Comparative Study on Various File System Implementations on Different OS

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Abstract - *The presented work is a report on various file systems. It first describes what are file systems, briefs on its structure, describing what is common in modern file systems, and how they differ in various parameters, which essentially makes them unique. It also explores how file systems exploit various hardware resources to its best, and gives the user, an easier way to manage files and directories. It then dives into how file systems are implemented, what are the common characteristics of various file systems, their data structures used to manage directories and the files therein. This report is concluded with the implementation of a simple file system, that uses the high level constructs of C language to implement a file system that efficiently manages text files*

1.INTRODUCTION

A file system is a collection of methods and data structures that an Operating System uses to keep track of files on a disk or a partition of it. In a way, it is how files are organized on the disk. By partitioning the disk into multiple fragments, one can enable a different file system on each partition. In other words, a file system is a structure on a block device, typically a disk, that provides structured, organized access to data and metadata. We'll be using the term metadata quite a lot when discussing file systems. It refers to all the things that describe the data but are not the core file data. For example, given a jpeg image file, the contents that represent the image in jpeg format are the file's data. The length, creation/modification/access times, permissions, owner of the file, and the location of the actual data are all metadata. The file's name is generally not considered to be part of the metadata. The present work explores file system at the surface, their structure, implementation, directory interface, their types, data structures used to implement them, etc. The work is concluded with the implementation of a basic file system, which aims to implement functions as basic but crucial as the ability to create files, the flexibility to rename, modify, and delete them , as well as maintain their ownership and gives the admin, the complete control over the system.

2 FILE SYSTEMS IN WINDOWS AND LINUX

2.1 WINDOWS FILE SYSTEMS:

Microsoft Windows OS use two major file systems: FAT, inherited from old DOS with its later extension FAT32, and widely-used NTFS file systems. Recently released ReFS file system was developed by Microsoft as a new generation file system for Windows 8 Servers. It serves as a database for all kinds of data like structured, unstructured and semi structured. It helps developers to transfer data in many different ways. It is developed by Microsoft to provide a link between windows vista's application layer and NTFS-New Technology File System. It does not serve as alternative to NTFS of Microsoft's. Microsoft Windows had 2 widely used file systems. They are , NTFS- New Technology File System:- This is the present file system which is given as default to the Windows Operating Systems. FAT-File Allocation Table :- This file system is inherited and developed from old DOS and has been extended to several later versions like exFAT which is also called extended File systems.

2.2 DIFFERENT TYPES OF FILES IN WINDOWS:

FAT-Record designation Table was presented by Microsoft in 1980's. Around then it was one of the least difficult document frameworks types and forms. It comprises of (i)File Framework Descriptor Sector(boot part), (ii)File Framework Square Allotment Table and (iii)Plane extra room for putting away information in documents, coordinators, etc. FAT use files to store the records and envelopes. These exhibits are of 32-byte size which characterize a document or any outside characteristic of that record. It likewise makes a record of first square of the document. The following squares are found effectively through the Square Assignment Table by utilizing it as a connected rundown. The Square Distribution Table contain a variety of square descriptors. Zero worth demonstrates that the square isn't utilized and a non-zero one identifies with the following square of a record or an extraordinary incentive for the document end. The numbers 12, 16 and 32 in FAT12, FAT16, FAT32 speak to the quantity of bits used to identify a record framework square. This implies FAT12 can utilize around 2^12=4096 diverse square references, where as FAT16 and FAT32 can utilize around 2^16=65536 and 2^32=4294967296 individually. The real most extreme check of squares is in reality less and depends record framework driver. FAT12 and FAT16 are utilized in old floppy circles and they are been out-dated at this point. FAT32 is still generally utilized in memory cards and USB's. FAT32 is bolstered in cell phones, computerized camera and other compact gadgets. FAT32 can be utilized on Windows perfect outside stockpiles or circle segments with the size not exactly or equivalent to <= 32 GB. Windows can't make a FAT32 record framework which would be bigger than 32 GB, though Linux bolsters the size up to 2 TB and which further doesn't permit to make documents the size of which surpasses 4 GB. To beat this issue, exFAT was acquainted by

Microsoft with defeat constraints in measuring of documents or segments.

NTFS-New Innovation Document Framework appeared in 1993 with Windows NT operating system and is at present the most well-known record framework accessible for end client PCs on Windows. Pretty much every windows server utilize this configuration as it were. Records in NTFS are put away as a document descriptor in Ace Document Table. Every one of the subtleties containing passages of file size, name, allocation, etc are stored in this Master File Table. First 16 entries of the master file table are retained for bitmap. This file table also keeps a record of all clusters which are free and used. It also detects the bad clusters called Badclus. The first sector and last sector of the file system contains system settings. This fie system uses 48 bit and 64 bit values as reference files, which makes them supportable to store large data and have high capacity.

UDF(Universal Disk Format) - file system is the industrial based file format for storing information on the DVD (Digital Versatile Disc or Digital Video Disc) optical media. The UDF file system is provided as dynamically loadable 32–bit and 64–bit modules, with system administration utilities for creating, mounting, and checking the file system on both SPARC and IA platforms. The Solaris UDF file system works with supported ATAPI and SCSI DVD drives, CD-ROM devices, and disk and diskette drives. In addition, the Solaris UDF file system is fully compliant with the UDF 1.50 specification.

