

Capstone Project: Securing the Access Grid – Cybershield Corp

1. Defined Departments and Their Responsibilities

Department	Responsibility
Engineering	Develop and maintain software systems
HR	Manage employee relations, payroll, recruitment
Finance	Manage company's financials including accounting and budget
Marketing	Conduct research, content creation, brand management
IT Support	Provide technical support and maintain systems
Executive	C-level management overseeing company-wide strategy

2. User Roles and Access Levels

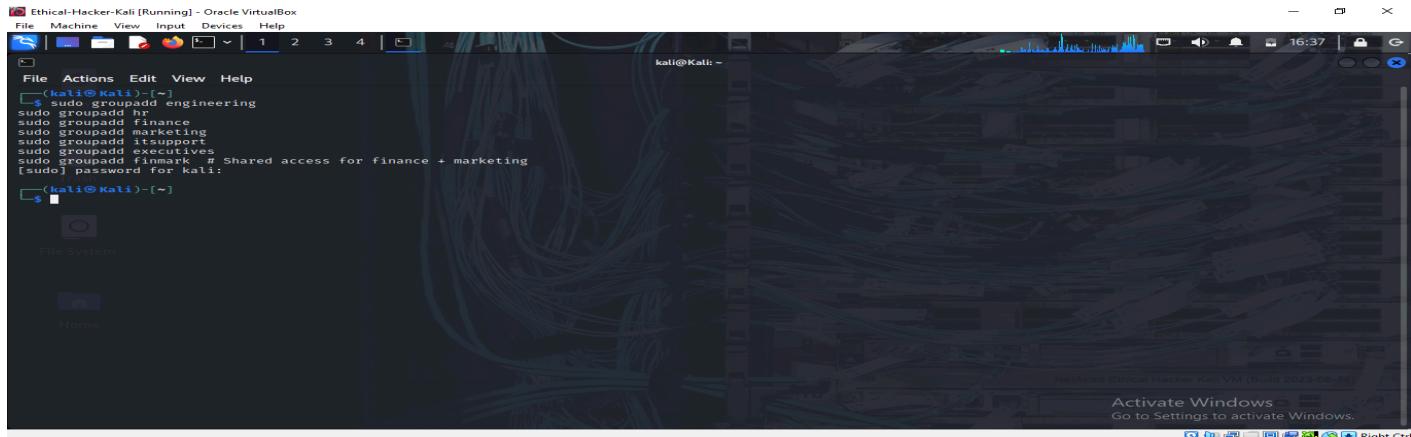
Role	Department	Access Level
Software Developers	Engineering	Full access to <code>/srv/company/engineering</code>
HR Managers & Assistants	HR	Full access to <code>/srv/company/hr</code>
Finance Analysts	Finance	Full access to <code>/srv/company/finance</code>
Marketing Analysts	Marketing	Full access to <code>/srv/company/marketing</code>
IT Admins & Helpdesk	IT Support	Full access to <code>/srv/company/it_support</code>
Executives (CEO, CIO...)	Executive	Read/Write access to all folders for oversight
Interns (all depts)	Various	Read-only access to their department folder

3. Directory and File Structure

Created under `/srv/company/`:

```
bash
CopyEdit
/srv/company/
└── engineering/
└── hr/
└── finance/
└── marketing/
└── it_support/
└── executives/
```

Each folder is accessible based on group membership using Linux permissions.



🔒 4. Group and Permission Strategy

Each department is assigned a **Linux group**:

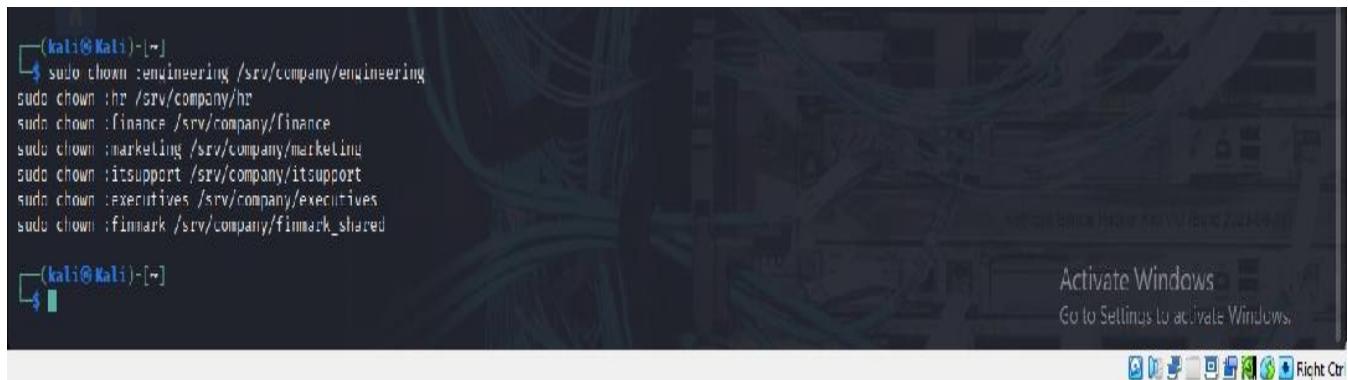
Department	Group Name	Permissions
Engineering	eng	rwx for group only
HR	hr	rwx for group only
Finance	fin	rwx for group only
Marketing	mark	rwx for group only

IT Support	it	rwx for group only
Executives	exec	rw for group, rx for others

Directory permissions (set using `chmod 750` or `chmod 770`):

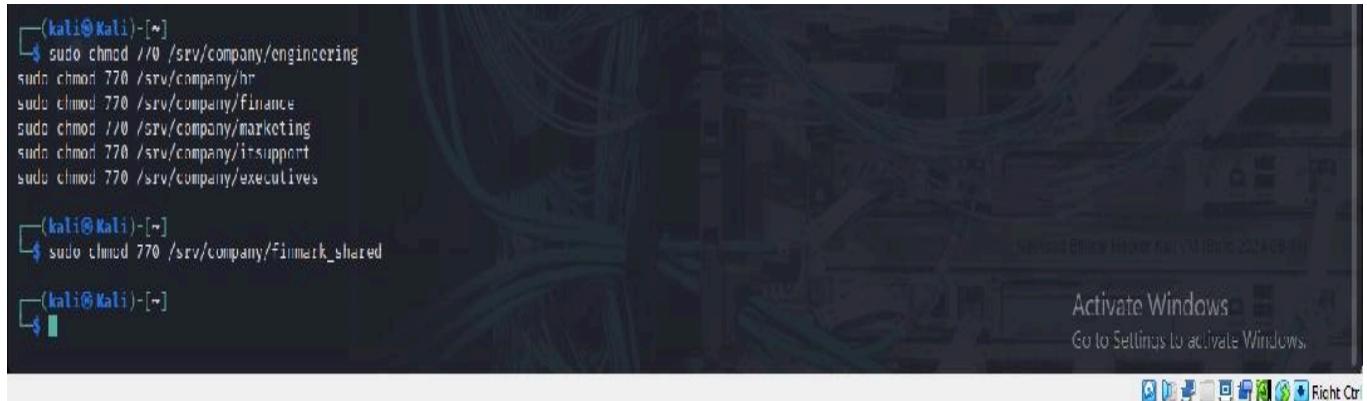
```
bash
CopyEdit
sudo chown :eng /srv/company/engineering
sudo chmod 770 /srv/company/engineering
```

