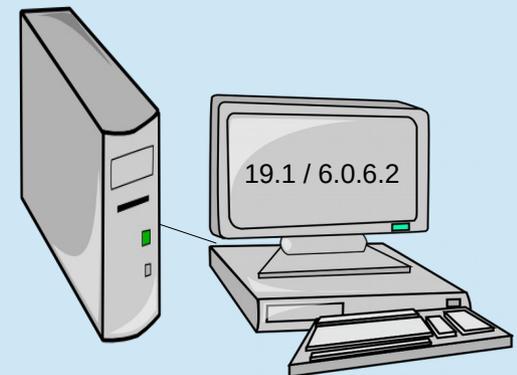
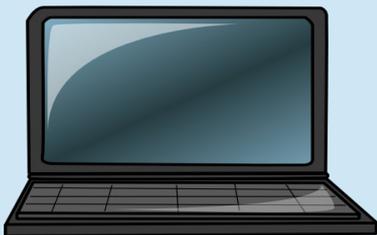


How to Make an Old Computer Useful Again

Howard Fosdick

(C) 2018



Who am I?

- * Independent Consultant (DBA, SA)
- * Refurbishing for charity is a hobby
- * Talked on this 12 years ago



Why Refurb ?

+ **Charity**



+ **Fun**



+ **Environment**





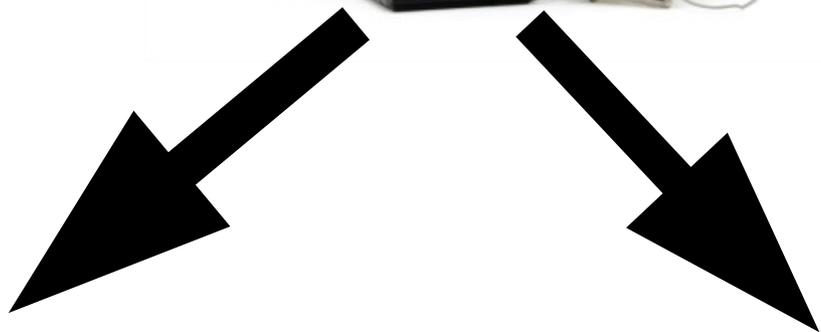
Agenda

I. Why Refurb?

II. How to – Hardware

III. How to – Software





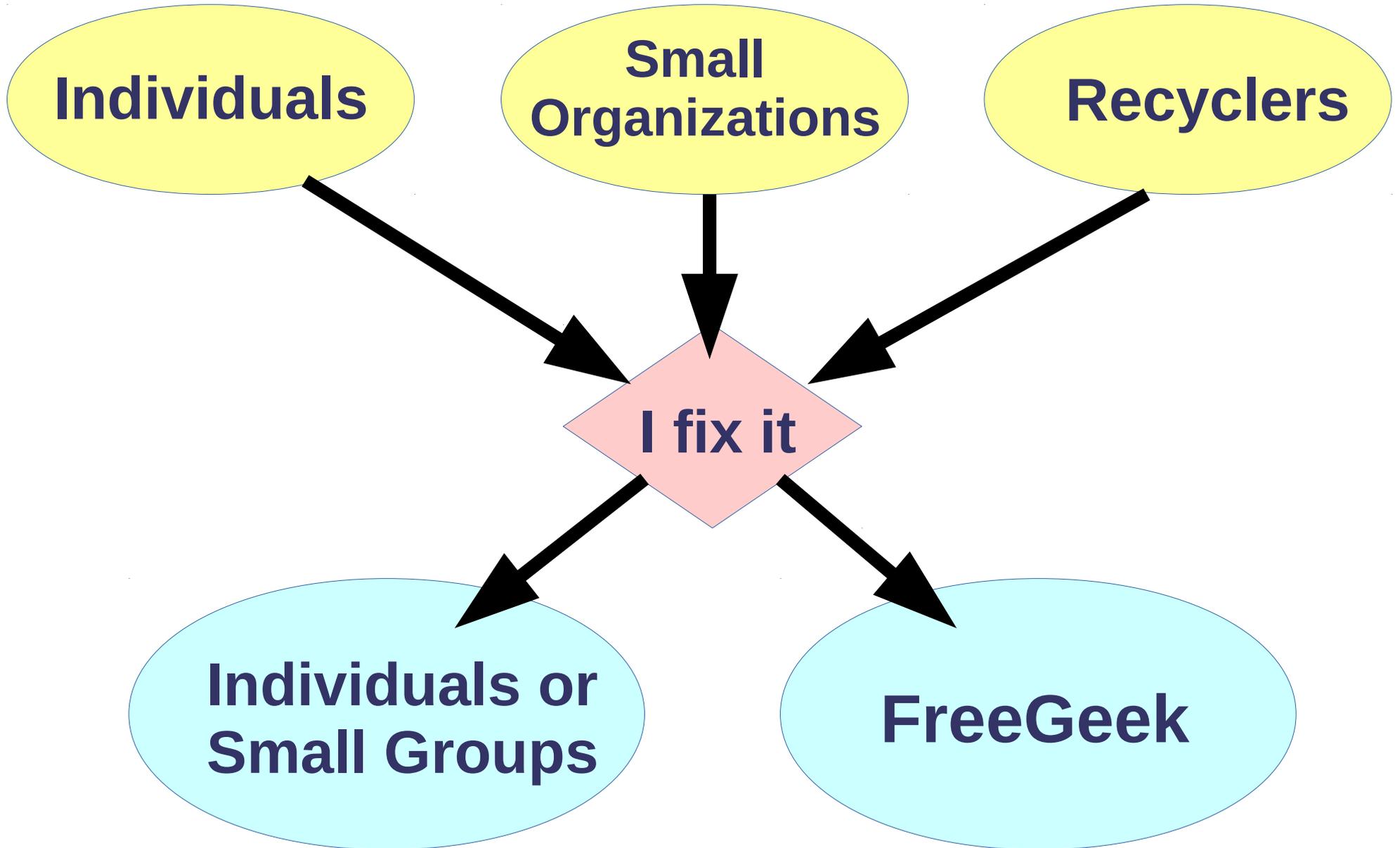
OR



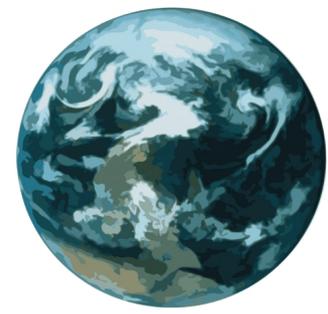
Refurbish = Reuse

Recycle = Destroy

What I Do



People Trash Good Hardware... Because of Software



- Windows slows down
- People don't know to tune it
- Perceive their system is obsolete
- Like a disposable razor blade
- Vendors like this

*Friggin' computer!
...too slow...
It's outta here!*



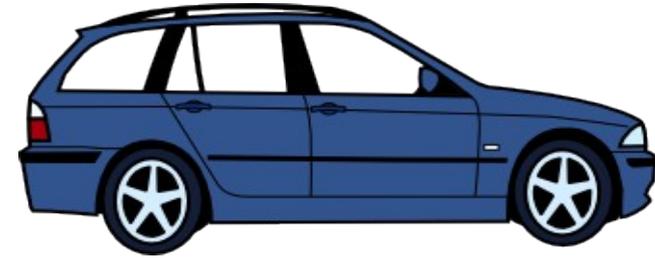
↑	10	2015
	8.1	2013
	8	2012
	7	2009
	Vista	2007

*I'm still on Win 7.
I better toss it!*



How Long Should a Computer Last?