ReFS - Strong Document Framework is the most recent improvement of Microsoft presented with Windows 8 operating system and now accessible for Windows 10 operating system. This record framework design completely contrasts from different Windows document frameworks and is essentially composed in a type of the B+-tree. ReFS has high resistance to disappointments because of new highlights included into the framework. What's more, specifically, Duplicate on-Compose (Bovine): no metadata is changed without being replicated; information isn't composed over the current information, however into new circle space. With any record adjustments, another duplicate of metadata is put away into free extra room, and afterward the framework makes a connection from more established metadata to the more current one. Hence, the framework stores huge amount of more seasoned reinforcements in better places giving simple document recuperation except if this extra room is overwritten. In the event that we need the Windows-just condition, NTFS is the best decision. In the event that we needed to trade records (even sometimes) with a non-Windows framework like a Macintosh or Linux box, at that point FAT32 will give you fine outcome and without any information misfortune, where your document size ought to be under 4GB. While document move speed and most extreme throughput is constrained by the slowest connect (as a rule the hard drive interface to the PC like SATA or a system interface like 3G WWAN), NTFS designed hard drives have tried quicker on benchmark tests than FAT32 arranged drives. As a rule, exFAT drives are quicker at composing and perusing information than FAT32 drives. All benchmarks show that NTFS is a lot quicker than exFAT. Basically except if you are 100 percent sure that you will never have a record littler than 4 GB, position the drive as exFAT

2.3 EXTENDED FILE SYSTEMS IN LINUX

There are various types of file system in linux/unix which are distributed according to their distros or the amount of work load which they are made of, now we will see some extended file system in linux:

Ext(extended file system) was the first file system in the series of extended file systems. Extended file system(ext) was implemented in April 1992 and it is the first file system created specially for the Linuxkernel. It has metadata structure inspired by the traditional Unix File System (UFS) and was designed and implemented by Remy Card to overcome the disadvantages of the MINIX file system.

The ext2 or second extended file system is a file system for the Linux kernel. It was initially designed by Remy Card as a replacement for the extended file system (ext). ext2 was the default filesystem in several Linux distributions, such as Debian and Red Hat Linux, until ext2 is supplanted more recently by ext3, which is completely compatible with ext2 and ext3 is a journaling file system. ext2 is still used as a filesystem for flash-based storage media (such as SD cards and USB flash drives etc.)

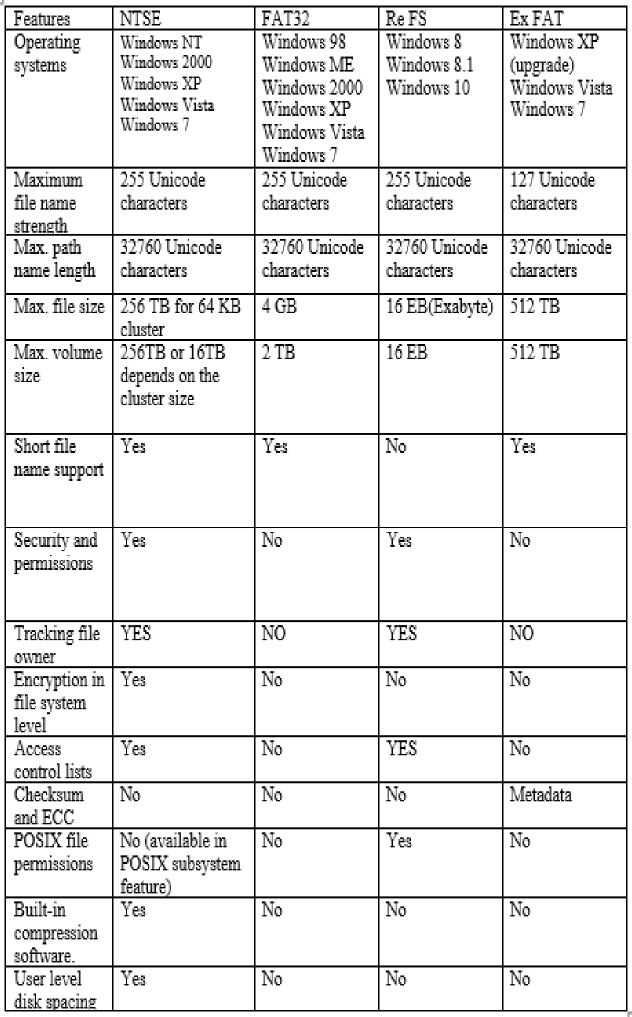
Third broadened record system(ext3) is the usually utilized Linux document framework. Ext3 is presented in 2001 which is created by Stephen Tweedie. Ext3 was accessible beginning from Linux kernel(v2.4.15). Most extreme document size of ext3 ranges from 16GB to 2TB. There are three kinds of journaling accessible in ext3 record system.The primary bit of leeway of ext3 over ext2 is journaling, which improves unwavering quality and wipes out the need to check the document framework after an unclean shutdown.

Ext4 was created to stretch out capacity limits and to include other execution improvements.It underpins the most extreme record size as near to other document frameworks. Most extreme record size of ext4 ranges from 16 GB to 16 TB. Some new highlights are included Ext4, for example, it underpins multiblock designation, deferred portion, diary checksum. These new highlights have improved the exhibition and unwavering quality of the document framework when contrasted with ext3.