Repeat for each department with their respective group.



```
(kali㉿Kali)-[~]
└─$ sudo chown :engineering /srv/company/engineering
sudo chown :hr /srv/company/hr
sudo chown :finance /srv/company/finance
sudo chown :marketing /srv/company/marketing
sudo chown :itsupport /srv/company/itsupport
sudo chown :executives /srv/company/executives
sudo chown :finmark /srv/company/finmark_shared

(kali㉿Kali)-[~]
└─$
```



```
(kali㉿Kali)-[~]
└─$ sudo chmod 770 /srv/company/engineering
sudo chmod 770 /srv/company/hr
sudo chmod 770 /srv/company/finance
sudo chmod 770 /srv/company/marketing
sudo chmod 770 /srv/company/itsupport
sudo chmod 770 /srv/company/executives

(kali㉿Kali)-[~]
└─$ sudo chmod 770 /srv/company/finmark_shared

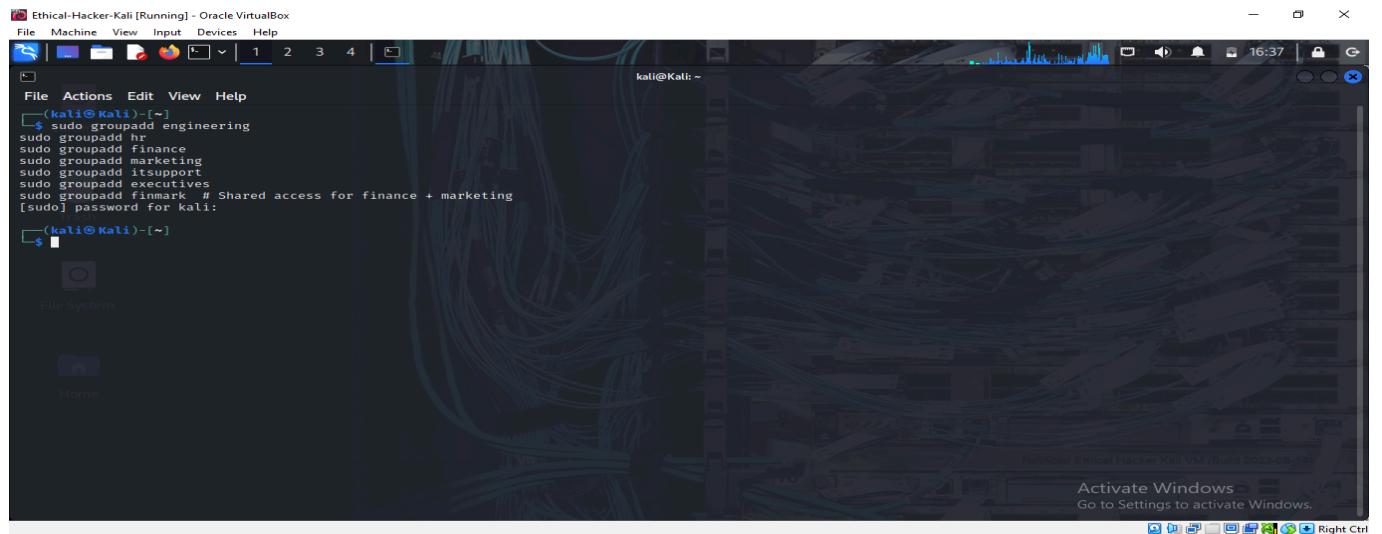
(kali㉿Kali)-[~]
└─$
```

📦 5. How Shared Directories Are Handled Securely

- Only members of specific groups can access their department folders.
- Shared folders (e.g., `/srv/company/executives`) have restricted read/write access only to `exec` group.

