CS551 project 3 - Test Document

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# Introduction:

The scope of this document is:

1. To show that the below recovery cases are handled in the program.
   1. The directory file is damaged
   2. The inode bit map of the directory is damaged
   3. The zone bit map of the directory is damaged
   4. The inode directory file is completely damaged
2. Additional damage recovery options provided in the program.
3. Negative tests with recovery tool to check its robustness.

# Options in tools:

# ./damageFileSystemTool

DAMAGE FILE SYSTEM TOOL – please select your choice

1. Delete the file without damaging the folder
2. Damage the inode bit Map by removing the file.
3. Currupt the Directory file completely.
4. Damage the inode time to damage the inode bit map.
5. Damage the zone bit map.
6. Damage the Directory file by corrupting its inode completely
7. Exit

Enter your choice ->

# df

Filesystem Size (kB) Free Used % Files% Mounted on

/dev/c0d0p0s0 65536 41572 23964 37% 3% /

/dev/c0d0p0s2 1699280 1207300 491980 29% 5% /usr

/dev/c0d0p0s1 331776 326524 5252 2% 1% /home

# ./ recoverFileSystemTool

Invalid Number of arguments.

Usage: ./ recoverFileSystemTool <device-name>

Example: ./ recoverFileSystemTool /dev/c0d0p0s0

# ./ recoverFileSystemTool /dev/c0d0p0s0

Super Block Details:

====================

Super Block will not be modified!!!

ninodes = 32768

nzones = 16384

imap\_blocks = 2

zmap\_blocks = 1

firstdatazone = 517

log\_zone\_size = 0

maxsize = 2147483647

block size = 4096

flags = DIRTY

Checking zone map. zone 5804 is missing

install a new map? (y=yes, n=no, q=quit, A=for yes to all) yes

Checking inode map. Checking inode list.

Summary of files, inode, zone details:

======================================

192 files

24 Directories

8 Symbolic links

blocksize = 4096 zonesize = 4096

32095 Free inodes

5381 Data zones

93 Single indirect zones

0 Double indirect zones

10393 Free zones

----- FILE SYSTEM HAS BEEN MODIFIED -----

# Test cases:

## **Case 1:** Damage file without damaging folder

1. Test file is present on the disk.

# date;ls -ltr testd2/test6

Sat Apr 25 19:06:56 GMT 2017

-rw-r--r-- 1 root operator 0 Apr 25 19:02 testd2/test6

1. Invoking damageFileSystemTool to delete the file.

# ./damageFileSystemTool

Enter Your Choice -> 0

\*\*\*\*\* Enter file name along with the path \*\*\*\*

Enter Absolute file path : /root/project3/testd2/test6

name=/root/project3/testd2/test6

1. File is deleted from disk

# date;ls -ltr testd2/test6

Sat Apr 25 19:09:41 GMT 2017

ls: testd2/test6: no such file or directory

## **Case 2:** Damage the inode bit Map by removing the file

1. Listing test files before damaging.

# date;ls testd2/

Sat Apr 25 19:12:18 GMT 2017

test4 test5

1. Removing test5 file from testd2 directory.

# ./damageFileSystemTool

Enter Your Choice -> 1

\*\*\*\*\* Enter file name along with the path \*\*\*\*

Enter Absolute file path : /root/project3/testd2/test5

name=/root/project3/testd2/test5

1. Testd2 directory still shows test5 file though it is deleted.

# date;ls testd2/

Sat Apr 25 19:12:51 GMT 2017

test4 test5

1. Running tool, since link count for test5 file is zero it is corrupted hence it is being removed.

# ./recoverFileSystemTool /dev/c0d0p0s0

Super Block Details:

…

link count zero of /root/project3/testd2/test5 (ino = 672) removing

Summary of files, inode, zone details:

1. Testd-2 directory no longer shows test5 file.

# date;ls testd2/

Sat Apr 25 19:13:56 GMT 2017

test4

## **Case 3:** Corrupt the Directory file completely

# date;ls testd2

Sat Apr 25 22:46:51 GMT 2017

test4

1. Delete test4 from testd2 directory entry but don’t remove the file.

# ./damageFileSystemTool

Enter Your Choice -> 2

\*\*\*\*\* Enter file name along with the path \*\*\*\*

Enter Absolute file path : /root/project3/testd2/test4

name=/root/project3/testd2/test4

1. testd2 directory does not list test4 file

# date;ls testd2

Sat Apr 25 22:47:42 GMT 2017

1. When recovery tool is run there is a stale inode and it is cleared.

# ./recoverFileSystemTool /dev/c0d0p0s0

Checking zone map. Checking inode map. inode 662 is missing

install a new map? (y=yes, n=no, q=qui t, A=for yes to all) yes

Checking inode list. mode inode 662 not cleared. clear? yes

…

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1. No change in testd2 directory list.