- > Depends on use
- > Laptops vs Desktops



---or---



Consensus is 3 to 5 years

Treat it like a car --

- + Regular maintenance (tune ups)
- + Replace parts
- + Run age-appropriate software (Linux)

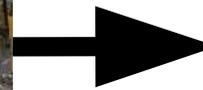
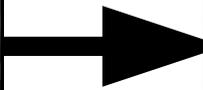
-> Any dual-core is still useful

**Windows is excellent for many roles.
Refurbishing is not one of them.**

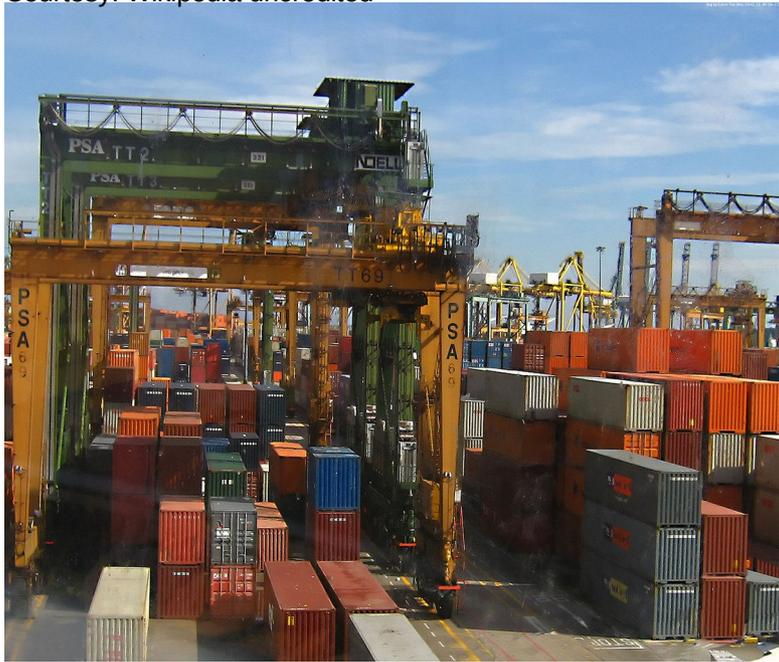
Vendor Incentives

- **Would you rather sell to a customer every 3 years, or every 9 years?**
- **Financial incentive to recycle... not refurbish**
- + **Incentives against pollution**

Vendors prefer this:



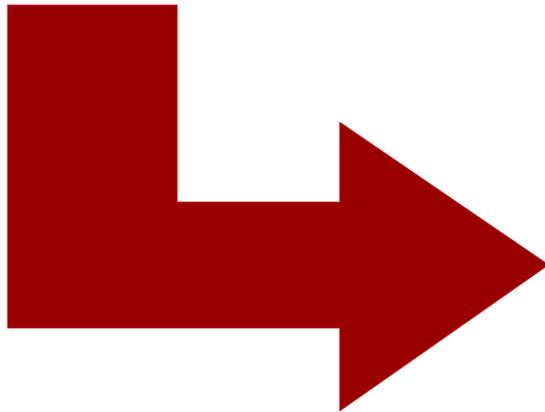
Courtesy: Wikipedia uncredited



Dirty Recycling

---VS---

Environmental Recycling



Courtesy: AP/scmp.com

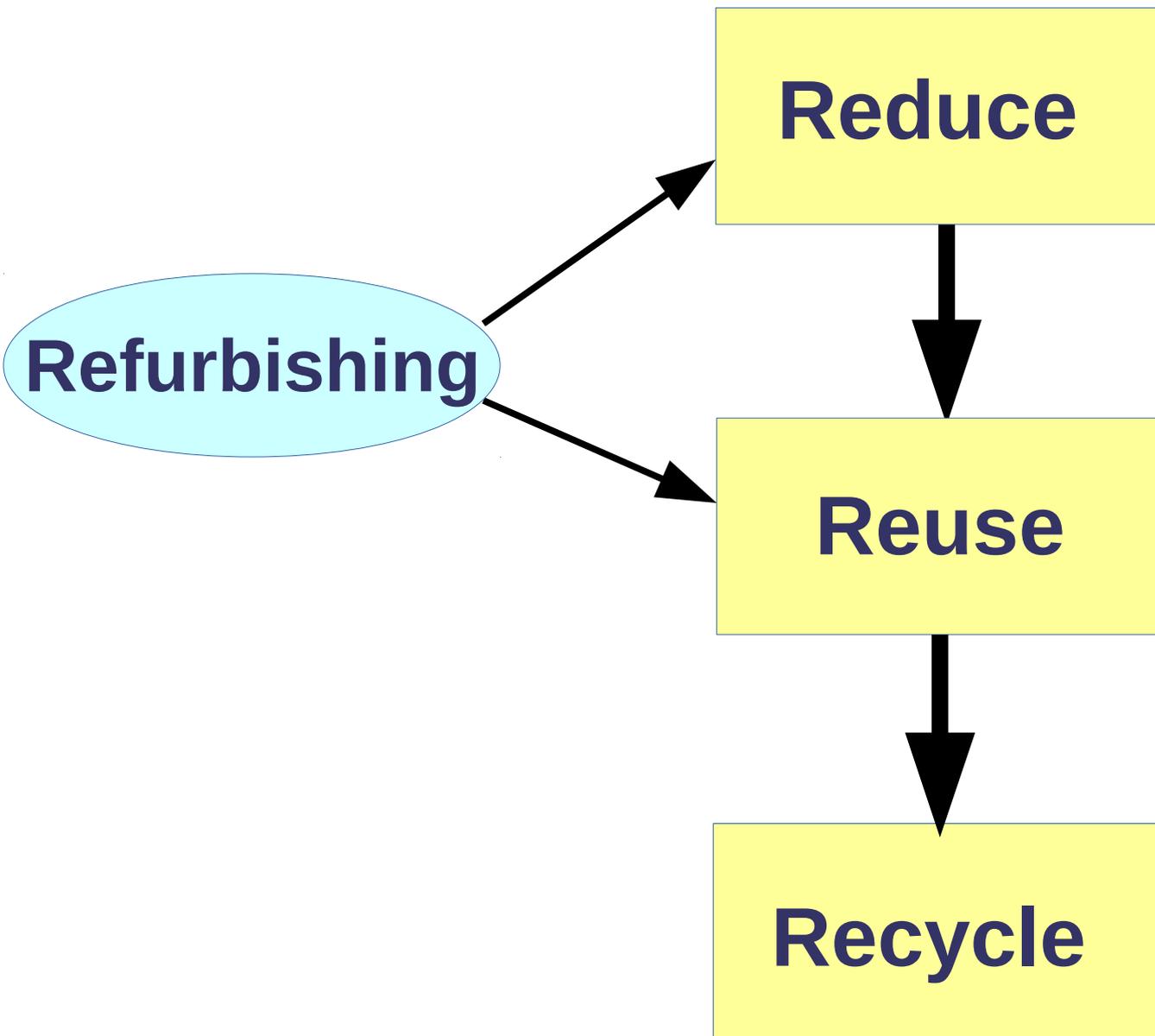
Courtesy: Basel Action Network

-- 80% is not Environmentally Recycled...
though companies tell you it is!

-- **Scandal** exposed by 60 Minutes, Time, others



The 3 R's of Environmentalism



The Worst Place . . .



