at surendra (@) linuxnix dot com.

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👤 **Carol** • 3 years ago
Thank you very much for taking your time to explain this. It's very clear.
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👤 **Surendra** Mod ➜ Carol • 3 years ago
No worries..!
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👤 **Zeneti** • 7 years ago
On majority of distro's the ability to suid on scripts (bash, perl etc) is not
Where experimenting and testing this for experience, it should be done

A great way to test this is to suid on "whoami" command. Try this:

$ whoami
zenettii
$ sudo chmod u+s /usr/bin/whoami
$ whoami
root
$ sudo chmod u-s /usr/bin/whoami

Regards.
4 ⌃ | ⌄ • Reply • Share ›

👤 **George Udosen** • a year ago
Hi nice article. Please note that 'find / -perm +4000' is now 'find / -perm
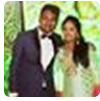1 ⌃ | ⌄ • Reply • Share ›

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arpan • 2 years ago

there is a bit confusion i have.
I have created a script which just create directory in /root(home director
now when i run the script with other user it gives me error

mkdir: cannot create directory `/root/dir1': Permission denied

why so?
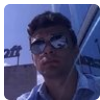it should allow it as root user. As the script owned by root user

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Lucylulu ➜ arpan • 2 years ago

You can't set suid within a shell script.

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userK • 3 years ago

Thank you for sharing this. I am setting this permission to a specific phγ
See this question on Information Security for more informations:
http://security.stackexchan...

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Brunelian IT • 3 years ago

Nice article. Easy to follow and to the point

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AndrewC • 3 years ago

Great article! Thanks!!

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Surendra Mod ➜ AndrewC • 3 years ago

Thanks for complements Andrew

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Dhananjay • 3 years ago

This is very help full. I Got clear understanding of the suid in linux. Thar

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Łukasz Przeniosło • 4 years ago

Hello there,

I have a problem with a Qt program and keyboard device (event1). My
application if i run it with sudo on the device itself, not through ssh or st
time. I though maybe your tutorial could fix the problem. I have set the '
is not an issue at the moment) and chmod 4777 /dev/input/event1. Eve
rule in /etc/udev/rules.d that says: KERNEL=="event1", MODE="4777"
with chmod the keyboard still doesnt work... Do you know maybe what

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courtney jones atlanta • 4 years ago

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thanks much

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duniaaneh • 4 years ago

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Ngowda • 4 years ago

Good info to understand setuid.

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Tharindu Edirisinghe • 4 years ago

This post is really informative. Got clear understanding of the suid in lin

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Joel Winkler • 4 years ago

My name is Joel and I am running a Macintosh system 10.6.8 and w
files that will not be altered (repaired). I&#039m not sure if this is harr
this problem. Thank you in advance for your assistance.

Joel

^ | ˅ • Reply • Share ›

gavin • 5 years ago

find / -xdev (-perm -4000) -type f -print0 | xargs -0 ls -l

^ | ˅ • Reply • Share ›

rajshekar007 • 5 years ago

I got your point. But I have a doubt. I hope you clarify it.
If we want others to execute our file as owner of that file then why not s
setting suid. If there is any advantage in doing so. What is that can you

^ | ˅ • Reply • Share ›

QuickBooks • 5 years ago

Great explanation, it saved me to solving the SUID puzzle.

Thank you very much.

^ | ˅ • Reply • Share ›

klooride • 5 years ago

Thanks! really helpful!

Just a little comment, at line where you write:
Here in 4750, 4 indicates SUID bit set, 7 for full permissions for owner,
permissions for others.
Isn't 5 for read-execute??

^ | ˅ • Reply • Share ›

Surendra Anne ➔ klooride • 5 years ago

yes.. thanks klooride for heads up. Updated the post.

^ | ˅ • Reply • Share ›

bharath • 6 years ago
Absolutely fantastic info.... Thanks Suri...

∧ | ∨ • Reply • Share ›

xavi • 6 years ago

I don't think this is accurate:

"Normal users don't have permissions to open socket files and open po

A regular user can't open ports under 1024, but they can certainly open

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Surendra Anne ↱ xavi • 6 years ago

I agree, but in the post Its not mention any where. It mention as
let us know if any sentence is misleading.

Thanks,
Surendra.

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aselvan • 6 years ago

Good explanation. Just a minor correction: your before graphic for "SUI
be "rw-rwxrwx" so it can become "rwSrwxrwx" after suid added to perm

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Surendra Anne ↱ aselvan • 6 years ago

Hi Aselvan,

The example shows already SUID bit set so its small "s", I dont
your comment.
Suri

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Rama ↱ Surendra Anne • 4 years ago

Hi good job,its crisp and clear.But i request you to verify
second part for "S" occurs for rw-.

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Coder • 7 years ago

Your graphical explanation of the difference between capital S and sma

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root
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Regards.

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