

Linux... Why Linux?

&

Why it makes a great D-Cinema Operating System

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The D-Cinema software, TMS and network delivery system that are necessary for the future of D-cinema must be an **integrated** system.



It must be compliant with the DCI,
SMPTE Standards and NATO user
requirements.



It must also be designed to
download, distribute and manage
digital movie files.

To run and manage a multiplex full of
digital screens...



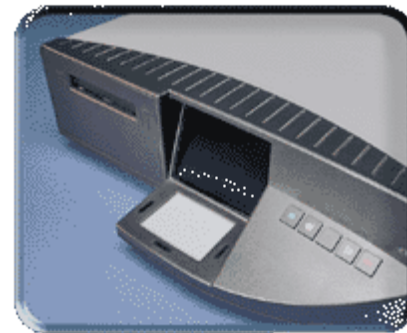
But, above all else, it must be:

Stable, Secure and Dependable.



Early Stand-Alone Servers...

- Used proprietary Wavelet or MPEG-2 HD Compression.
- Used a “Solid State VCR” metaphor. They could only load and play one movie at a time.
- Operational scope was limited to one single screen.
- Use a simple “DOS style” language for play list management.
- They use Windows 2000...
- or were ported to Win XP
- They were undependable, especially compared to DLP projectors of the period.
- They used “security by obscurity”.

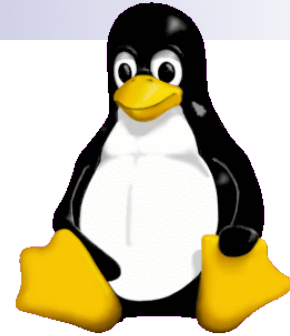


Practical Digital Cinema Software Needs...

What is needed is software that:

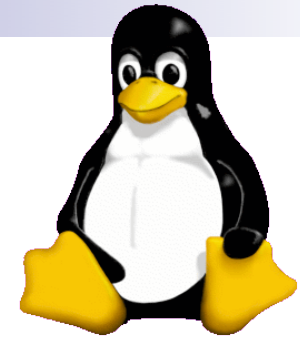
- Dependably solves the “Thursday Night” problem... with less than overnight to handle sending new movies to their screens.
- Under 15 min. To change screens in case of auditorium changes.
- Dependably handle and verify validity of KDM Security Keys
- Each screen server must run for at least 24 hours, alone, during full system or network outage.
- System robustness... is not a requirement, but Studios and Exhibitors insist on this.
- And there is a need to make D-Cinema software operation understandable to a theatre manager and a teenaged projectionist.

Linux... Why Linux?



- Linux is much more secure than Windows...
 - Microsoft has released an ever increasing number of Windows security patches, in response to more frequent virus, worm, and spyware attacks on Windows
 - Windows has many security weaknesses inherent in its design.
- Linux is more stable by design.
- It is designed to be a networking operating system
 - Linux's basic design makes remote diagnostics and repair possible.
- With more than 30,000 programmers worldwide working on Linux software, most Linux bugs are fixed sooner than Windows bugs.
 - Some reported Windows bugs are never fixed.

Linux... Why Linux?



- Linux is a very powerful and efficient Operating system.
- It is not clogged with “fluff” like Internet Explorer and Windows Media Player.
- It is Open Source... reasonably priced.
- Multiple distribution vendors... Competition!
- No Solitaire... and it can be setup so that it won't run video games.
 - No “Halo3” or “Grand Theft Auto” accidentally projected on your screen during a show.
- Linux development began in 1991, and has grown in momentum since then.

So, if Linux is so great, why haven't I heard much about it?



Unix & Berkeley Software Distribution (BSD)

- Unix began as a robust, secure, multi-user mainframe operating system.
- After three decades of use, the UNIX computer operating system, which began at Bell Labs, is still considered to be one of the most **powerful**, **stable**, and **secure** operating systems (OS) in the computer world.
- Apple MAC OS X is based on BSD Unix (one type of Unix)
 - BSD Unix began in 1969
 - On boot up a modern mac says, “Copyright Regents of the University of California 1982, 1989, 1994, 1996”.

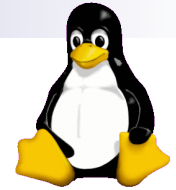
Unix becomes Linux

- Linux began as grass-roots effort led by Linus Torvalds to produce a free, open source version of Unix.
- Linus released the first version of Linux, version 0.01 in September of 1991.
- The number of Linux developers, both volunteer, and those employed to write Linux code increases geometrically every year.