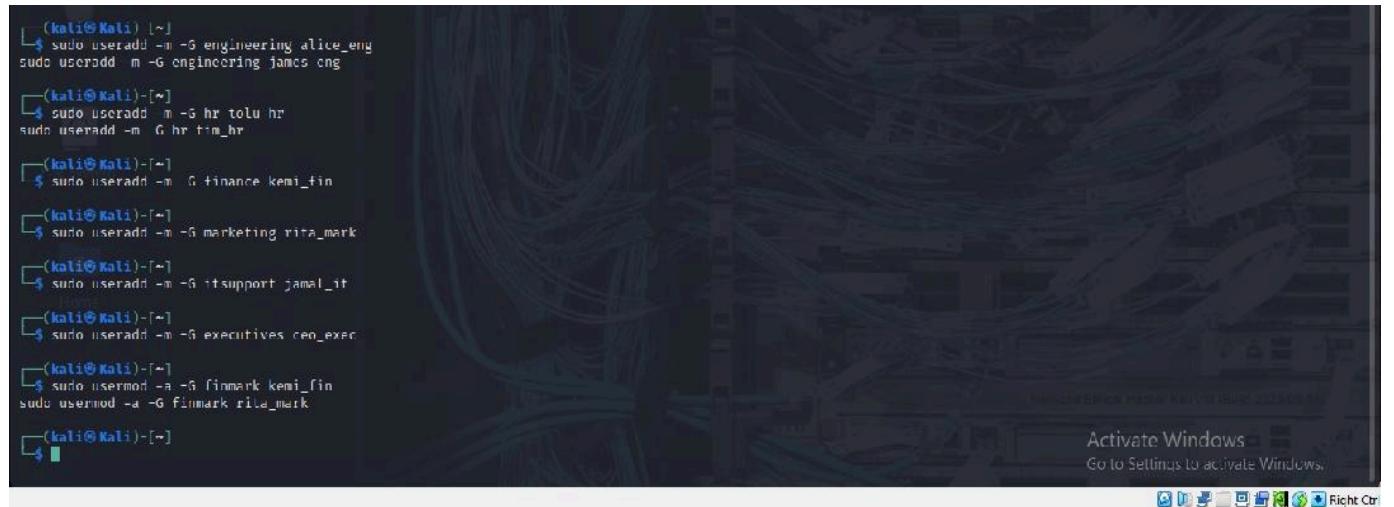
- Interns are given read-only permissions using Access Control Lists (ACLs), or by assigning specific group ownership and `chmod 750`.

📸 6. Screenshots or Command Outputs



```
(kali㉿Kali)-[~]
└─$ sudo groupadd engineering
└─$ sudo groupadd finance
└─$ sudo groupadd marketing
└─$ sudo groupadd itsupport
└─$ sudo groupadd executives
└─$ sudo groupadd finmark # Shared access for finance + marketing
[kali㉿Kali]-[~]
└─$
```

This screenshot shows a terminal window on a Kali Linux desktop environment. The user has run several `sudo groupadd` commands to create new groups: `engineering`, `finance`, `marketing`, `itsupport`, and `executives`. A note at the bottom indicates the creation of a shared group `finmark` for the `finance` and `marketing` departments.



```
(kali㉿Kali)-[~]
└─$ sudo useradd -m -G engineering alice_eng
sudo useradd -m -G engineering jamcs_cng

(kali㉿Kali)-[~]
└─$ sudo useradd -m -G hr tolu_hr
sudo useradd -m -G hr tim_hr

(kali㉿Kali)-[~]
└─$ sudo useradd -m -G finance kemi_fin

(kali㉿Kali)-[~]
└─$ sudo useradd -m -G marketing rita_mark

(kali㉿Kali)-[~]
└─$ sudo useradd -m -G itsupport jamal_it

(kali㉿Kali)-[~]
└─$ sudo useradd -m -G executives ceo_exec

(kali㉿Kali)-[~]
└─$ sudo usermod -a -G finmark kemi_fin
sudo usermod -a -G finmark rita_mark

(kali㉿Kali)-[~]
└─$
```

This screenshot shows a terminal window on a Kali Linux desktop environment. The user has run several `sudo useradd` and `sudo usermod` commands to create new users and assign them to specific groups. The users and their assigned groups are:

- `alice_eng` in `engineering` group
- `jamcs_cng` in `engineering` group
- `tolu_hr` in `hr` group
- `tim_hr` in `hr` group
- `kemi_fin` in `finance` group
- `rita_mark` in `marketing` group
- `jamal_it` in `itsupport` group
- `ceo_exec` in `executives` group