2.4 NON EXTENDED FILE SYSTEM IN LINUX

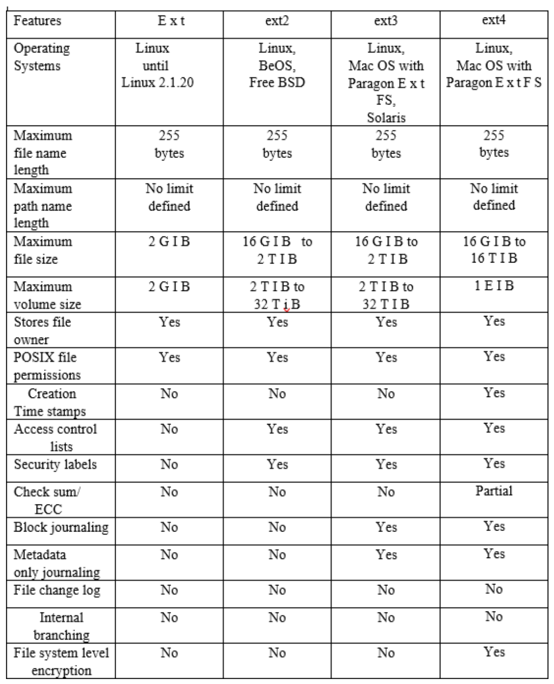
XFS is an elite 64bit journaling document framework made by Silicon Illustrations, Inc(SGI) in 1993.It is upheld by most Linux circulations, some of them utilizes XFS as the default record framework. SGI's IRIX working system(starting from v5.3) utilizes XFS as the default record framework. XFS exceeds expectations in the execution of parallel info/yield (I/O) activities. XFS empowers outrageous versatility of I/O strings, record framework data transmission, and size of documents when traversing different physical stockpiling gadgets. XFS highlights incorporate striped portion of Assault arrays,file framework journaling,variable square sizes, direct I/O, ensured rate I/O,snapshots, online defragmentation,online resizing. A special element to XFS is the pre-portion of I/O data transfer capacity at a pre-decided rate,this is appropriate for some ongoing applications. In any case, this exceptional component was upheld just on IRIX working framework and just with specific equipment.JFS Journaled Record System(JFS) is a 64-piece journaling document framework made by IBM. There are adaptations for AIX, eComStation, operating system/2, and Linux working frameworks. The last is accessible as free programming under the conditions of the GNU Overall population Permit (GPL). In the AIX working framework, there are two ages of JFS filesystem to be specific JFS (JFS1) and JFS2 individually. The subsequent age exists in working frameworks, for example, operating system/2 and Linux and is basically called as JFS.We ought not be mistaken for JFS in AIX that alludes to JFS1. ReiserFS is a broadly useful journaled document framework earlier planned and actualized by a group at Namesys drove by Hans Reiser..ReiserFs was presented in Linux kernel(v2.4.1) ReiserFS is utilized as the default record framework on Elive, Xandros, Linspire, and YOPER Linux appropriations. ReiserFS is utilized as default record framework in Novell's SUSE Linux Endeavor until Novell chose to move to ext3 on October 12, 2006 for future discharges Namesys considered ReiserFS as steady and highlight total and, except for security updates and basic bug fixes, stopped advancement on it to focus on its successor, Reiser4. Reiser4 is a file system created and developed by Namesys and it is successor to ReiserFS. The creation of Reiser4 was backed by the Linspire project as well as DARPA. What makes Reiser4 special is its multitude of transaction models.

2.5 Comparison of different windows file systems based on their features:



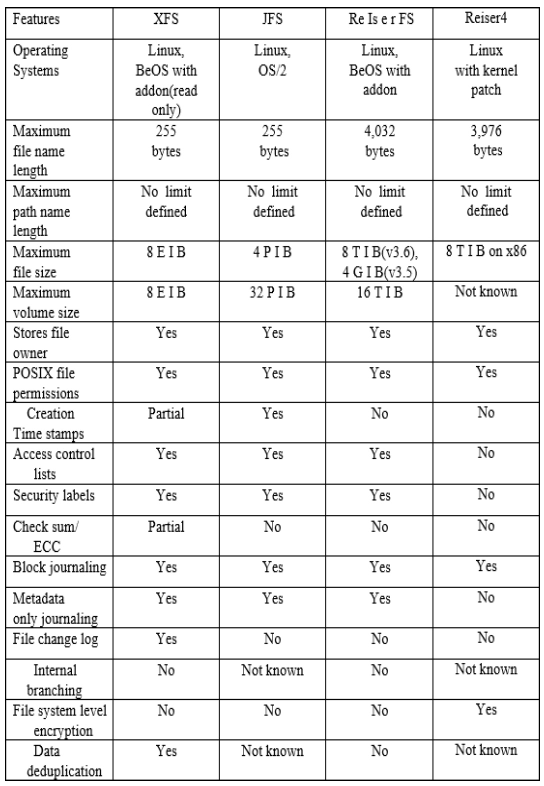
Features	NTSE	FAT32	Re FS	Ex FAT
Operating systems	Windows NT Windows 2000 Windows XP Windows Vista Windows 7	Windows 98 Windows ME Windows 2000 Windows XP Windows Vista Windows 7	Windows 8 Windows 8.1 Windows 10	Windows XP (upgrade) Windows Vista Windows 7
Maximum file name strength	255 Unicode characters	255 Unicode characters	255 Unicode characters	127 Unicode characters
Max. path name length	32760 Unicode characters	32760 Unicode characters	32760 Unicode characters	32760 Unicode characters
Max. file size	256 TB for 64 KB cluster	4 GB	16 EB(Exabyte)	512 TB
Max. volume size	256TB or 16TB depends on the cluster size	2 TB	16 EB	512 TB
Short file name support	Yes	Yes	No	Yes
Security and permissions	Yes	No	Yes	No
Tracking file owner	YES	NO	YES	NO
Encryption in file system level	Yes	No	No	No
Access control lists	Yes	No	YES	No
Checksum and ECC	No	No	No	Metadata
POSIX file permissions	No (available in POSIX subsystem feature)	No	Yes	No
Built-in compression software.	Yes	No	No	No
User level disk spacing	Yes	No	No	No