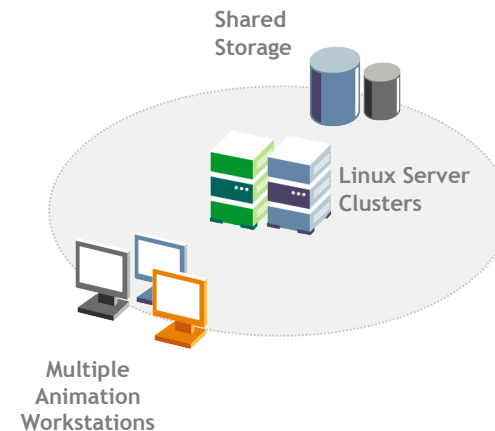
The number of company employed developers writing Linux code (there are far more volunteer professionals).

Kernel Version	Number of Developers	Number of Companies
2.6.11	479	30
2.6.12	704	38
2.6.13	641	39
2.6.14	632	45
2.6.15	685	49
2.6.16	782	56
2.6.17	787	54
2.6.18	904	60
2.6.19	887	67
2.6.20	730	75
2.6.21	838	68
All	2998	83

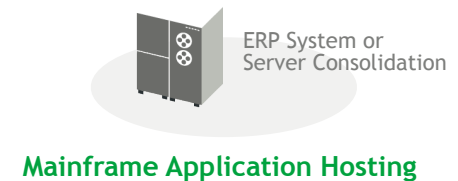
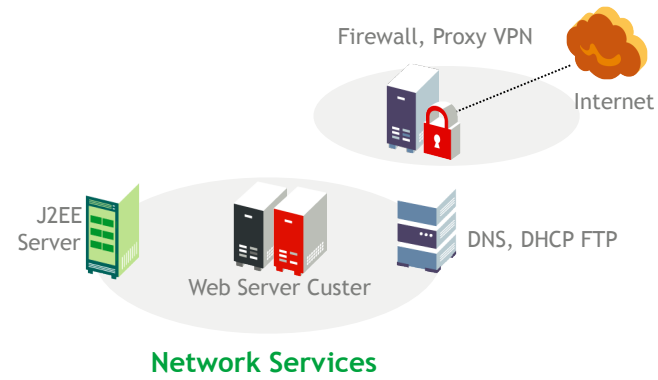
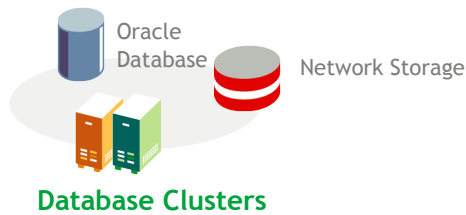
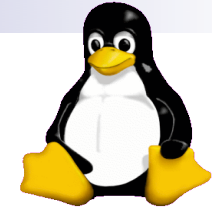
Linux excels as a robust dependable high-performance system architecture.



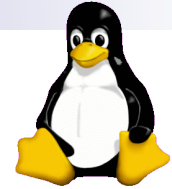
- That is why...
 - It is the most popular Web Server operating system
 - Used by Google, and most search engines
 - Used by most E-Commerce sites
 - Used by Pixar, Disney, Dreamworks, and Independents for CGI render farms
 - Efilm, ILM, and Technicolor Digital Intermediates for compositing and



Linux/Unix... are the most popular computer operating systems in the world.



Windows is the most popular desktop computer operating system.



Windows is the most popular desktop computer operating system.



