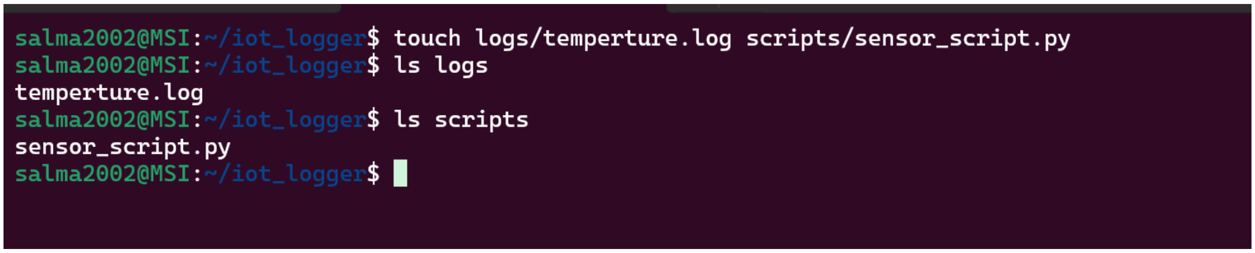
Day 2 – Phase 2: File & Directory Management + Search

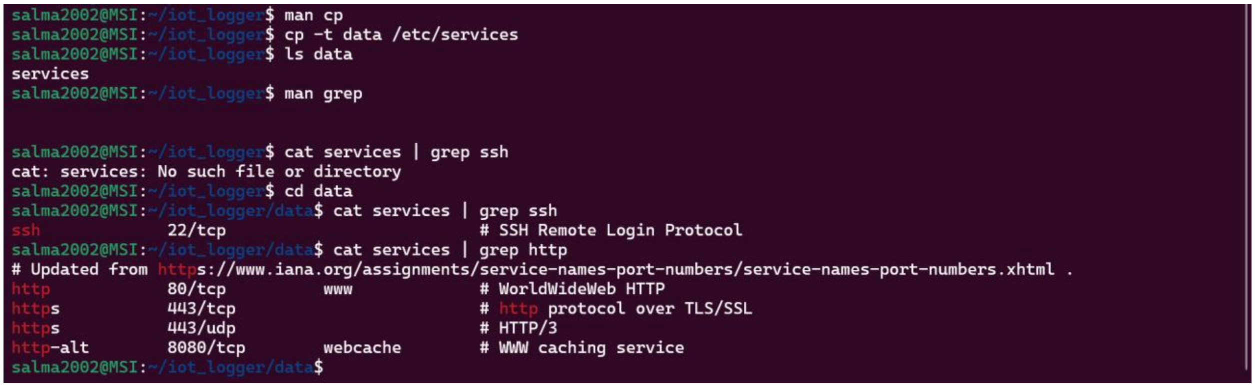
Tasks:

- **Inside iot_logger, create logs/temperature.log and scripts/sensor_script.py.**



```
salma2002@MSI:~/iot_logger$ touch logs/temperture.log scripts/sensor_script.py
salma2002@MSI:~/iot_logger$ ls logs
temperture.log
salma2002@MSI:~/iot_logger$ ls scripts
sensor_script.py
salma2002@MSI:~/iot_logger$ 
```