The user `kemi_fin` has also been added to the `finmark` group.

```
Ethical-Hacker-Kali [Running] - Oracle VirtualBox
File Machine View Input Devices Help
File Actions Edit View Help
└─$ sudo useradd -m -G itsupport jamal_it
└─(kali㉿Kali)-[~]
└─$ sudo useradd -m -G executives ceo_exec
└─(kali㉿Kali)-[~]
└─$ sudo usermod -a -G finmark kemi_fin
sudo usermod -a -G finmark rita_mark
└─(kali㉿Kali)-[~]
└─$ sudo mkdir -p /srv/company/{engineering,hr,finance,marketing,itsupport,executives,finmark_shared}
└─(kali㉿Kali)-[~]
└─$ sudo chmod 770 /srv/company/engineering
sudo chmod 770 /srv/company/hr
sudo chmod 770 /srv/company/finance
sudo chmod 770 /srv/company/marketing
sudo chmod 770 /srv/company/itsupport
sudo chmod 770 /srv/company/executives
sudo chmod 770 /srv/company/finmark_shared
└─(kali㉿Kali)-[~]
└─$ sudo chmod 770 /srv/company/engineering
sudo chmod 770 /srv/company/hr
sudo chmod 770 /srv/company/finance
sudo chmod 770 /srv/company/marketing
sudo chmod 770 /srv/company/itsupport
sudo chmod 770 /srv/company/executives
└─(kali㉿Kali)-[~]
└─$ sudo chmod 770 /srv/company/finmark_shared
└─(kali㉿Kali)-[~]
└─$
```

```
Ethical-Hacker-Kali [Running] - Oracle VirtualBox
File Machine View Input Devices Help
File Actions Edit View Help
└─(kali㉿Kali)-[~]
└─$ sudo passwd alice_eng
New password:
Retype new password:
passwd: password updated successfully
└─(kali㉿Kali)-[~]
└─$ sudo passwd james_eng
New password:
Retype new password:
passwd: password updated successfully
└─(kali㉿Kali)-[~]
└─$ sudo passwd tolu_hr
New password:
Retype new password:
passwd: password updated successfully
└─(kali㉿Kali)-[~]
└─$ sudo passwd tim_hr
New password:
Retype new password:
passwd: password updated successfully
└─(kali㉿Kali)-[~]
└─$ sudo passwd kemi_fin
New password:
Retype new password:
passwd: password updated successfully
└─(kali㉿Kali)-[~]
└─$ sudo passwd rita_mark
New password:
Retype new password:
Activate Windows
Go to Settings to activate Windows.
Right Ctrl
```

```
Ethical-Hacker-Kali [Running] - Oracle VirtualBox
File Machine View Input Devices Help
File Actions Edit View Help
└─(kali㉿Kali)-[~]
└─$ sudo passwd rita_mark
New password:
Retype new password:
passwd: password updated successfully
└─(kali㉿Kali)-[~]
└─$ sudo passwd jamal_it
New password:
Retype new password:
passwd: password updated successfully
└─(kali㉿Kali)-[~]
└─$ sudo passwd ceo_exec
New password:
Retype new password:
passwd: password updated successfully
└─(kali㉿Kali)-[~]
└─$ su - alice_eng
password:
$ cd /srv/company/engineering
$ cd /srv/company/hr
$ ls -l /srv/company/*
drwxrwx--- 2 root engineering 4096 Jul 9 16:42 /srv/company/engineering
drwxrwx--- 2 root executives 4096 Jul 9 16:42 /srv/company/executives
drwxrwx--- 2 root finance 4096 Jul 9 16:42 /srv/company/finance
drwxrwx--- 2 root finmark 4096 Jul 9 16:42 /srv/company/finmark_shared
drwxrwx--- 2 root hr 4096 Jul 9 16:42 /srv/company/hr
drwxrwx--- 2 root itsupport 4096 Jul 9 16:42 /srv/company/itsupport
drwxrwx--- 2 root marketing 4096 Jul 9 16:42 /srv/company/marketing
$
```

```
Ethical-Hacker-Kali [Running] - Oracle VirtualBox
File Machine View Input Devices Help
File Actions Edit View Help
(kali㉿Kali)-[~]
$ sudo passwd jamal_it
New password:
Retype new password:
passwd: password updated successfully
(kali㉿Kali)-[~]
$ sudo passwd ceo_exec
New password:
Retype new password:
passwd: password updated successfully
(kali㉿Kali)-[~]
$ su - alice_eng
Password:
$ cd /srv/company/engineering
$ cd /srv/company/hr
-sh: 2: cd: can't cd to /srv/company/hr
$ ls -ld /srv/company/*
drwxrwx--- 2 root engineering 4096 Jul 9 16:42 /srv/company/engineering
drwxrwx--- 2 root executives 4096 Jul 9 16:42 /srv/company/executives
drwxrwx--- 2 root finance 4096 Jul 9 16:42 /srv/company/finance
drwxrwx--- 2 root finmark 4096 Jul 9 16:42 /srv/company/finmark_shared
drwxrwx--- 2 root hr 4096 Jul 9 16:42 /srv/company/hr
drwxrwx--- 2 root itsupport 4096 Jul 9 16:42 /srv/company/itsupport
drwxrwx--- 2 root marketing 4096 Jul 9 16:42 /srv/company/marketing
$ exit
(kali㉿Kali)-[~]
$ sudo chmod 750 /srv/company/hr
(kali㉿Kali)-[~]
$
```

```
Ethical-Hacker-Kali [Running] - Oracle VirtualBox
File Machine View Input Devices Help
File Actions Edit View Help
(kali㉿Kali)-[~]
$ ls -l /srv/company/
total 28
drwxrwx--- 2 root engineering 4096 Jul 9 16:42 engineering
drwxrwx--- 2 root executives 4096 Jul 9 16:42 executives
drwxrwx--- 2 root finance 4096 Jul 9 16:42 finance
drwxrwx--- 2 root finmark 4096 Jul 9 16:42 finmark_shared
drwxr-x--- 2 root hr 4096 Jul 9 16:42 hr
drwxrwx--- 2 root itsupport 4096 Jul 9 16:42 itsupport
drwxrwx--- 2 root marketing 4096 Jul 9 16:42 marketing

(kali㉿Kali)-[~]
$ ls -ld /srv/company/*
drwxrwx--- 2 root engineering 4096 Jul 9 16:42 /srv/company/engineering
drwxrwx--- 2 root executives 4096 Jul 9 16:42 /srv/company/executives
drwxrwx--- 2 root finance 4096 Jul 9 16:42 /srv/company/finance
drwxrwx--- 2 root finmark 4096 Jul 9 16:42 /srv/company/finmark_shared
drwxr-x--- 2 root hr 4096 Jul 9 16:42 /srv/company/hr
drwxrwx--- 2 root itsupport 4096 Jul 9 16:42 /srv/company/itsupport
drwxrwx--- 2 root marketing 4096 Jul 9 16:42 /srv/company/marketing
```

```
(kali㉿Kali)-[~]
$ sudo groups alice_eng
alice_eng : alice_eng engineering

(kali㉿Kali)-[~]
$ su - alice_eng
Password:
$ cd /srv/company/engineering
$ exit

(kali㉿Kali)-[~]
$ groups alice_eng
groups : james_eng
groups : tolu_hr
groups : tim_hr
groups : kemi_fin
groups : rita_mark
groups : jamal_it
groups : ceo_exec
alice_eng : alice_eng engineering
james_eng : james_eng engineering
tolu_hr : tolu_hr hr
tim_hr : tim_hr hr
kemi_fin : kemi_fin finance finmark
rita_mark : rita_mark marketing finmark
jamal_it : jamal_it itsupport
ceo_exec : ceo_exec executives

(kali㉿Kali)-[~]
$
```

```
kali㉿Kali:[~]
$ su tolu_hr
Password:
$ 
$ exit
[kali㉿Kali:[~]
$ su ceo_exec
Password:
$ cd
$ exit
[kali㉿Kali:[~]
$ su jamal_it
Password:
$ cd
$ exit
[kali㉿Kali:[~]
$ su rita_mark
Password:
$ cd
$ exit
[kali㉿Kali:[~]
$ su kemi_fin
Password:
$ cd
$ /srv/company/hr
sh: 2: cd: can't cd to /srv/company/hr
$ exit
[kali㉿Kali:[~]
$
```