Table - 1:Comparison of different windows file systems based on their features



Features	E x t	ext2	ext3	ext4
Operating Systems	Linux until Linux 2.1.20	Linux, BeOS, Free BSD	Linux, Mac OS with Paragon E x t FS, Solaris	Linux, Mac OS with Paragon E x t F S
Maximum file name length	255 bytes	255 bytes	255 bytes	255 bytes
Maximum path name length	No limit defined	No limit defined	No limit defined	No limit defined
Maximum file size	2 G I B	16 G I B to 2 T I B	16 G I B to 2 T I B	16 G I B to 16 T I B
Maximum volume size	2 G I B	2 T I B to 32 T i B	2 T I B to 32 T I B	1 E I B
Stores file owner	Yes	Yes	Yes	Yes
POSIX file permissions	Yes	Yes	Yes	Yes
Creation Time stamps	No	No	No	Yes
Access control lists	No	Yes	Yes	Yes
Security labels	No	Yes	Yes	Yes
Check sum/ ECC	No	No	No	Partial
Block journaling	No	No	Yes	Yes
Metadata only journaling	No	No	Yes	Yes
File change log	No	No	No	No
Internal branching	No	No	No	No
File system level encryption	No	No	No	Yes

Table - 2: Comparison of extended file systems in linux



Features	XFS	JFS	Re Is e r FS	Reiser4
Operating Systems	Linux, BeOS with addon(read only)	Linux, OS/2	Linux, BeOS with addon	Linux with kernel patch
Maximum file name length	255 bytes	255 bytes	4,032 bytes	3,976 bytes
Maximum path name length	No limit defined	No limit defined	No limit defined	No limit defined
Maximum file size	8 E I B	4 P I B	8 T I B(v3.6), 4 G I B(v3.5)	8 T I B on x86
Maximum volume size	8 E I B	32 P I B	16 T I B	Not known
Stores file owner	Yes	Yes	Yes	Yes
POSIX file permissions	Yes	Yes	Yes	Yes
Creation Time stamps	Partial	Yes	No	No
Access control lists	Yes	Yes	Yes	No
Security labels	Yes	Yes	Yes	No
Check sum/ ECC	Partial	No	No	No
Block journaling	Yes	Yes	Yes	Yes
Metadata only journaling	Yes	Yes	Yes	No
File change log	Yes	No	No	No
Internal branching	No	Not known	No	Not known
File system level encryption	No	No	No	Yes
Data deduplication	Yes	Not known	No	Not known

Table 3:Comparative study of non-extended systems in linux

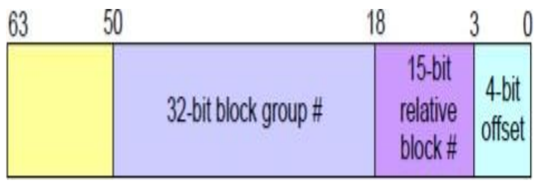
A complete study on ext4 file system inLinux:

Ext4 was created to stretch out capacity limits and to include other execution improvements.It bolsters the greatest document size as relative to other record systems.Maximum record size of ext4 ranges from 16 GB to 16 TB. Some new highlights are included Ext4, for example, it bolsters multiblock designation, postponed allotment, diary checksum.These new highlights have improved the exhibition and unwavering quality of the document framework when contrasted with ext3.New features added to ext4 are

64 bit file system

Ext4 is 64bit filesystem allowing file size upto 16TB

Inode size of 256 bytes



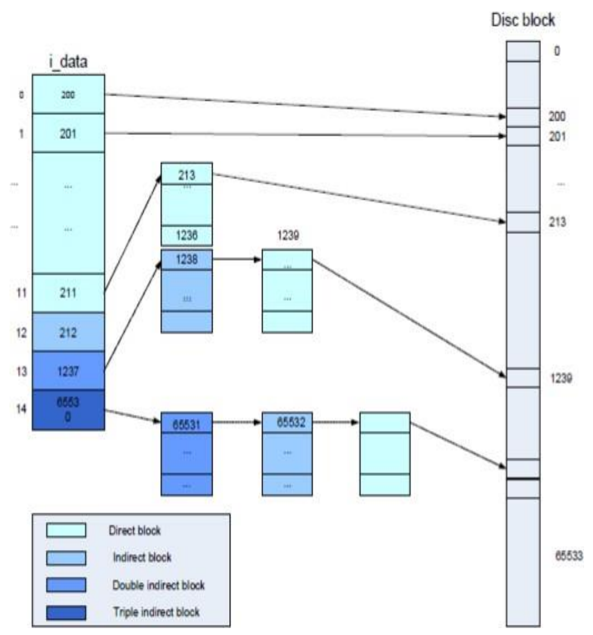
Extents

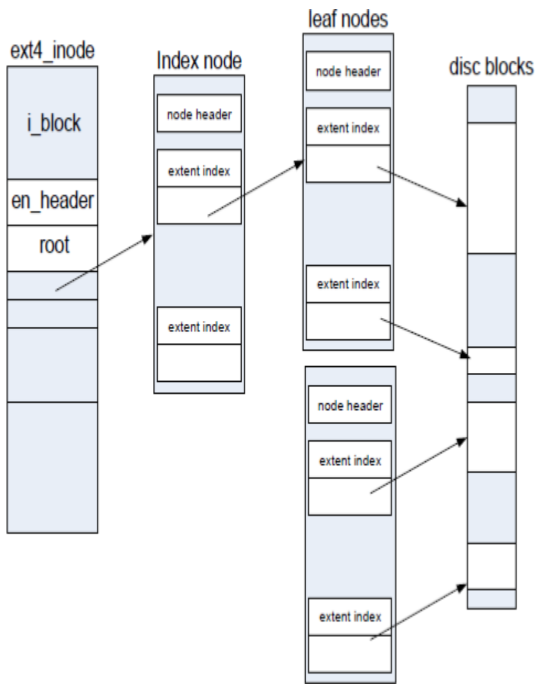
Significant distinction somewhere in the range of ext3 and ext4 record framework is the manner in which that the square numbers are put away with information files.Ext3 utilizes roundabout mapping blocks.ext4 recalls the quantity of squares in degree (descriptor that speaks to a consistent arrangement of physical squares)

Block allocation enhancement

Higher fragmentation rates causes greater disk access time affecting overall throughput.It has impact on increased metadata overhead causing less efficient mapping.By improving block allocation techniques we can reduce file system fragmentation.