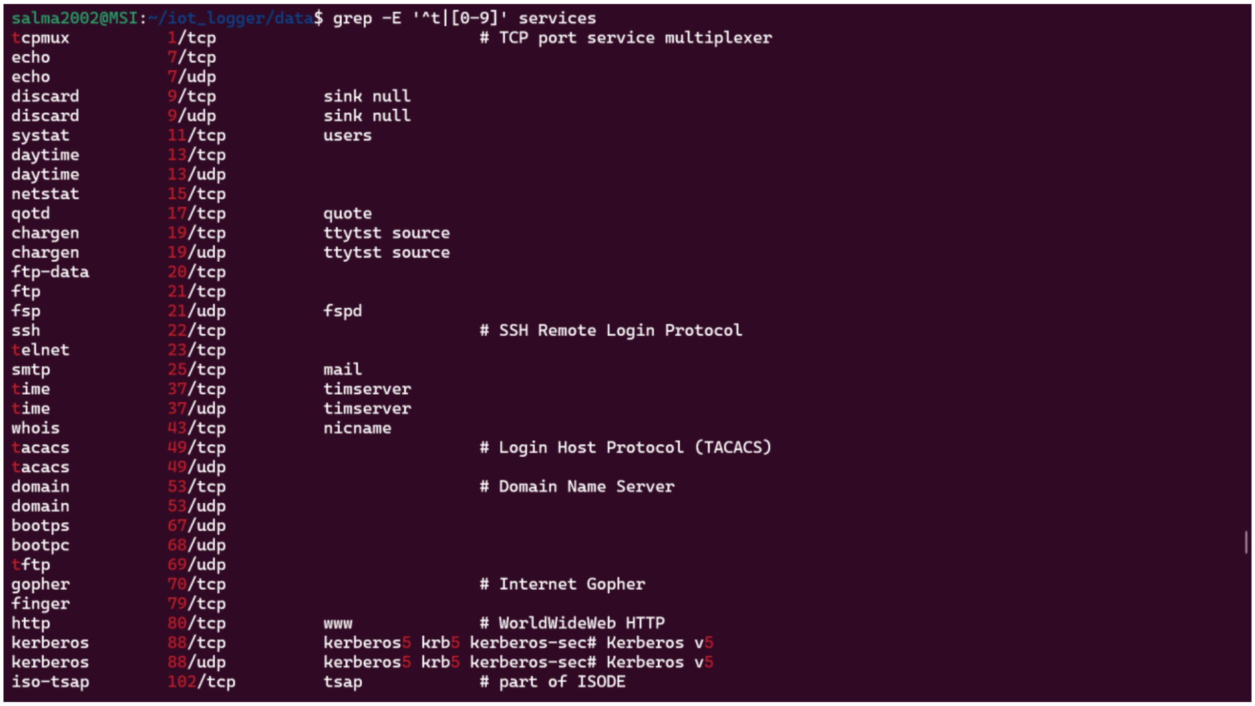
- **Copy /etc/services into data and search for patterns like ssh or http.**



```
salma2002@MSI:~/iot_logger$ man cp
salma2002@MSI:~/iot_logger$ cp -t data /etc/services
salma2002@MSI:~/iot_logger$ ls data
services
salma2002@MSI:~/iot_logger$ man grep


salma2002@MSI:~/iot_logger$ cat services | grep ssh
cat: services: No such file or directory
salma2002@MSI:~/iot_logger$ cd data
salma2002@MSI:~/iot_logger/data$ cat services | grep ssh
ssh             22/tcp                          # SSH Remote Login Protocol
salma2002@MSI:~/iot_logger/data$ cat services | grep http
# Updated from https://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xhtml .
http            80/tcp          www             # WorldWideWeb HTTP
https           443/tcp                         # http protocol over TLS/SSL
https           443/udp                         # HTTP/3
http-alt        8080/tcp        webcache        # WWW caching service
salma2002@MSI:~/iot_logger/data$
```