Include command outputs such as:

```
bash
CopyEdit
$ ls -ld /srv/company/*
$ getfacl /srv/company/hr
$ groups alice_eng
$ su - alice_eng
$ cd /srv/company/hr      # Should fail
$ cd /srv/company/engineering # Should succeed
```

```
$ su alice_eng
Password:
$ cd /srv/company/engineering
$ cd /srv/company/hr
$ sh: 2: cd: can't cd to /srv/company/hr
$ ls -ld /srv/company/*
drwxrwx--- 2 root engineering 4096 Jul 9 10:42 /srv/company/engineering
drwxrwx--- 2 root executives 4096 Jul 9 10:42 /srv/company/executives
drwxrwx--- 2 root finance 4096 Jul 9 10:42 /srv/company/finance
drwxrwx--- 2 root limmark 4096 Jul 9 10:42 /srv/company/limmark_shared
drwxrwx--- 2 root hr 4096 Jul 9 10:42 /srv/company/hr
drwxrwx--- 2 root itsupport 4096 Jul 9 10:42 /srv/company/itsupport
drwxrwx--- 2 root marketing 4096 Jul 9 10:42 /srv/company/marketing
$ exit

[kali㉿Kali:[~]
$ sudo chmod 750 /srv/company/hr

[kali㉿Kali:[~]
$
```