II. How To – Hardware



-> I can make no assumptions about hardware or users

How to Refurbish

1. Clean it

Ground yourself

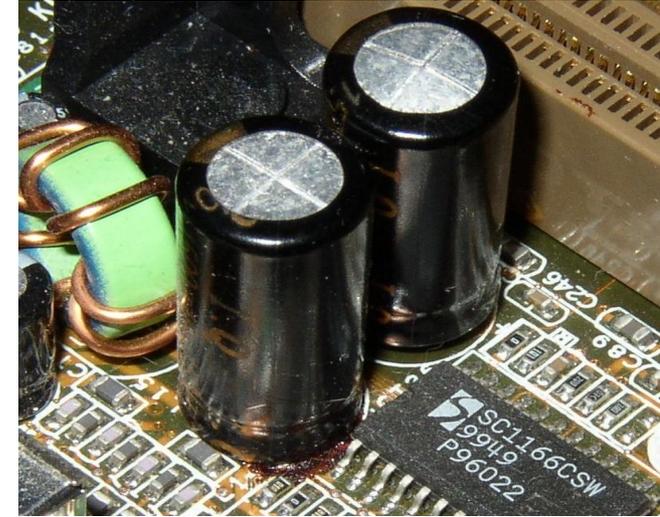
Compressed air

2. Identify hardware → Write it down

3. Verify hardware

4. Size & install software

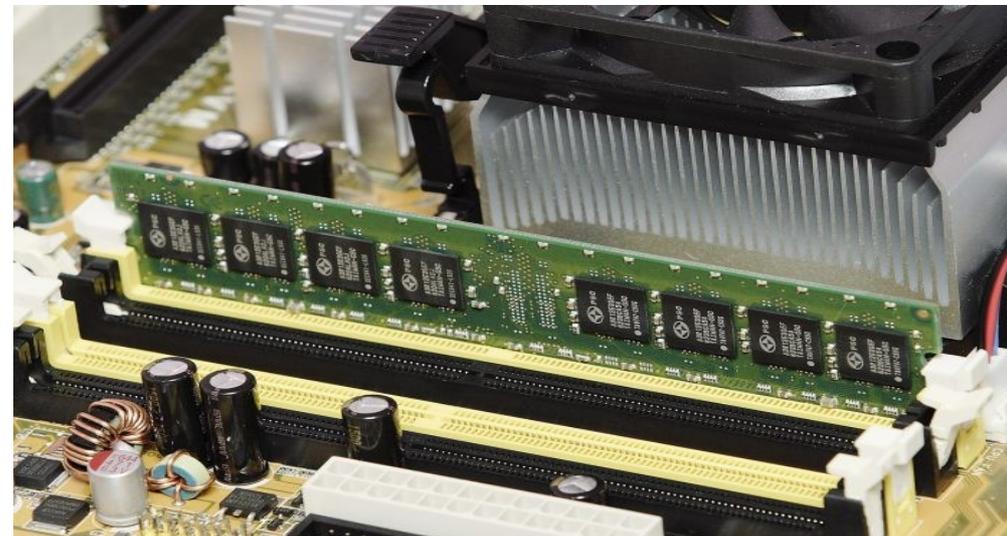
5. Verify



Bad Capacitor



Dirty!



Memory Slot Open plus Good Capacitors

2. Identify Hardware

--- GUI Tools ---

Bios/Uefi panels,
I-Nex, hardinfo,
lshw-gtk, kinfocenter

Query:	Line Command:
Display all info about hardware	<code>inxi -Fx</code> <i>or</i> <code>hwinfo --short</code> <i>or</i> <code>lshw</code>
Display all CPU info	<code>lscpu</code> <i>or</i> <code>lshw -C cpu</code>
Display CPU features (eg, PAE, SSE2)	<code>lshw -C cpu grep capabilities</code>
Is CPU 32- or 64- bit?	<code>lshw -C cpu grep width</code>
Display BIOS/UEFI info	<code>dmidecode -t bios -q</code>
Current memory size and configuration?	<code>dmidecode -t memory grep -i size</code> <i>or</i> <code>lshw -short -C memory</code>
Maximum memory for this hardware?	<code>dmidecode -t memory grep -i max</code>
Are memory slot available? (null answer means NO)	<code>lshw -short -C memory grep -i empty</code>
Show current memory use	<code>free -m</code> <i>or</i> <code>top</code>
Determine amount of video memory	<code>lspci grep -i vga</code> Then reissue w/ device number: <code>lspci -v -s 00:02.0</code> VRAM is prefetchable value.
Show kernel version, is it 64-bit, network host name	<code>uname -a</code>
List disk drives	<code>lshw -short -C disk</code>
List disks and partitions info	<code>lsblk</code> (simple) <i>or</i> <code>fdisk -l</code> (detailed)
List mounted filesystems, space used & available	<code>df -m</code>
List partition ids (UUIDs)	<code>blkid</code>
List USB devices	<code>lsusb</code>
List PCI devices	<code>lspci</code>

3. Verify Hardware



1. Memory
 2. Disk
 3. Mobo
 4. Peripherals (DVD, USB ports, etc)
- > Long Tests!
- * Bios/Uefi diagnostics
 - * Hirens Boot CD, Ultimate Boot CD (UBCD)

> Minimize this step at your peril !

The Most Common Problems --

1. Dirt
2. Capacitor
3. Corroded USB ports
4. Sticky DVD
5. Disk
6. Hot laptop



Courtesy tempo11.blogspot.com



Courtesy thesmartech.blogspot.com

“Quick Guide to Fixing Hardware”

www.osnews.com/story/26650/Quick_Guide_to_Fixing_Hardware

3. Verify Hardware -- Disks

- * MTBF misleads, AFR better
- * Backblaze.com stats
- * Run **all** SMART tests
- * GUIs -> *gnome-disks*, *GSmartControl*
- * 0 bad sectors
- * Thumb drive backup



SMART Data & Self-Tests

Updated 6 minutes ago Self-test Result Last self-test completed successfully ON

Temperature 39° C / 102° F Self-assessment Threshold not exceeded

Powered On 3 years, 3 months and 6 days Overall Assessment **Disk is OK, one attribute failed in the past**

SMART Attributes

ID	Attribute	Value	Normalized	Threshold	Worst	Type	Updates	Assessment
1	Read Error Rate	0	200	51	200	Pre-Fail	Online	OK
3	Spinup Time	5 seconds	193	21	188	Pre-Fail	Online	OK
4	Start/Stop Count	400	100	0	100	Old-Age	Online	OK
5	Reallocated Sector Count	0 sectors	200	140	200	Pre-Fail	Online	OK
7	Seek Error Rate	0	200	51	200	Pre-Fail	Online	OK
9	Power-On Hours	3 years, 3 months and 6 days	61	0	61	Old-Age	Online	OK
10	Spinup Retry Count	0	100	51	100	Pre-Fail	Online	OK
11	Calibration Retry Count	0	100	51	100	Old-Age	Online	OK
12	Power Cycle Count	395	100	0	100	Old-Age	Online	OK
190	Airflow Temperature	39° C / 102° F	61	45	45	Old-Age	Online	Failed in the past
194	Temperature	39° C / 102° F	111	0	95	Old-Age	Online	OK
196	Reallocation Count	0	200	0	200	Old-Age	Online	OK