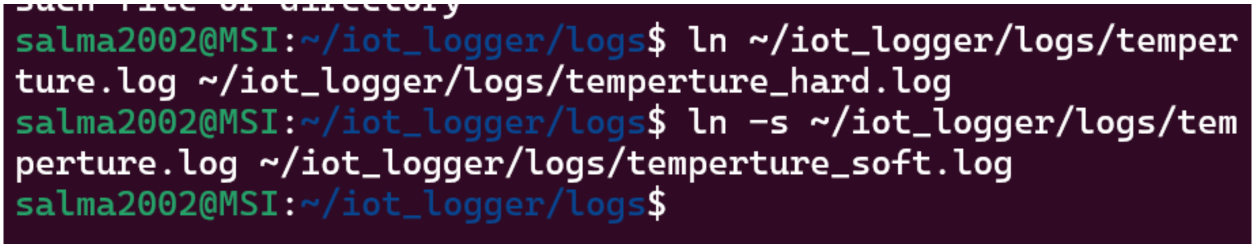
- **Use regex to find lines starting with t or containing numbers.**



```
salma2002@MSI:~/iot_logger/data$ grep -E '^t|[0-9]' services
tcpmux          1/tcp                           # TCP port service multiplexer
echo            7/tcp
echo            7/udp
discard         9/tcp           sink null
discard         9/udp           sink null
systat          11/tcp          users
daytime         13/tcp
daytime         13/udp
netstat         15/tcp
qotd            17/tcp          quote
chargen         19/tcp          ttytst source
chargen         19/udp          ttytst source
ftp-data        20/tcp
ftp             21/tcp
fsp             21/udp          fspd
ssh             22/tcp                          # SSH Remote Login Protocol
telnet          23/tcp
smtp            25/tcp          mail
time            37/tcp          timserver
time            37/udp          timserver
whois           43/tcp          nicname
tacacs          49/tcp                          # Login Host Protocol (TACACS)
tacacs          49/udp
domain          53/tcp                          # Domain Name Server
domain          53/udp
bootps          67/udp
bootpc          68/udp
tftp            69/udp
gopher          70/tcp                          # Internet Gopher
finger          79/tcp
http            80/tcp          www             # WorldWideWeb HTTP
kerberos        88/tcp          kerberos5 krb5 kerberos-sec# Kerberos v5
kerberos        88/udp          kerberos5 krb5 kerberos-sec# Kerberos v5
iso-tsap        102/tcp         tsap            # part of ISODE
```

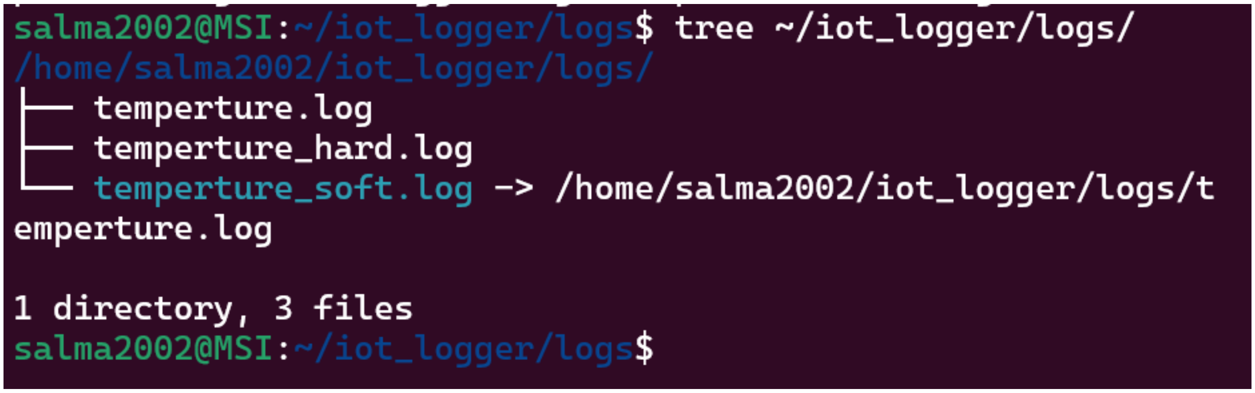
- **Locate .txt files in /home/ and remove temporary ones if needed.**

- **Create hard and symbolic links for temperature.log.**



```
such file or directory
salma2002@MSI:~/iot_logger/logs$ ln ~/iot_logger/logs/temper
ture.log ~/iot_logger/logs/temperture_hard.log
salma2002@MSI:~/iot_logger/logs$ ln -s ~/iot_logger/logs/tem
perture.log ~/iot_logger/logs/temperture_soft.log
salma2002@MSI:~/iot_logger/logs$
```

- **Display directory structure to confirm organization.**



```
salma2002@MSI:~/iot_logger/logs$ tree ~/iot_logger/logs/
/home/salma2002/iot_logger/logs/
├── temperture.log
├── temperture_hard.log
└── temperture_soft.log -> /home/salma2002/iot_logger/logs/t
emperture.log

1 directory, 3 files
salma2002@MSI:~/iot_logger/logs$
```

Open-Ended Questions:

• Explain the different types of files in Linux (regular, directory, symbolic link, device, etc.) and how to check them with commands.