Ext3 is one of the most reliable file systems,therefore developers are putting much effort to make it even more reliable.





In Ext3 catalog sections are put away in a connected list,which is exceptionally wasteful for registries with huge number of enries.The registry ordering highlight tends to this versatility issue by putting away index passages in Htree information structure,which is particular BTree like structure utilizing 32bit..Fast query time of Htree improves execution on huge registries.

There is a possibility that the ext4 file system can still become quite fragmented.Ext4 online defragmentation tool,e4defrag can defragment individual files or entire file system and by this way it helps in avoiding file fragmentation caused with file system aging

2.5 Benchmark tests:

Benchmark testing is the process of load testing a component or an entire end to end IT system to determine the performance characteristics of the application. The benchmark test is repeatable in that the performance measurements captured will vary only a few percent each time the test is run. This enables single changes to be made to the application or infrastructure in an attempt to determine if there is a performance improvement or degradation.

Benchmark testing can combine aspects of security testing

BOONIE++

Bonnie++ is a plate and document framework benchmarking device for estimating I/O execution. With Bonnie++ you can rapidly and effectively produce an important incentive to speak to your present record framework execution.

Run the bonnie++ order with the accompanying characteristics:

[TEST_LOCATION] –is where bonnie++ will create the benchmark operations.

[TEST_SIZE] – the size of the test file – this should be greater than double the RAM in your system.

[TEST_NAME] – this is simply a label which will be written out with the results.

[TEST_USER] – the user who should perform the test. This is not required if you are not running as root.

-d – is utilized to indicate the record framework registry to use to benchmark.

-u – is utilized to run an a specific client. This is best utilized on the off chance that you run the program as root. This is the UID or the name.

-g – is utilized to run as a specific gathering. This is the GID or the name.

-r – is utilized to indicate the measure of RAM in MB the framework has introduced.

-b – expels compose buffering and plays out a match up toward the finish of each bonnie++ activity.

-s – indicates the dataset size to use for the IO test in MB.

-n – is the quantity of records to use for the make documents test.

-m – this adds a mark to the yield with the goal that you can comprehend what the test was sometime in the future.

-x n – is utilized to rehash the tests n times. Change n to the quantity of how often to run the tests.

Here we are using Boonie++ and Iozone test as our main tests in which Benchmark tests using Bonnie++ and Iozone have been performed for Ubuntu and FreeBSD

The versions for Ubuntu 8.10(x86_64) with the Linux 2.6.27 kernel,X server 1.5.2,GCC 4.3.2,GNOME 2.24,the ext2 file system and FreeBSD 7.1 Beta2 (AMD64) with X server 1.5.2,GCC 4.3.2,GNOME 2.24,the FFS file system and Java 1.6.0_07_02.Both the operating systems were left in their default configuration.For testing both operating systems comparison was completed with AMD hardware,the strongest performance is exhibited with Ubuntu 8.10.

bonnie++ plays out numerous tests, contingent upon the contentions utilized, and doesn't show much until the tests are finished. At the point when the tests total, two yields are noticeable. The primary concern isn't discernible (except if you truly recognize what you are doing) anyway over that is a table based yield of the consequences of the tests performed. How about we start with a fundamental test, advising bonnie++ where to test and the amount Smash is introduced, 2GB in this model. bonnie++ will at that point utilize a dataset double the size of the Slam for tests. As I am running as root, I am indicating a client name.

The yield shows many insights, however it's very straight forward once you comprehend the arrangement. To start with, dispose of the primary concern (or three lines in the above yield) as this is the outcomes isolated by a comma. A few contents and diagramming applications comprehend these outcomes yet it's not all that simple for people. The best hardly any lines are only the tests which bonnie++ performs and once more, can be disposed of.

Of cause, all the yield of bonnie++ is valuable in some unique situation anyway we are simply going to focus on arbitrary read/compose, perusing a square and composing a square. This comes down to this segment:

bonnie++ can do considerably more and, even out of the case, show substantially more yet this will give you some essential figures to comprehend and look at. Keep in mind, consistently perform tests on datasets bigger than the Slam you have introduced, on numerous occasions throughout the day, to diminish the opportunity of different procedures meddling with the outcomes.

```
bonnie++ - d/tmp - s 4G - n 0 - m TEST - f - b - u james
```

IOZONE TEST:

Iozone performs the following 13 types of test. If you are executing iozone test on a database server, you can focus on the 1st 6 tests, as they directly impact the database performance

Read – Indicates the performance of reading a file that already exists in the filesystem.

Write – Indicates the performance of writing a new file to the filesystem.

Re-read – After reading a file, this indicates the performance of reading a file again.

Re-write – Indicates the performance of writing to an existing file.

Random Read – Indicates the performance of reading a file by reading random information from the file. i.e this is not a sequential read.

Random Write – Indicates the performance of writing to a file in various random locations. i.e this is not a sequential write.