Start Self-test Refresh **gnome-disks: *smartctl* output** Close

3. Verify Hardware – Laptop Temperature



Courtesy: MakeUseOf.com

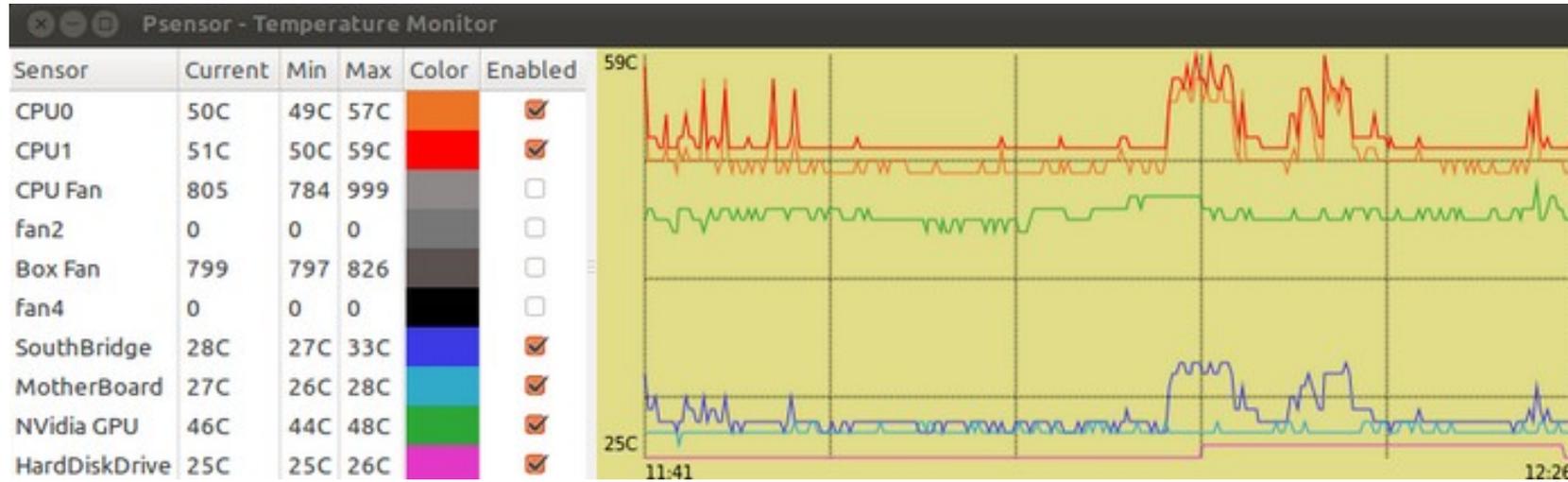
- * Clean it
- * Check vents, fans

Then final stress test with –

- * Package -> **Im_sensors**
- * GUI -> **Psensor** or **XSensors**

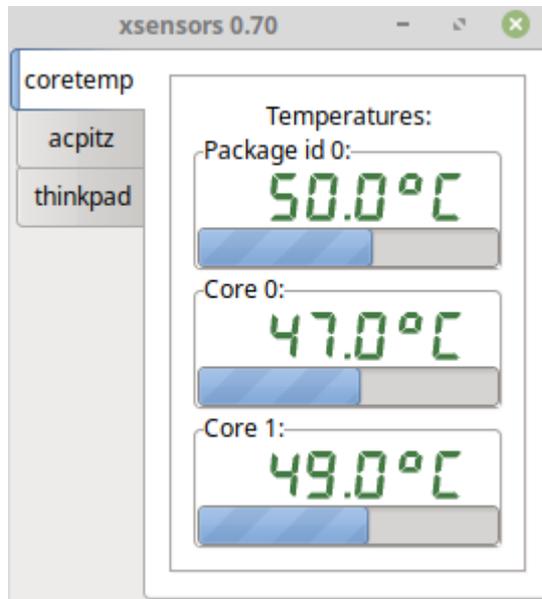
3. Verify Hardware – Laptop Temperature

Psensor



Courtesy: Unixmen.com

XSensors



Fan Overload



Photo: Cooler Master

4. Sizing the Software –

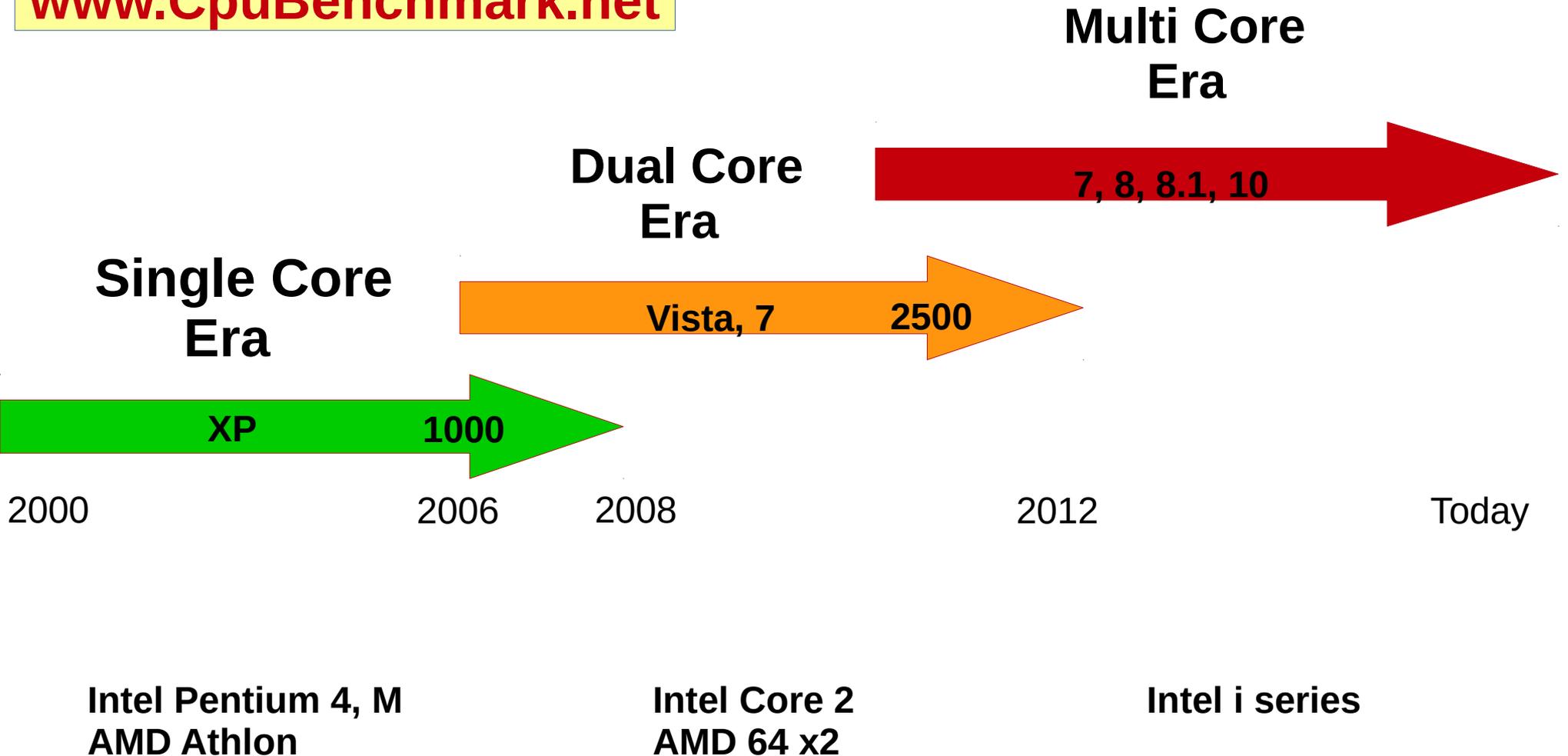
Proxy for Your Computer's Power



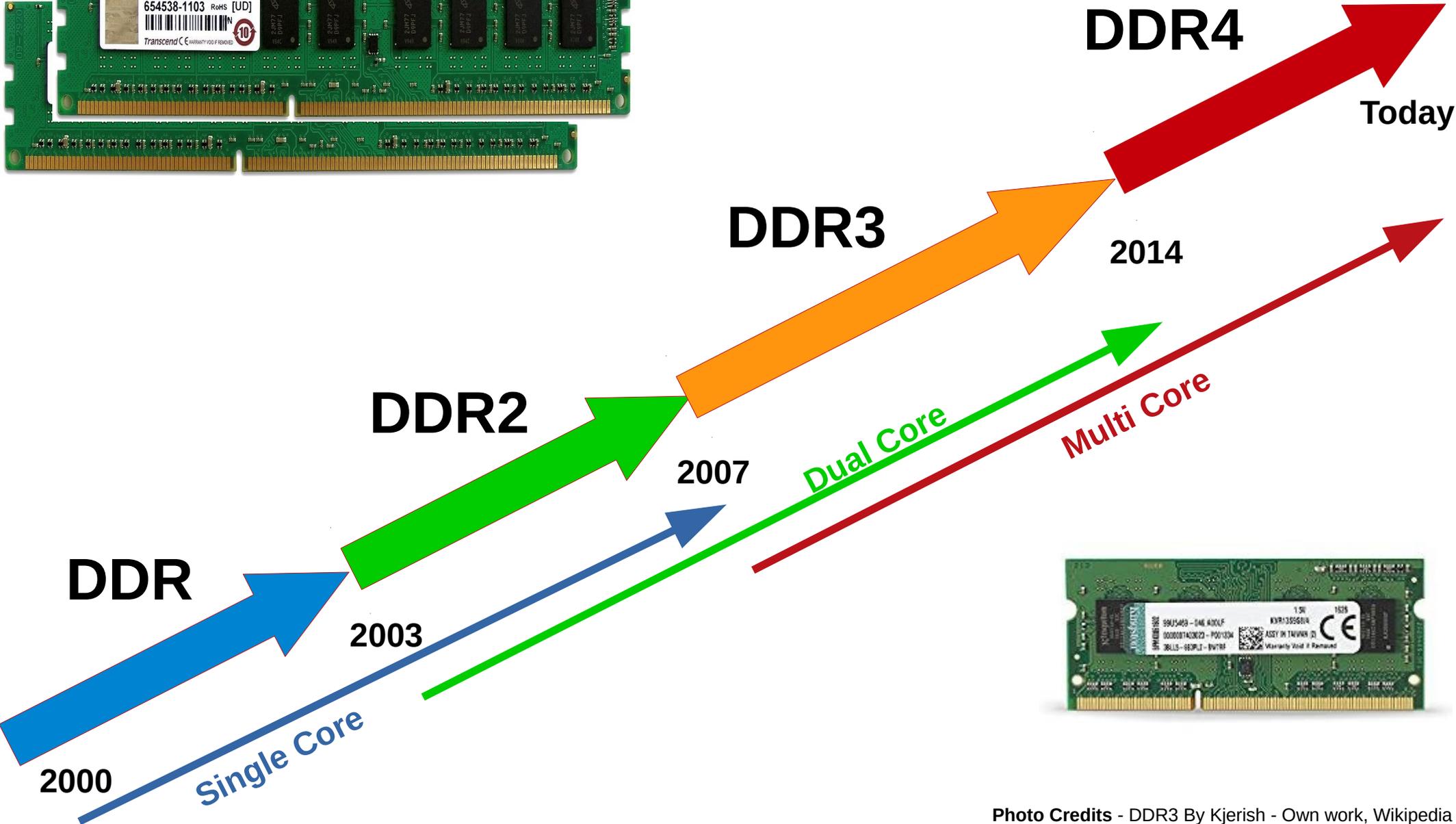
1. Processor (# cores, speed)
2. Memory
3. Video Memory