1. Regular Files

Regular files are the most common type, used to store data. They can be:

- Text files → Contain human-readable characters (e.g., .txt, source code files).
- Binary files → Contain compiled programs or other non-readable data (e.g., executables).
- Media files → Store multimedia content like images, videos, and music (e.g., .jpg, .mp4).

2. Directory Files

A directory is a special type of file that holds references to other files or subdirectories.

- Example: /home/user/ contains a user's files and folders.

3. Symbolic Links (Symlinks)

A symbolic link is a pointer (shortcut) to another file or directory.

- It doesn't contain data itself, only the path to the target.
- Example: /usr/bin/python -> /usr/bin/python3.11
- If the target is deleted, the symlink becomes broken (dangling).

4. Character Device Files

Character device files represent devices that transfer data one character at a time.

- Common examples: keyboards, mice, and serial ports.
- Typically found in /dev/.
- Example: /dev/input/mouse2

- Can be created using the mknod command.

5. Block Device Files

Block device files represent devices that handle data in fixed-size blocks.

- Commonly used for disks and storage devices.
- Found in /dev/.
- Example: /dev/sda1 (a partition on a hard disk).

6. FIFO (Named Pipes)

FIFO files are used for inter-process communication (IPC).

- They allow processes to pass data so that it is read in the same first-in, first-out order it was written.
- Created with the mkfifo command.
- Example:
- mkfifo mypipe

How to Check File Types

Linux provides several ways to check file types:

- ls -l → Displays file type in the first character (- = regular, d = directory, l = symlink, c = character device, b = block device, p = pipe).

Reference: **Types of files in Linux**

• What's the difference between a hard link and a symbolic link? Give real examples of when to use each.

In Linux, files are represented by inodes, which store metadata and point to the actual file data on disk. A file in the filesystem is essentially a name (link) that refers to an inode.

Hard Links

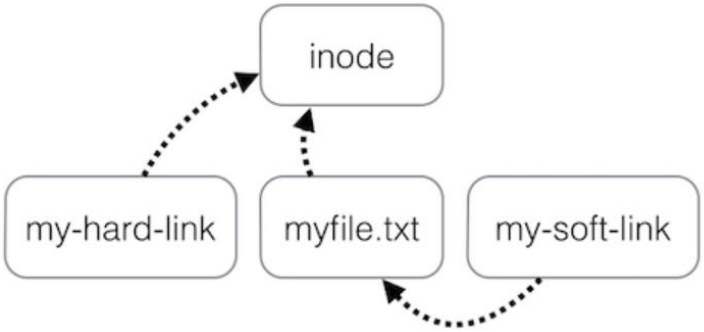
- A hard link is an additional filename that points directly to the same inode as the original file.
- Deleting the original file does not remove the data, because the inode remains as long as at least one link exists.
- Renaming or moving the original file also does not affect the hard link, since both names point to the same inode.
- Any modification to the data in the inode is reflected in all hard-linked files.
- Limitation: Hard links can only exist within the same filesystem.

Example use case:
When you need multiple filenames pointing to the same physical data, such as maintaining different references to a configuration file without duplicating storage.

Symbolic Links (Symlinks)

- A symbolic link is a special file that stores the path to another file.
- Unlike hard links, a symlink does not point directly to the inode.
- If the target file is deleted, renamed, or moved, the symlink becomes a broken link (dangling).
- Symlinks can span across different filesystems because they reference names, not inodes.

Example use case:
When you want a shortcut or alias to a file or directory, such as linking /etc/nginx/sites-enabled/ to files in /etc/nginx/sites-available/.



Reference:
[What is the difference between a symbolic link and a hard link? – Stack Overflow]

- **Is rmdir the same as rm -r when deleting directories? Explain**

  No, they are not the same.

  - rmdir: This command can only delete a directory if it is completely empty. If the directory contains any files or subdirectories, the command will fail.
  - rm -r: This command recursively deletes a directory along with all its contents (files and subdirectories). It is more powerful and also more dangerous because it removes everything without requiring the directory to be empty.

  Reference: [Difference between rmdir and rm -r]