Backward Read

Record Re-Write

Stride Read

Fread

Fwrite

Freread

Frewrite

IOZone Examples

Run all IOZone tests using default values

- a choice represents programmed mode. This makes transitory test documents from sizes 64k to 512MB for execution testing. This mode additionally utilizes 4k to 16M of record sizes for read and compose (more on this later) testing.

- a choice will likewise execute all the 13 sorts of tests.

```
$ ./iozone -a
```

The first setion of the iozone output contains the header information, which displays information about the iozone utility, and all the iozone options that are used to generate this report, as shown below.

```
Iozone: Performance Test of File I/O
```

The second section of the output contains the output values (in per second) of various tests.

1st column KB: Indicates the file size that was used for the testing.

- 2nd column reclen: Indicates the record length that was used for the testing.

3rd column until the last column: Indicates the various tests that are performed and its output values in per second

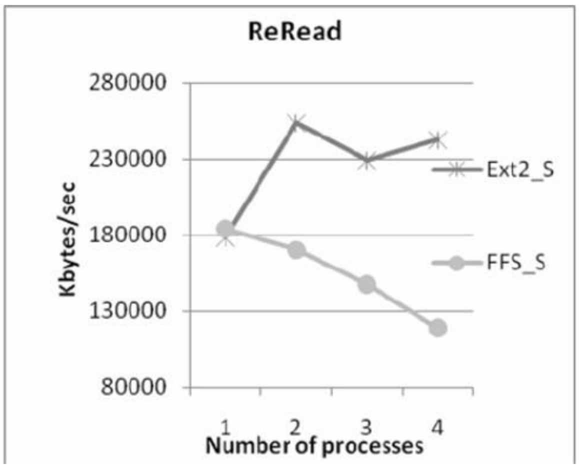
4. CONCLUSIONS

ve the output to a spreadsheet using iozone -b

To save the iozone output to a spreadsheet, use the - b option as shown below. -b stands for binary, and it instructs iozone to write the test output in binary format to a spreadsheet.

Note: The - b choice can be utilized with any of the models referenced beneath.

From the information that is spared in the spreadsheet, you can utilize the make some pretty diagrams utilizing the chart usefulness of the spreadsheet apparatus. Coming up next is an example diagram that was made from iozone yield.



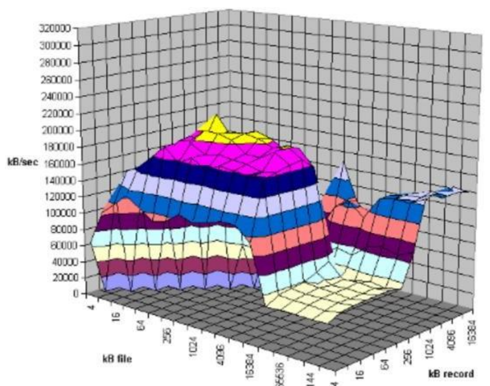
.Iozone reread for ext2 and FFS Observations:

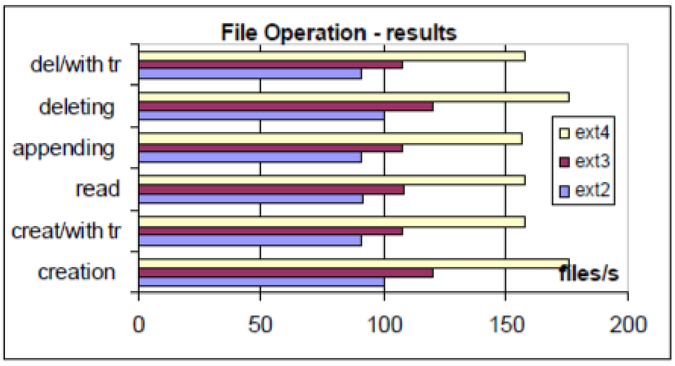
After performing the Bonnie and Iozone performance tests ext2 executes more efficiently than ffs. Thus Linux performs better than FreeBSD in these Bonnie++ and Iozone tests.

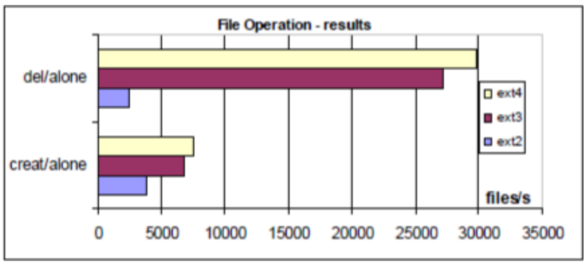
Postmark Benchmark technique

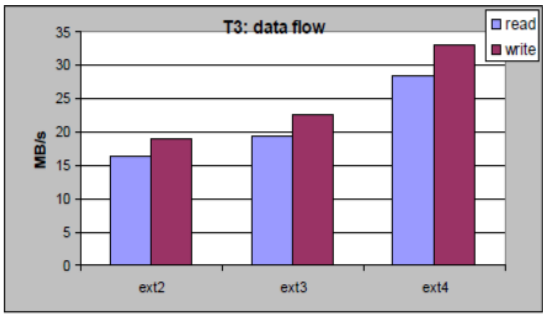
Stamp benchmark procedure is utilized for testing the picked document frameworks .It recreates the Web Mail server load. Stamp makes huge arrangement of haphazardly produced records and spares them in any one area in the filesystem. Over this arrangement of records Stamp and the working framework performs tasks like creation ,perusing

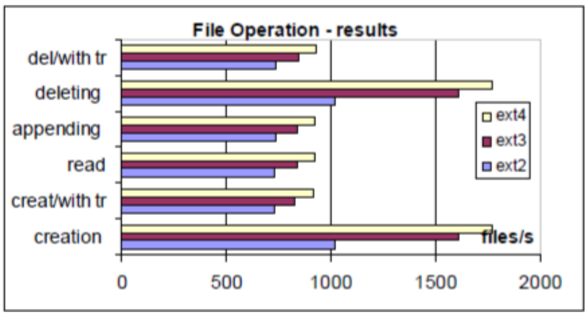
enrollment and cancellation of documents and decide the time required to play out these activities. These tasks are performed haphazardly so as to give the believability of the recreation. Number of documents, their size range and number of exchanges are configurable. To dispose of the reserve impact it is recommendable to make huge arrangement of files(minimum 10,000) and execution of enormous number of exchanges over the created files.We have exhibited the aftereffects of three diverse test techniques.