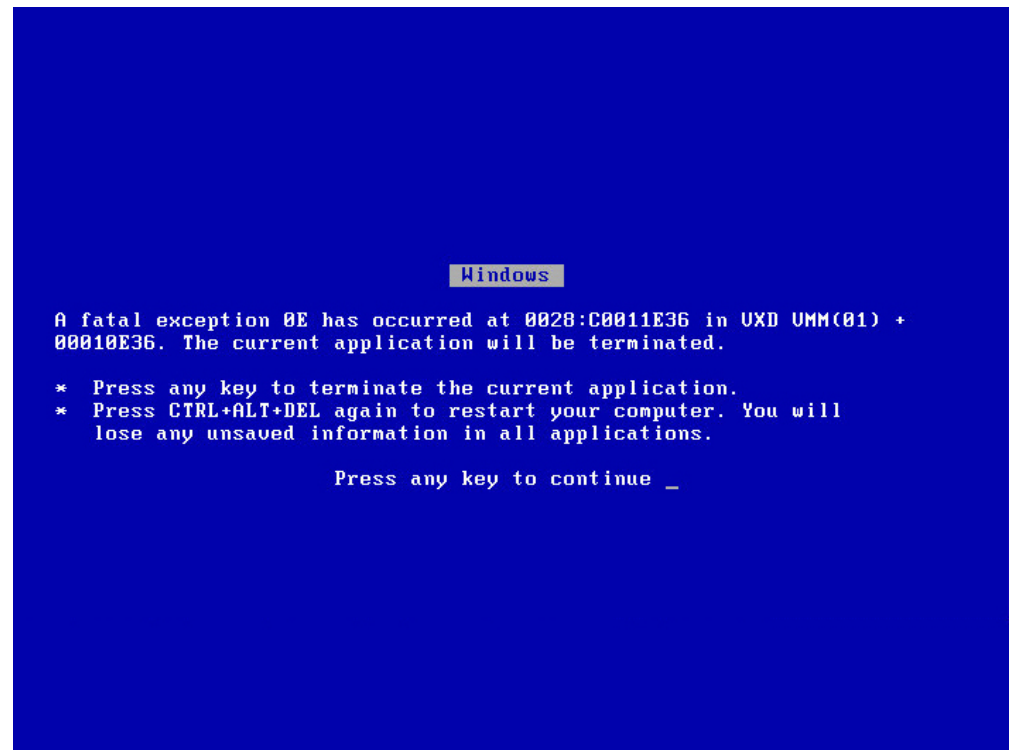
- Windows has a 90% share of the desktop market, and that is declining.
- Linux is at 80% and growing market share of the web server, render farm, and supercomputer markets.
- The Linux Apache web server is, by far, the most popular way to drive a website.



So, Why not Windows for Digital Cinema?

A Top Studio Executive, when asked about Microsoft Windows, said,

“We will trust movie content to Windows, when Microsoft can secure Outlook.”



Identities Lost by Company According to the FBI CyberCrime Unit in 2007

- All of these data losses were on Windows-based servers with insufficiently robust or partially unencrypted devices.

Company	IDs exposed by loss of unencrypted device
Gap Inc. (San Francisco, CA)	800,000
New York City Financial Information Services Agency (New York, NY)	280,000
Connecticut Department of Revenue Services (Hartford, CT)	106,000
TSA (Arlington, VA)	100,000
Yuba County Health and Human Services (Yuba County, CA)	70,000
Home Depot (Boston, MA)	10,000
Transportation Security Administration (Arlington, VA)	3,930