4. Sizing the Software – Which Era is your PC?

Look up your CPU at www.CpuBenchmark.net



Memory Evolution



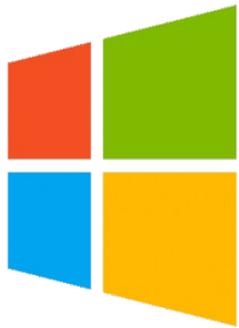
III. How to – Software

> *Sizing software to the box is critical!*



Keep Windows?

I securely erase then install Linux



1. Refurbish existing install

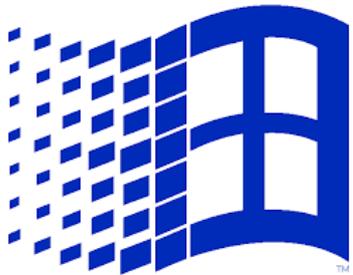
2. Reformat & reinstall

+ Only reformat guarantees no malware (except Lenovo)

- Reinstall requires **code** and **keys** for:

1. Windows
2. Apps
3. Drivers

3. Reformat & install new Windows version – **verify 1st !**



Courtesy: Microsoft (TM)

10	Xsupport ends 01/14/25
8.1	Xsupport ends 01/10/23
8	You must upgrade to 8.1
7 SP1	Xsupport ends 01/14/20
Vista	Out of Support
XP	Out of Support

How to Refurbish Windows

1. Eliminate malware

www.pcworld.com/article/243818/security/how-to-remove-malware-from-your-windows-pc.html

2. Reclaim wasted disk space

www.howtogeek.com/125923/7-ways-to-free-up-hard-disk-space-on-windows/

3. Uninstall unneeded programs

<http://support.microsoft.com/en-us/help/2601726>

4. Prune the Start-up List

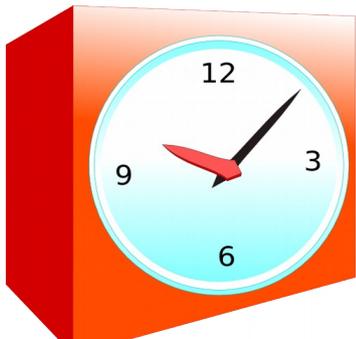
www.howtogeek.com/74523/how-to-disable-startup-programs-in-windows/

5. Disable unneeded Services

www.marksanborn.net/howto/turn-off-unnecessary-windows-services/

6. Encrypt your data

www.tomsguide.com/us/encrypt-files-windows,news-18314.html



Takes a day or two!

How to Securely Erase a Drive

SSD

Wear Leveling:

- + *ATA Trim*
- + *ATA Secure Erase*
- + *PC Disk Eraser*
- + *HDD Erase*
- + *Manufacturer's tools*

If ATA Secure Erase Fails:

- + *DBAN / Nwipe @1 pass*

HD

Residual Magnetism:

- + *DBAN / Nwipe*
- + *DD or CAT*
- + *Encryption*

Hard Remapped Sectors:

- + *ATA Secure Erase*

Tools: *ATA Secure Erase* and *Trim* reside in disk firmware
UltimateBootCD.com & the disk manufacturer's website

Prior encryption of partition is the best method!

By Doug Griswold/Bay Area News Group



Secure Erasure – Resources

1. ***“The Truth About How to Securely Erase SSDs”***
<http://skrilnetz.net/the-truth-about-how-to-securely-erase-a-solid-state-drive-ssd/>
2. ***“Reliably Erasing Data from Flash-based SSDs”***
<http://cseweb.ucsd.edu/~swanson/papers/Fast2011SecErase.pdf>
3. ***“How Long Do SSDs Really Last?”***
www.howtogeek.com/322856/how-long-do-solid-state-drives-really-last/
4. ***“Securely Erase a Hard Drive: DBAN May Not be Enough”***
<http://techlogon.com/2012/07/07/securely-erase-a-hard-drive-dban-may-not-be-sufficient/>
5. ***“Are We Completely Wiping that Hard Drive?”***
www.technibble.com/are-we-completely-wiping-that-hard-disk/
6. ***“Wiki Description: ATA Secure Erase”***
http://ata.wiki.kernel.org/index.php/ATA_Secure_Erase

Visit manufacturer's website!

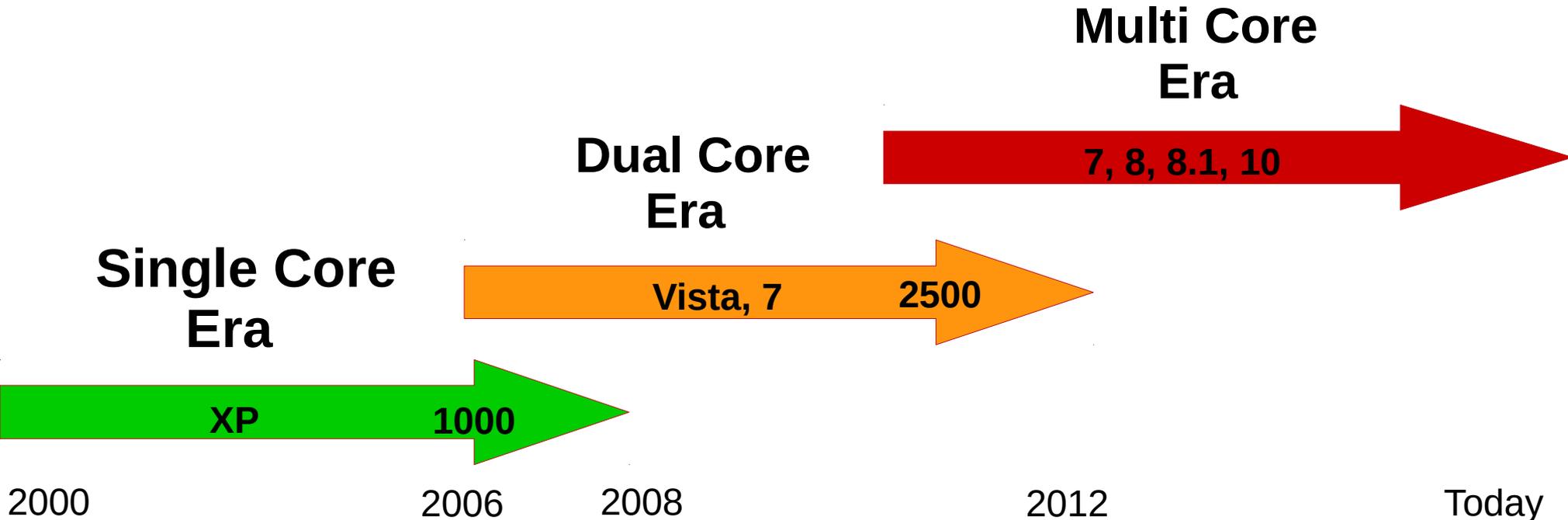


Why Linux?

- + Supports hardware Windows no longer does
- + Distros specifically for old hardware
- + Malware-resistant (AV software slows performance)
- + Cost-free, doesn't slow w/ use
- + Installs with apps, thousands more for free download
- + No complicated licensing and activation
- + Doesn't bind to hardware (as Windows does via Registry)
- + Clone, copy, or move Linux & apps
across partitions, disks, devices, and computers
- + Runs Windows programs
- + Linux Updates are reliable
- + Linux functions longer without rebooting



Which Linux ?



