Exercise 19.1: The tmpfs Special Filesystem

tmpfs is one of many special filesystems used under **Linux**. Some of these are not really used as filesystems, but just take advantage of the filesystem abstraction. However, **tmpfs** is a real filesystem that applications can do I/O on.

Essentially, **tmpfs** functions as a **ramdisk**; it resides purely in memory. But it has some nice properties that old-fashioned conventional ramdisk implementations did not have:

1. The filesystem adjusts its size (and thus the memory that is used) dynamically; it starts at zero and expands as necessary up to the maximum size it was mounted with.
2. If your RAM gets exhausted, **tmpfs** can utilize swap space. (You still can't try to put more in the filesystem than its maximum capacity allows, however.)
3. **tmpfs** does not require having a normal filesystem placed in it, such as **ext3** or **vfat**; it has its own methods for dealing with files and I/O that are aware that it is really just space in memory (it is not actually a block device), and as such are optimized for speed.

   Thus there is no need to pre-format the filesystem with a `mkfs` command; you merely just have to mount it and use it.

Mount a new instance of **tmpfs** anywhere on your directory structure with a command like:

```
$ sudo mkdir /mnt/tmpfs
$ sudo mount -t tmpfs none /mnt/tmpfs
```

See how much space the filesystem has been given and how much it is using:

```
$ df -h /mnt/tmpfs
```

You should see it has been allotted a default value of half of your RAM; however, the usage is zero, and will only start to grow as you place files on `/mnt/tmpfs`.

You could change the allotted size as a mount option as in:

```
$ sudo mount -t tmpfs -o size=1G none /mnt/tmpfs
```

You might try filling it up until you reach full capacity and see what happens. Do not forget to unmount when you are done with:

```
$ sudo umount /mnt/tmpfs
```

Virtually all modern **Linux** distributions mount an instance of **tmpfs** at `/dev/shm`:

```
$ df -h /dev/shm
```

```
Filesystem     Type   Size  Used Avail Use% Mounted on
tmpfs          tmpfs  3.9G   24M  3.9G   1% /dev/shm
```

Many applications use this such as when they are using **POSIX** shared memory as an inter-process communication mechanism. Any user can create, read and write files in `/dev/shm`, so it is a good place to create temporary files in memory.

Create some files in `/dev/shm` and note how the filesystem is filling up with **df**.

In addition, many distributions mount multiple instances of **tmpfs**; for example, on a **RHEL** system:

```
$ df -h | grep ' tmpfs'
```

```
tmpfs           tmpfs     7.8G   38M  7.8G   1% /dev/shm
tmpfs           tmpfs     7.8G   18M  7.8G   1% /run
tmpfs           tmpfs     7.8G     0  7.8G   0% /sys/fs/cgroup
tmpfs           tmpfs     1.6G  1.2M  1.6G   1% /run/user/42
tmpfs           tmpfs     1.6G   56K  1.6G   1% /run/user/1000
```

Notice this was run on a system with 16 GB of ram, so clearly you cannot have all these **tmpfs** filesystems actually using the default ~8 GB they have each been allotted!

Please Note

Some distributions (such as **Fedora**) may (by default) mount `/tmp` as a **tmpfs** system; in such cases one has to avoid putting large files in `/tmp` to avoid running out of memory. Or one can disable this behavior as we discussed earlier when describing `/tmp`.