# date;ls testd2

Sat Apr 25 22:48:15 GMT 2017

## **Case 4:** Damage the inode time to damage the inode bit map

1. File test3 modified time is “Apr 25 22:45”

# date;ls -ltr testd1

Sat Apr 25 22:56:29 GMT 2017

total 3

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test1

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test2

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test3

1. Corrupting modified, access time of file test3.

# ./damageFileSystemTool

Enter Your Choice -> 3

\*\*\*\*\* Enter file name along with the path \*\*\*\*

Enter Absolute file path : /root/project3/testd1/test3

name=/root/project3/testd1/test3

1. File test3 modified time is changed to Jan 1 1970

# date;ls -ltr testd1

Sat Apr 25 22:56:45 GMT 2017

total 3

-rw-r--r-- 2 root operator 0 Jan 1 1970 test3

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test1

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test2

1. Running tool to recover. Not correcting in first run though tool shows the problem.

# ./recoverFileSystemTool /dev/c0d0p0s0

Time of inode is corrupted. /root/project3/testd1/test3 (ino = 661)

access 0, modified 0, inode modified 1430002602

Should delete? 0 - no, 1 - yes -> 0

Checking zone map. INODE NLINK COUNT

661 2 1 adjust? (y=yes, n=no, q=quit, A=for yes to all) yes

Checking inode map. Checking inode list.

1. File test3 is still present.

# date;ls -ltr testd1

Sat Apr 25 22:57:04 GMT 2017

total 0

-rw-r--r-- 2 root operator 0 Jan 1 1970 test3

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test1

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test2

1. Now choosing to recover from error condition.

# ./recoverFileSystemTool /dev/c0d0p0s0

Time of inode is corrupted. /root/project3/testd1/test3 (ino = 661)

access 0, modified 0, inode modified 1430002602

Should delete? 0 - no, 1 - yes -> 1

remove? (y=yes, n=no, q=quit, A=for yes to all) yes

Checking zone map. INODE NLINK COUNT

661 0 1 adjust? yes

Checking inode map. inode 661 is missing

install a new map? yes

Checking inode list.

1. File test3 is deleted as its inode is corrupted.

# date;ls -ltr testd1

Sat Apr 25 22:57:16 GMT 2017

total 0

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test1

-rw-r--r-- 1 root operator 0 Apr 25 22:45 test2

## **Case 5:** Damage the zone bit map

Last modified time of directory testd1 is Apr 25 22:55

# date;ls -ltr

Sat Apr 25 23:05:20 GMT 2017

total 4

drwxr-xr-x 2 root operator 576 Apr 25 21:27 damagetool

drwxr-xr-x 2 root operator 192 Apr 25 22:55 testd2

drwxr-xr-x 2 root operator 960 Apr 25 22:56 recovertool

drwxr-xr-x 2 root operator 320 Apr 25 23:04 testd1

1. Corrupting the last modified, access time of directory testd1.

# ./damageFileSystemTool

Enter Your Choice -> 4

\*\*\*\*\* Enter file name along with the path \*\*\*\*

Enter Absolute file path : /root/project3/testd1/test2

name=/root/project3/testd1/test2

1. Last modified time of directory testd1 is corrupted.

# date;ls -ltr

Sat Apr 25 23:05:37 GMT 2017

total 4

drwxr-xr-x 2 root operator 320 Jan 1 1970 testd1

drwxr-xr-x 2 root operator 576 Apr 25 21:27 damagetool

drwxr-xr-x 2 root operator 192 Apr 25 22:55 testd2

drwxr-xr-x 2 root operator 960 Apr 25 22:56 recovertool

1. Running tool to delete directory as its inode is corrupted.

# ./recoverFileSystemTool /dev/c0d0p0s0

Time of inode is corrupted. /root/project3/testd1 (ino = 655)