7. Table Mapping Users to Roles and Permissions

Username	Full Name	Role	Group	Directory Access
alice_eng	Alice U.	Junior Software Developer	eng	RW in /srv/company/engineering
bob_hr	Bob K.	HR Assistant	hr	RW in /srv/company/hr
kemi_fin	Kemi R.	Tax Advisor	fin	RW in /srv/company/finance
tom_mark	Tom B.	Market Researcher	mark	RW in /srv/company/marketing
zainab_it	Zainab L.	Helpdesk Support	it	RW in /srv/company/it_support
jane_exec	Jane A.	CEO	exec	RW in /srv/company/*



8. Optional Script (Re-implementation)

🔧 Bash Script: cybershield_setup.sh

```
#!/bin/bash
```

```
# ===== GROUPS =====
groupadd engineering
groupadd hr
groupadd finance
groupadd marketing
groupadd it
groupadd exec
groupadd finmark # Shared group for Finance + Marketing

# ===== USERS =====
useradd -m alice_eng -G engineering
useradd -m james_eng -G engineering

useradd -m tolu_hr -G hr
useradd -m tim_hr -G hr
```

```
useradd -m kemi_fin -G finance,finmark
useradd -m rita_mark -G marketing,finmark

useradd -m jamal_it -G it
useradd -m ceo_exec -G exec

# ===== SET PASSWORDS =====
echo "alice_eng:Pass123!" | chpasswd
echo "james_eng:Pass123!" | chpasswd
echo "tolu_hr:Pass123!" | chpasswd
echo "tim_hr:Pass123!" | chpasswd
echo "kemi_fin:Pass123!" | chpasswd
echo "rita_mark:Pass123!" | chpasswd
echo "jamal_it:Pass123!" | chpasswd
echo "ceo_exec:Pass123!" | chpasswd

# ===== FOLDER STRUCTURE =====
mkdir -p /srv/company/{engineering,hr,finance,marketing,it,exec,finmark_shared}

# ===== OWNERSHIP =====
chown root:engineering /srv/company/engineering
chown root:hr /srv/company/hr
chown root:finance /srv/company/finance
chown root:marketing /srv/company/marketing
chown root:it /srv/company/it
chown root:exec /srv/company/exec
chown root:finmark /srv/company/finmark_shared

# ===== PERMISSIONS =====
chmod 770 /srv/company/engineering
chmod 750 /srv/company/hr      # Least privilege
chmod 770 /srv/company/finance
chmod 770 /srv/company/marketing
chmod 770 /srv/company/it
chmod 770 /srv/company/exec
chmod 770 /srv/company/finmark_shared

echo "✅ RBAC setup complete!"
```