## UNIX Commands

Some common UNIX commands to research and become proficient with are:

| COMMON UNIX COMMANDS | | SOLARIS COMMANDS | LINUX COMMANDS |
|---|---|---|---|
| chgrp | ls | listusers | chage |
| chmod | newgrp | ppriv | gpasswd |
| chown | passwd | | getcap |
| getent | userdel | | setcap |
| getfacl | setfacl | | |
| groupadd | su | | |
| groupdel | sudo | | |
| groupmod | useradd | | |
| groups | umask | | |
| id | usermod | | |

## `chmod`: More about the Absolute-mode

Another approach to calculate absolute-mode values involves the use of binary numbers. Each permission, that is read (r), write (w), or execute (x), is assigned a binary digit. Specifically, the number "1" is assigned when the permission is set and the number "0" is assigned when the permission is not set. Then, for a given class, the binary digits are assembled together to form one binary number where, from left to right, the read permission digit leads, the write permission digit follows, and the execute permission digit ends and when that binary number is converted to decimal, the permission number for that class is obtained.

For instance, let's consider the file `/tmp/comments.txt`. To set the permission of that file so that its permissions string will be `rw-r--r--`:

- For the user (owner) class, the read and write only permission (`rw-`) corresponds to 110 in binary because the read permission is set, the write permission is set, and the execute permission is not set. In decimal, the number is equal to 6.
- For the group class, read only permission (`r--`) corresponds to 100 in binary or 4 in decimal
- For the other (world) class, again read only permission (`r--`) corresponds to 100 in binary or 4 in decimal

Therefore, to set the desired permissions using absolute-mode notation, we would use:

```
chmod 644 /tmp/comments.txt
```

When it comes to special permissions, a similar approach can be used – that is, the numbers "1" or "0" can be assigned depending on whether the permission is set or not set, respectively. Next, simply place each binary digit from left to right in the following order: SUID bit, SGID bit, Sticky bit. The binary number obtained can then be converted to decimal.

Note that the absolute-mode syntax of the `chmod` command is sometimes referred to as **octal-mode** syntax. This is because all the possible combinations of permissions for a given class are the numbers between 0 and 7; which makes it seems like we are working with the octal (base-8) number system.

## Recommended Readings

- UNIX and Linux System administration Handbook 4th Edition (Chapters 4 & 7)

## Recommended Internet Sites

- Man (manual) pages – Use any search engine using the format "[Topic] man page"
- RFCs – Use any search engine using the format "RFC [RFC NUMBER]"
- UNIX File and Directory Permissions and Modes: https://web.archive.org/web/20160801103505/http://www.grymoire.com/Unix/Permissions.html

Please contact the Course Coordinators if you are unable to access any of the Recommended Internet Sites.