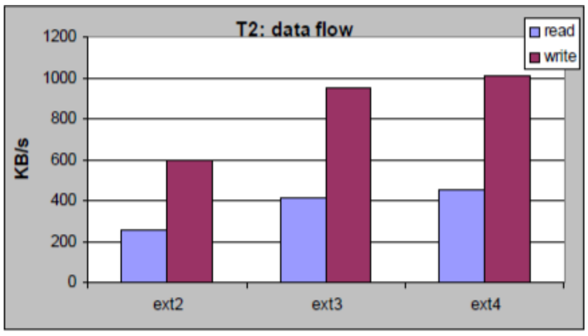












Postmark test-1(small files)

Records utilized for playing out this test are generally little ,running from 1K to 100K.Postmark setup utilized for this test was : document size extents from 1000 to 100000,number of produced documents are 4000 and number of exchanges performed are 50000.Performance outcomes for each document activity, for example, creation , creation/alone, creation/with exchanges, perusing, annexing , erasing, erasing/alone, erasing/with exchanges are given on the Figures 1a and 1b.

Activities erase/alone and make/alone are performed in uncommon benchmark stages, and don't assume exchanges. The record frameworks picked for playing out this Stamp test are ext2,ext3 and ext4.

Test-1 data flow results Observations:

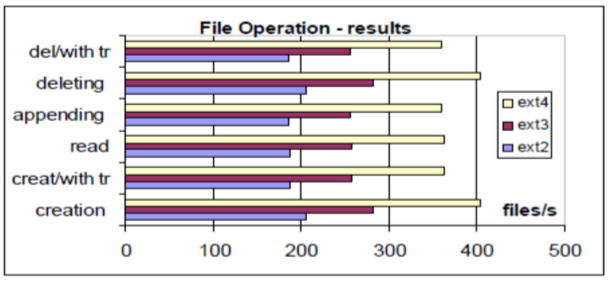
1) In this test ext4 file system has shown higher performance when compared to ext2 and ext3.

2) Ext4 is 40% more faster than ext3 and ext4 is twice as fast as ext2.

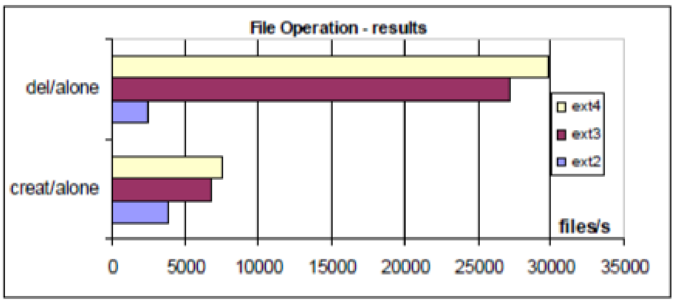
3) ext3 is 35% more faster than ext

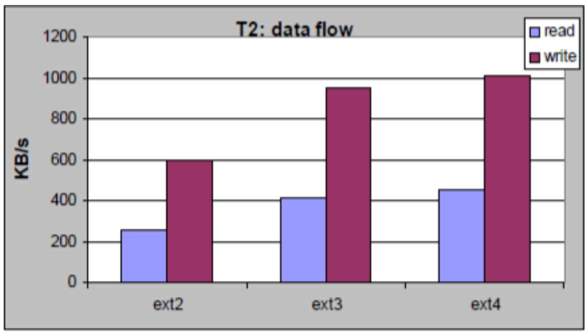
Postmark test-2(ultra small files)

Files used for performing this test are ultra small,ranging from 1byte to 1K.Postmark configuration used for this test was:file size ranges from 1byte to 1K,number of generated files are 30000 and number of transactions performed are 50000.Performance results for each file operation are given on the Figures 2a and 2b.



2a.File operations with transactions





Test-2 data flow results. Observations:

1) In this test procedure with ultra-small files,Ext4

filesystem has higher performances over ext2 and ext3.

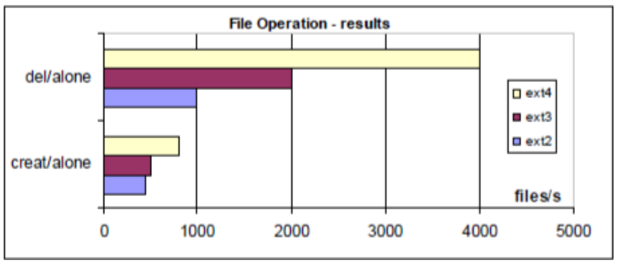
2) Ext4 is 10% faster than ext3.

3) Ext4 is 70% more faster than ext2.

4) Ext3 is 60% faster than ext2.

Postmark test-3(large files)

Files used for performing this test are large,ranging from 1K to 300K.Postmark configuration used for this test was:file size ranges from 1000 t0 300000,number of generated files are 4000 and number of transactions performed are 50000.Performance results for each file operation are given on the Figures 3a and 3b.