Windows Services that must be disabled for proper security according to the FBI

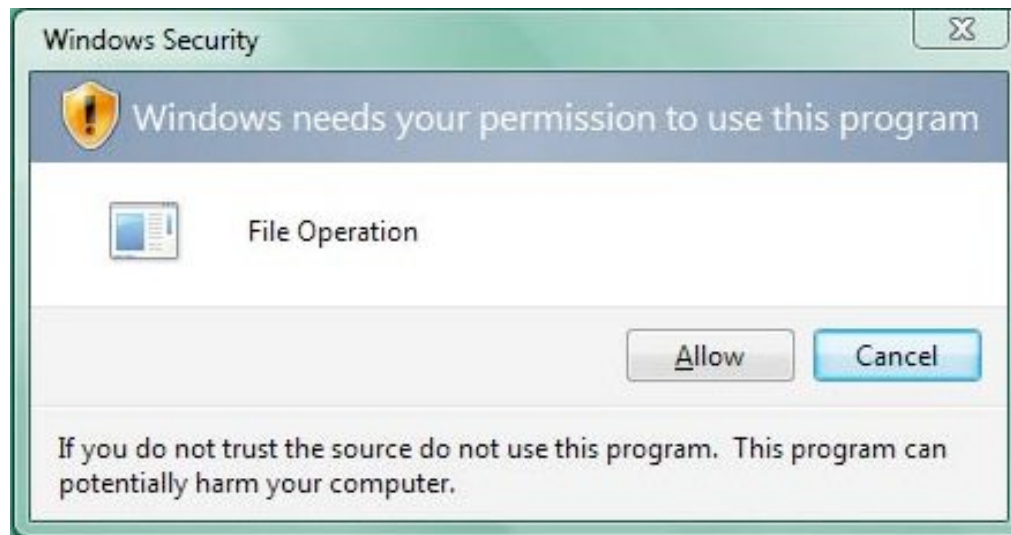
Service name	Display name	Enterprise Client desktop/laptop	Standalone desktop/laptop
Alerter	Alerter	Disabled	Disabled
ClipSrv	ClipBook	Disabled	Disabled
Browser	Computer Browser	Not Defined	Disabled
Fax	Fax	Not Defined	Disabled
MSFTpsvr	FTP Publishing	Disabled	Disabled
IISADMIN	IIS Admin	Disabled	Disabled
cisvc	Indexing Service	Not Defined	Disabled
Messenger	Messenger	Disabled	Disabled
mnmsrvc	NetMeeting® Remote Desktop Sharing	Disabled	Disabled
RDSessMgr	Remote Desktop Help Session Manager	Not Defined	Disabled
RemoteAccess	Routing and Remote Access	Disabled	Disabled
SNMP	SNMP Service	Disabled	Disabled
SNMPTRAP	SNMP Trap Service	Disabled	Disabled
SSDPsrv	SSDP Discovery Service	Disabled	Disabled
Schedule	Task Scheduler	Not Defined	Disabled
TlntSvr	Telnet	Disabled	Disabled
TermService	Terminal Services	Not Defined	Disabled
Upnphost	Universal Plug and Play Device Host	Not Defined	Disabled
W3SVC	World Wide Web Publishing	Disabled	Disabled

US-CERT The Cyber Security Arm of Homeland Security



In 2007:

- 11 major Cyber Alerts were called by the CERT division of US Homeland Security
- 21 major security patch roll ups were issued for Internet Explorer.
- 14 for major security patch roll ups were issued for Firefox for Windows.

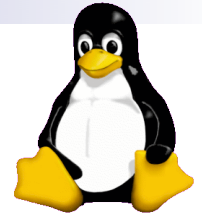


Remember...

Stable, Secure and Dependable.



Linux excels as a robust dependable high-performance system architecture.



Fact:

LINUX received the highest level of security and operations certification ever reached in the Computer Operating system Industry, Common Criteria Evaluation Assurance Level EAL 4



Some Linux Security Features:

- ▶ Virus' can't modify any system files without the root password, neither can users!
- ▶ Virtual private networking
- ▶ Robust Certificate management
- ▶ Support for encrypted file system
- ▶ Secure network connections are available

These profiles support the requirements of Director of Central Intelligence Directive (DCID) which specifies security intelligence-related information and systems measures, including those necessary for Top Secret and Below Interoperability (TSABI).



Linux excels as a secure high-performance system architecture.



What is Common Criteria?

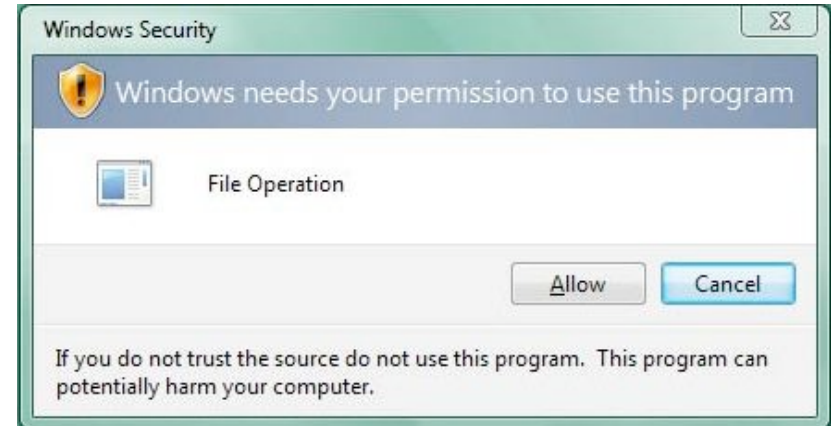
- It is an independent, objective security certification body
- Worldwide acceptance by 14 nations
- Ratings can be used to compare security of operating systems

Linux Security Features:

- ▶ Virtual private networking
- ▶ Rich access control lists (ACL)
- ▶ Secure network connections with 128-Bit SSL, IPSec, Secure Shell, Kerberos 5 and authentication
- ▶ Robust certificate management
- ▶ Built-in monitoring
- ▶ Support for encrypted file system
- ▶ LINUX firewall and proxy suite

What Makes Linux so Secure?

```
drwxrwxr-x 76 root admin 2584 Dec 18 20:25 Applications
drwxrwxr-x 7 harymat admin 238 Nov 5 11:34 Cardiris
-rw-r--r-- 1 root admin 16384 Jul 5 10:57 Desktop DB
-rw-r--r-- 1 root admin 15602 May 28 2007 Desktop DF
-rw-r--r-- 1 harymat admin 83554 Sep 25 09:55 Installer Log File
drwxrwxr-t 52 root admin 1768 Nov 4 01:16 Library
drwxr-xr-x 1 root wheel 512 Dec 30 23:31 Network
drwxrwxr-x 2 harymat harymat 68 Apr 12 2006 Set Install Language
drwxr-xr-x 4 root wheel 136 Jun 30 2007 System
drwxrwxr-x 2 harymat harymat 68 Apr 12 2006 Test Install Language
lrwxr-xr-x 1 root admin 60 Jan 19 2007 User Guides And Information
drwxrwxr-t 8 root admin 272 Sep 2 10:09 Users
drwxrwxrwt 4 root admin 136 Dec 31 15:27 Volumes
drwxr-xr-x 4 root admin 136 Jan 19 2007 automount
drwxr-xr-x 48 root wheel 1360 Jun 30 2007 bin
drwxrwxr-t 2 root admin 68 Aug 19 2006 cores
dr-xr-xr-x 2 root wheel 512 Dec 30 16:53 dev
lrwxr-xr-x 1 root admin 11 Nov 3 2006 etc -> private/etc
lrwxr-xr-x 1 root admin 9 Dec 30 16:54 mach -> /mach.sym
-r--r--r-- 1 root admin 615748 Dec 30 16:54 mach.sym
-rw-r--r-- 1 root wheel 8570180 May 23 2007 mach_kernel
drwxr-xr-x 6 root wheel 204 Dec 30 16:54 private
drwxr-xr-x 63 root wheel 2142 Jun 30 2007 sbin
lrwxr-xr-x 1 root admin 11 Nov 3 2006 tmp -> private/tmp
drwxr-xr-x 9 root wheel 306 Feb 26 2007 usr
lrwxr-xr-x 1 root admin 11 Nov 3 2006 var -> private/var
```



- File and directory permissions are robust
- On Linux all devices are seen by the Operating System as secure files
- Root, Group, and User
 - Read, write, and execute permissions are separated by user.
- But, the operating system will still run securely without user intervention

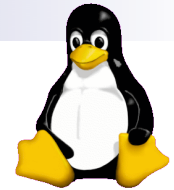
NASA Requires Linux For Next-Gen Avionics System

NASA has required "open source Linux" in the building of the next-generation avionics system that will guide the Ares rockets responsible for launching the manned Orion spacecraft to the moon.

These rockets are part of NASA's Constellation program aimed at returning humans to the moon. The Constellation program is also intended to replace the Space Shuttle fleet, which is scheduled for retirement in 2010, as well as act as a potential platform for future Mars missions.



Some computer companies that support Linux Software and hardware:



Application Support



Hardware Support



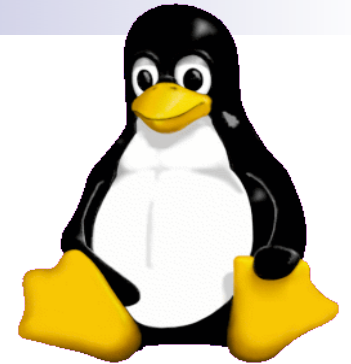
The file formats that we use in the Digital Cinema DCP are Open Standards based and don't require any particular operating system.



But, Linux is an Open Standards based operating system, so it **always** supports open standards file formats, while Windows often only supports a Microsoft-proprietary version of standards.



For many different reasons, Linux is the perfect Digital Cinema operating system



- Robustness
- Security
- Linux continues to support old protocols
 - Windows often changes protocol support when it upgrades OS's
- An open standards, non-proprietary system
- The Studio preference
- Can be security “hardened”

Thank You