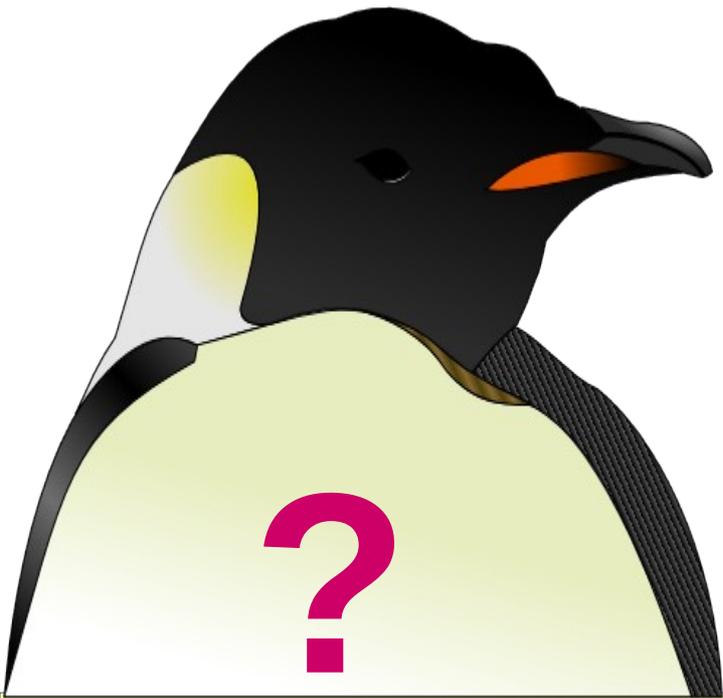
Ultra-Light Distro

Puppy, antiX, TinyCore

Lightweight Distro

Mint/Xfce, Xubuntu, Lubuntu

Any Distro



Which Distro?

> Depends on your needs!

Test with:



1. **Live OS** (eg, Unetbootin)
2. **Virtual Machines** – great for testing
-- not for judging performance

Distro Criteria

- + **User-friendly**
- + **Light apps**
- + **Big repository**
- + **Track record**
- + **Large user community & active forum**
- + **Stability -- LTS (not rolling releases)**
- + **Reliability not cutting edge features**
- + **Easy configuration (GUI not text files)**



Dual Core → Lightweight Distros

-> 2 gig ram !

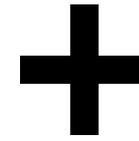
- + Light DE (Xfce, LXDE, LXQt)
- + Simple menu interface
 - + no fancy GUI
- + Light Apps
- + Can do anything a current machine can:
 - + Surfing, social media, email, office, VOIP, Youtube, Ebay...
- It can't do:
 - VMs, emulators
 - High-end graphics, SOA games
- Concurrency is lesser:
 - Fast browser (Chromium, FF Quantum, Opera)
 - Block ads, trackers! (VPN may help)
 - Stop default run of flash, videos
 - Trim app auto-start
- > 2 Firefox profiles (1 for speed, 1 for access)