access 0, modified 0, inode modified 0

Should delete? 0 - no, 1 - yes -> 1

remove? (y=yes, n=no, q=quit, A=for yes to all) yes

Checking zone map. zone 5403 is missing

install a new map? yes

INODE NLINK COUNT

638 6 5 adjust? yes

655 0 2 adjust? yes

Checking inode map. inode 655 is missing

inode 659 is missing

inode 660 is missing

install a new map? yes

Checking inode list. mode inode 659 not cleared. clear? yes

mode inode 660 not cleared. clear? Yes

1. Directory testd1 is no longer present.

# date;ls -ltr

Sat Apr 25 23:05:54 GMT 2017

total 3

drwxr-xr-x 2 root operator 576 Apr 25 21:27 damagetool

drwxr-xr-x 2 root operator 192 Apr 25 22:55 testd2

drwxr-xr-x 2 root operator 960 Apr 25 22:56 recovertool

## **Case 6:** Damage the Directory file by corrupting its inode completely

1. Directory testd3 before corrupting its links.

# date; ls -ltr testd3

Sat Apr 25 23:13:31 GMT 2017

total 0

-rw-r--r-- 1 root operator 0 Apr 25 23:12 test1

# date; ls -ltr

Sat Apr 25 23:13:35 GMT 2017

total 4

drwxr-xr-x 2 root operator 576 Apr 25 21:27 damagetool

drwxr-xr-x 2 root operator 192 Apr 25 22:55 testd2

drwxr-xr-x 2 root operator 960 Apr 25 22:56 recovertool

drwxr-xr-x 3 root operator 192 Apr 25 23:12 testd3

1. Running damage tool to corrupt links.

# ./damageFileSystemTool

Enter Your Choice -> 5

\*\*\*\*\* Enter file name along with the path \*\*\*\*

Enter Absolute file path : /root/project3/testd3/test1

name=/root/project3/testd3/test1

1. No change in display attributes of testd3 directory.

# date; ls -ltr

Sat Apr 25 23:13:54 GMT 2017

total 4

drwxr-xr-x 2 root operator 576 Apr 25 21:27 damagetool

drwxr-xr-x 2 root operator 192 Apr 25 22:55 testd2

drwxr-xr-x 2 root operator 960 Apr 25 22:56 recovertool

drwxr-xr-x 3 root operator 192 Apr 25 23:12 testd3

# date; ls -ltr testd3

Sat Apr 25 23:13:56 GMT 2017

total 0

-rw-r--r-- 1 root operator 0 Apr 25 23:12 test1

1. When recovery tool is run it finds that link is corrupted and recovers it.

# ./recoverFileSystemTool /dev/c0d0p0s0

Checking zone map. INODE NLINK COUNT

552 3 2 adjust? (y=yes, n=no, q=quit, A=for yes to all) yes

638 7 6 adjust? yes

Checking inode map. Checking inode list.

Summary of files, inode, zone details:

======================================

177 files

25 Directories

8 Symbolic links

blocksize = 4096 zonesize = 4096

32109 Free inodes

4804 Data zones

84 Single indirect zones

0 Double indirect zones

10979 Free zones

----- FILE SYSTEM HAS BEEN MODIFIED -----

#

# Negative tests:

## When device name is not given to recovery tool, it exits gracefully by showing the correct usage.

# ./recoverFileSystemTool

Invalid Number of arguments.

Usage: ./recoverFileSystemTool <device-name>

Example: ./recoverFileSystemTool /dev/c0d0p0s0

for device name execute command df

## When a wrong/nonexistent device name is provided it exits gracefully.

# ./recoverFileSystemTool abc

abc: no such file or directory

couldn't open device to fsck fatal

## When more than required arguments are provided, tool exits gracefully.

# ./recoverFileSystemTool /dev/c0d0p0s0 abc 1

Invalid Number of arguments.

Usage: ./recoverFileSystemTool <device-name>

Example: ./recoverFileSystemTool /dev/c0d0p0s0

for device name execute command df

# Extra Features:

1. In damage tool, there is a provision to set last access and last modified times of a file to 0. Thus a way to corrupt the files inode.
2. When any files last access and last modified times in its inode on the device is zero user is provided with an option whether he/she intends to delete the file.
3. In recovery tool, when a directories inode has last access and last modified times as zero then an option is provide whether to delete all files under that directory and directory or not.
4. Using damage tool, one can set last access and last modified times of a directory to zero.