Test-3 data flow results Observations:

1) In this test procedure with large files,Ext4 filesystem has higher performances over ext2 and ext3.

2) Ext4 is 46% faster than ext3.

3) Ext4 is 73% more faster than ext2.

4) Ext3 is 18% faster than ext2.

FILE ALLOCATION METHODS

Record Assignment technique is utilized to adequately use circle space accessible by obliging space for documents. Working framework allots the plate space for the records by utilizing diverse approaches.It's partitioned into three general categories:Contiguous Allocation,Indexed Portion and Connected allocation.The primary target to adjust these 3 approaches is to ensure there proficient usage of circle space and fast access to the files.These three strategies use particular techniques to successfully utilize plate space which has its very own upsides and downsides.

Comparitive Study Of Three Approaches

Contiguous Allocation Method –

By this approach, continuous blocks of disk spaces is assigned to each and every file. It uses the concept of first fit or best fit. It's the simplest allocation method.

Location of file is identified by the starting address of the block followed by the length of file. These two details are crucial to work with file.

File	Starting Address	Length
A	2	3
B	6	2

Focal points – For bordering memory distribution we can without much of a stretch get to the document Successive Access and Direct Access. Numerous perusing isn't required. Can be perused by a solitary activity since it's apportioned in persistent squares bringing about superb activity.

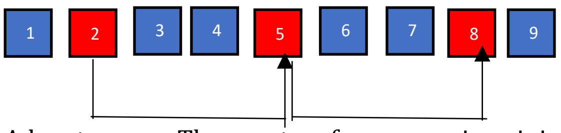
Number of circle looks for getting to the document is negligible so it's incredibly quick.

Weaknesses- The significant con is that the most extreme size of the record must be restricted at the beginning of creation itself.Most of the plate space is squandered because of outer fracture prompting wasteful utilization of circle space.Compaction can be applied as an answer for outside discontinuity. It's an over the top expensive answer for the issue.

Linked Designation Technique For Record distribution strategy , each document isn't dispensed in constant memory squares. The plate squares are put anyplace on the circle. Each record is a connected rundown of blocks.In this methodology, the index contains the beginning address and completion address of the document which are pointers. At that point each square contains a pointer that focuses to the

File	Index block
A	8

following square.



Advantages – The waste of memory is minimized and maximum disk space utilization is implemented.External fragmentation is not present in this method of allocation. Only internal fragmentation is possible in the last block.It's not necessary to specify the file size during creation.

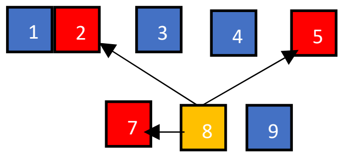
Disadvantages-Space is occupied for storing pointers leading to extra overhead.Access time is much greater for linked list allocation since the files are located in random order.This method doesn't support direct access only supports sequential access. For finding a block of file it has to implement sequential access from beginning of the file and follow the pointers until the block of the file is identified.

Indexed Allocation Method-All shortcomings of linked allocation method and contiguous allocation method is overcome by indexe allocation method.

In this approach, all the pointers are brought together into one location known as the indexed block.All the pointers in index block is set to null.

Advantages –This method supports direct access resulting in faster access of the files also supports sequential method of accessing the file.In this method external fragmentation is absent.Directory just keeps track of the starting block address.Free blocks in the disk is used efficiently.

Disadvantages-The index table should be present in the memory.The index block should be large to hold pointers. Searching for entry in index table is tedious procedure.



CONCLUSIONS

If we need the Windows-only environment, NTFS is the best choice. If we had to exchange files (even occasionally) with a non-Windows system like a Mac or Linux box, then FAT32 will give you fine result and with no data loss, where your file size should be less than 4GB.

While file transfer speed and maximum throughput is limited by the slowest link (usually the hard drive interface to the PC like SATA or a network interface like 3G WWAN), NTFS formatted hard drives have tested faster on benchmark tests than FAT32 formatted drives

Generally speaking, exFAT drives are faster at writing and reading data than FAT32 drives. All benchmarks show that NTFS is much faster than exFAT. The bottom line is that unless you are 100 percent sure that you will never have a file smaller than 4 GB, format the drive as exFAT looking to solve different problems. Most popularly Ext4 is the file system of choice for most of the Linux distributions.ext4 has all the goodness that we have come to expect from the past file systems(ext2/ext3) but with enhancements.ext4 has good features such as file system journaling, journal check sums, backward compatibility support for ext2 and ext3,persistent pre-allocation of free space, improved file system checking, support for large files. XFS is a high-end file system that specializes in speed and performance. XFS does extremely well when it comes to parallel input and output because of its focus on performance.

The XFS file system can handle massive amounts of data, so much in fact that some users of XFS have close to 300+ terabytes of data. If you have a home server and you're perplexed on where you should go with storage, consider XFS. A lot of the features the file system comes with (like snapshots) could aid in your file storage system. It's not just for servers, though. If you're a more advanced user and you're interested in a lot of what was promised in BtrFS, check out XFS. It does a lot of the same stuff and doesn't have stability issues. Reiser4 has the unique ability to use different transaction models. It can use the copy-on-write model (like BtrFS), write-anywhere, journaling, and the hybrid transaction model. It has a lot of improvements upon ReiserFS, including better file system journaling via wandering logs, better support for smaller files, and faster handling of directories.Resier4 is for those looking to stretch one file system across multiple use-cases. Maybe you want to set up one machine with copy-on-write, another with write-anywhere, and another with hybrid transaction, and you don't want to use different types of file systems to accomplish this task. Reiser4 is perfect for this type of use-case There are many file systems available on Linux. used are ext4, XFS,Reiser4.

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