By Jun Yi

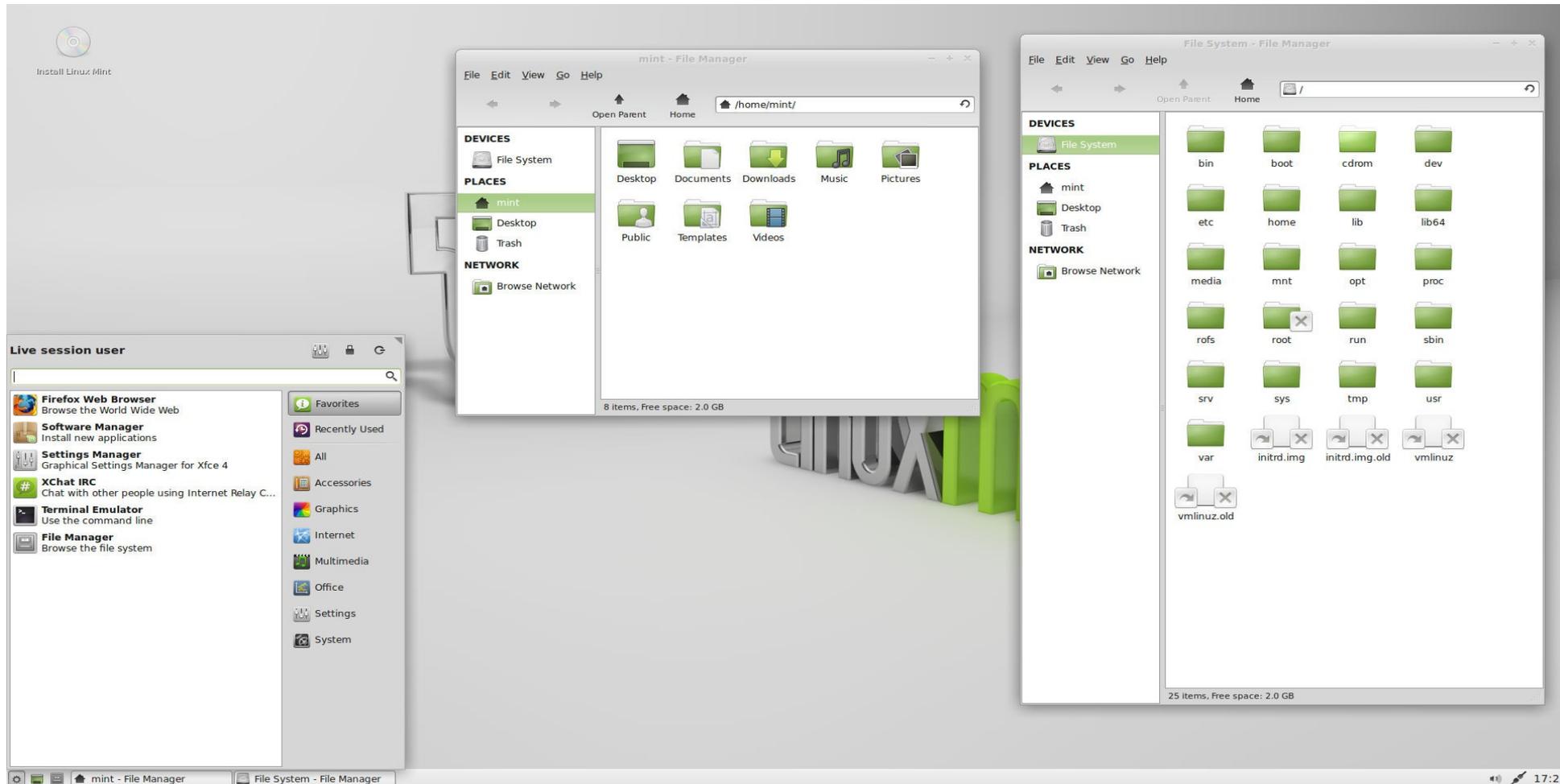


Linux Mint
from freedom came elegance

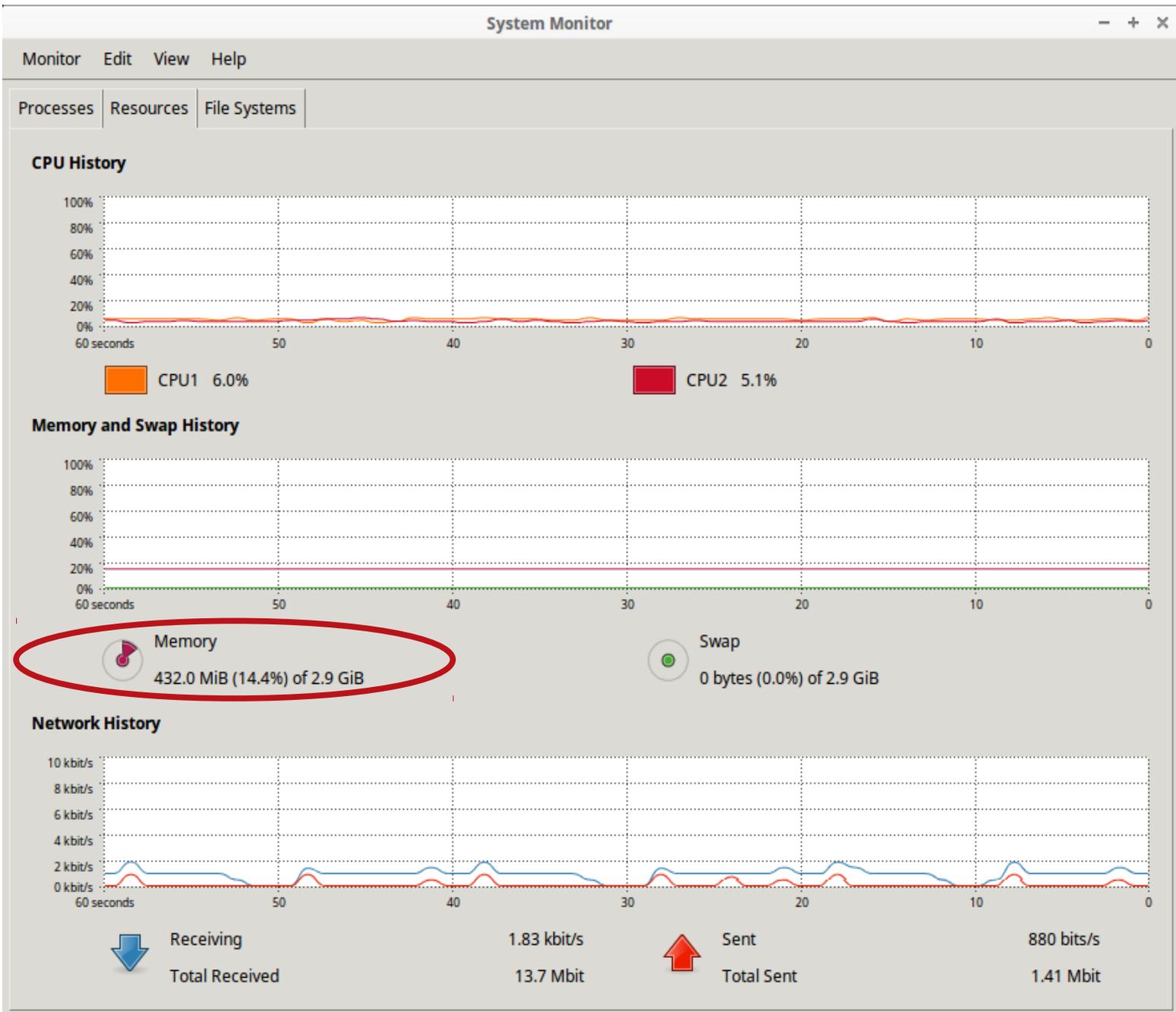


- + Fulfills my criteria
- + Simple menu interface (no glitz)

Sample Screen



Example – at Idle



EMachinesT5274
2008 / Vista



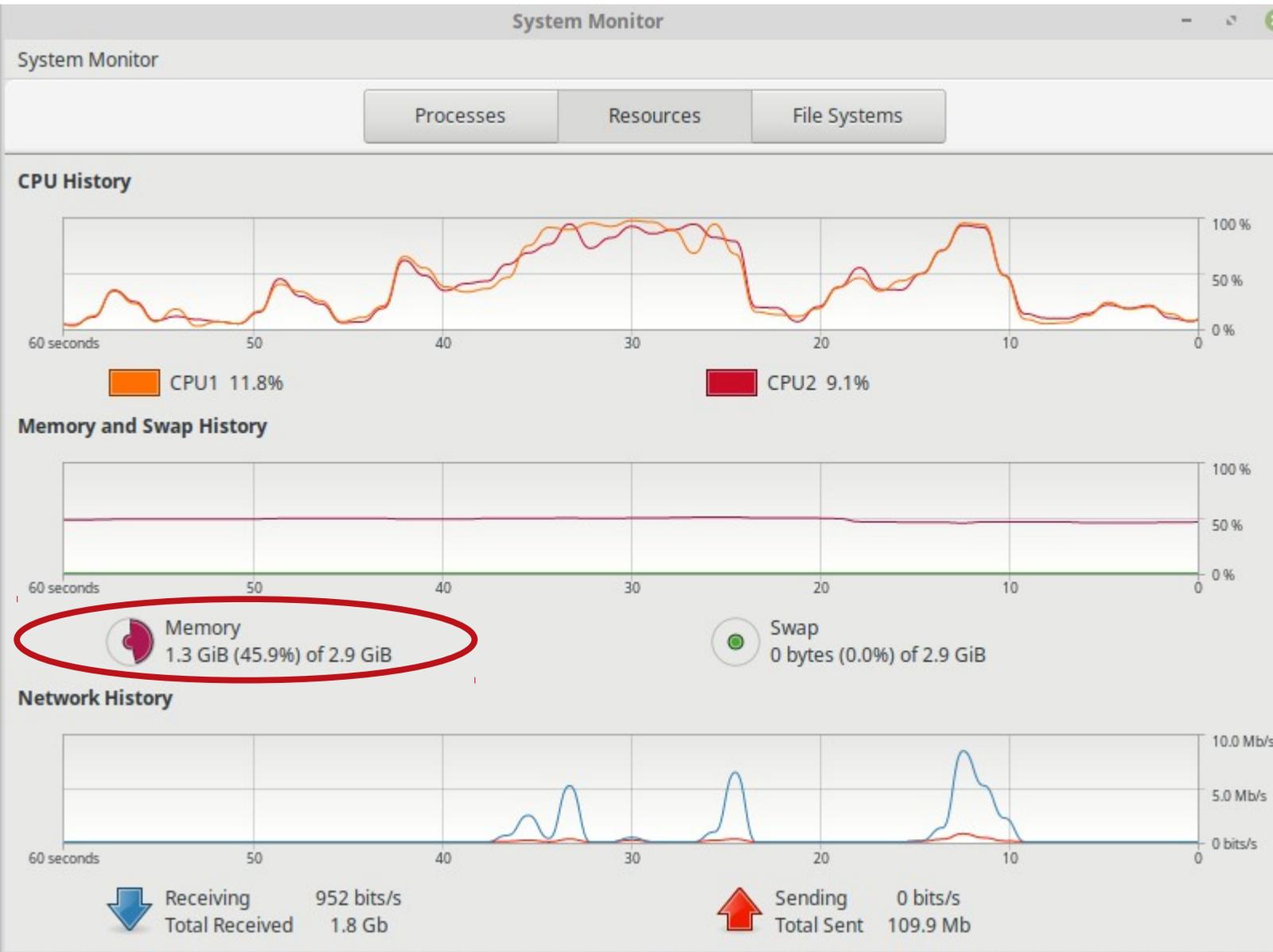
E2180 @ 2.0 ghz

1,087 passmark

3 G ram

256 M vram

Example – at Work



Running -->

- + FF (2 tabs open)
- + LOffice Impress
- + Hardware Info
- + Terminal
- + System Monitor



Want Virtual Machines ?



Early Multi Core (2012 / Win 7)

Lenovo Thinkpad x220

i5-2520M 2x2 @ 2.5 ghz

3,584 passmark

12 G ram



Won't Boot? Try this...

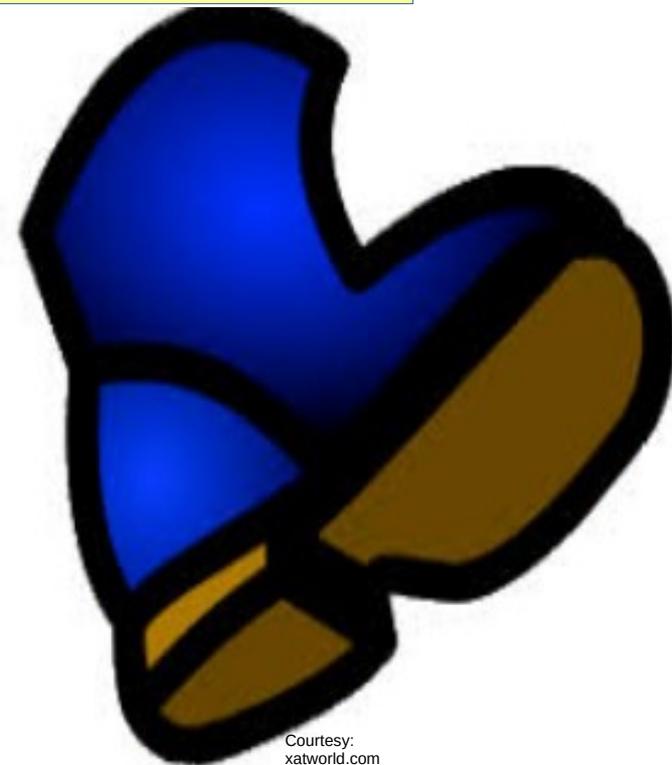
1. Boot messages (*splash, quiet*)
 2. Kernel parms (*acpi=off* or *acpi=force, noapic, nomodeset, pci...*)
 3. Update BIOS
 4. Older kernel
 5. Change Boot Loader
 6. Change X Display Server
- Puppy Linux

ACPI = Power Management (startup, shutdown, sleep states)

APIC = Interrupt Controller (IRQ sharing & remapping)

To change kernel parms, edit `/boot/grub/grub.conf`

At Grub menu --> **ESC**, then **E** for Edit, **F10** when done



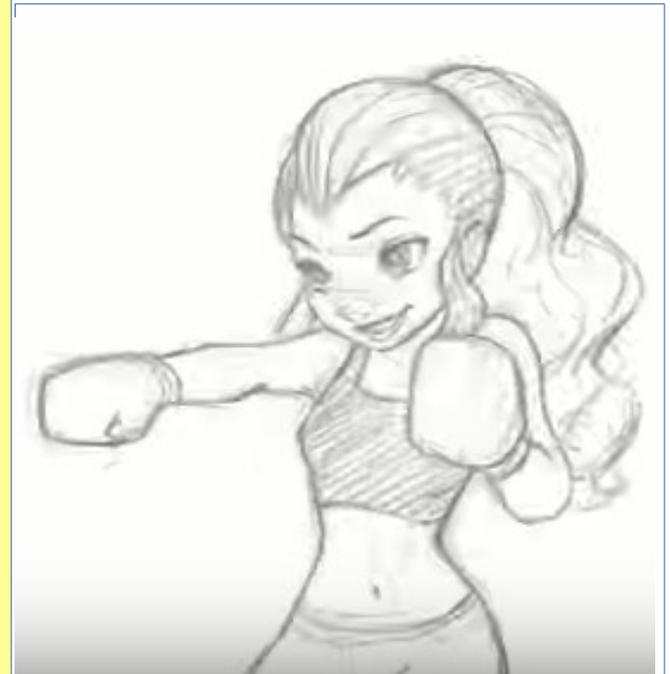
Single-core → UltraLight Distros

-> **1 gig ram !**

-> **Add video card** (AGP, PCI, or PCI-Express with VGA or DVI)

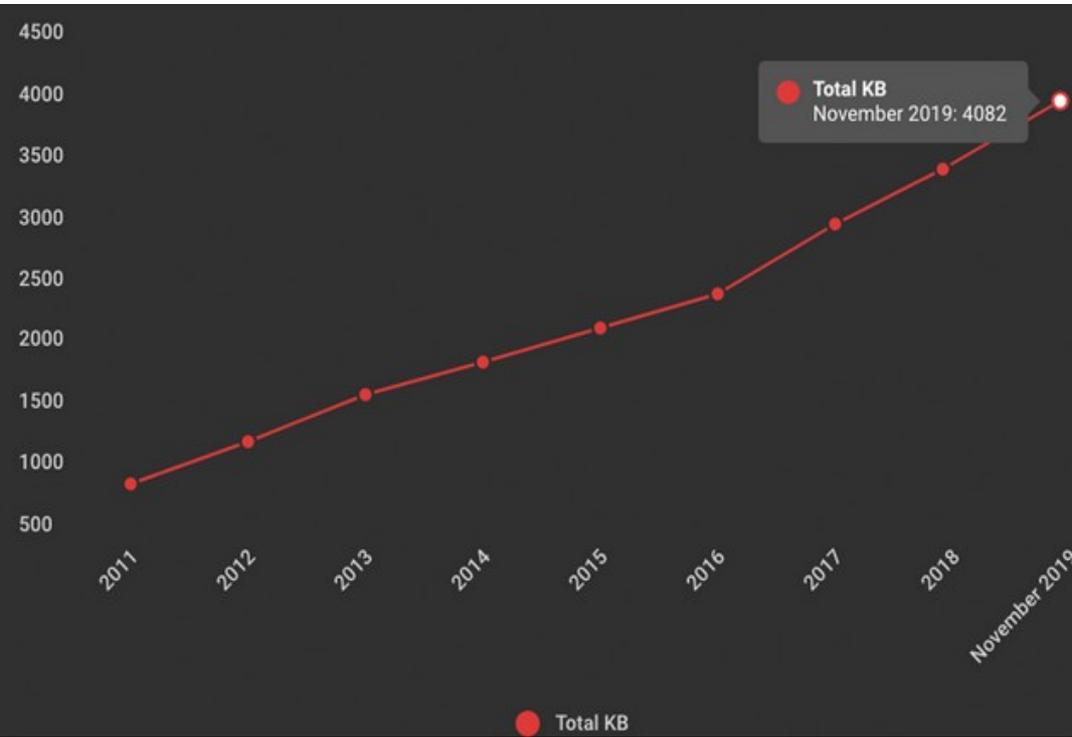
-> **Verify your distro runs on OLD computers (not LIMITED ones)**

- Window Managers, not DE's (JWM, Fluxbox...)
- + Simple menu interface
 - must change code to change it
- + Light apps (eg, GNOME Office not LibreOffice)
- Web surfing is challenged by growing websites
- Watch for outdated browsers
- **You must manage concurrency !**
 - Fast browser (Chromium, FF Quantum, Opera)
 - Specialized browser (Dooble, Dillo...)
 - Block ads, trackers! (VPN may help)
 - Stop auto run of flash, videos
 - Toggle JavaScript on/off
 - Manage background processing
 - Limit app auto-start list, open apps

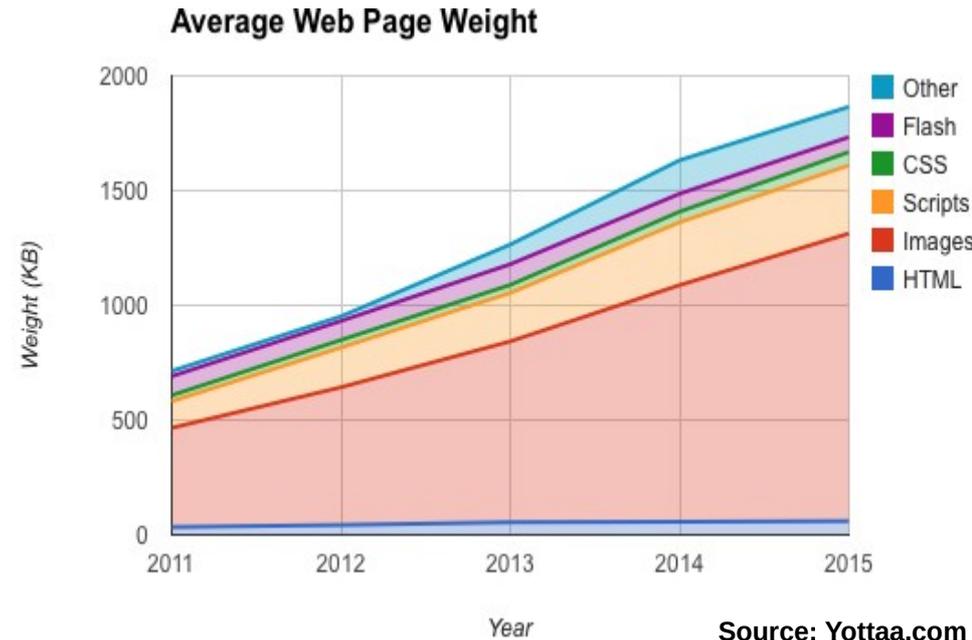


By Jun Yi

Why are Webpages Slow ?

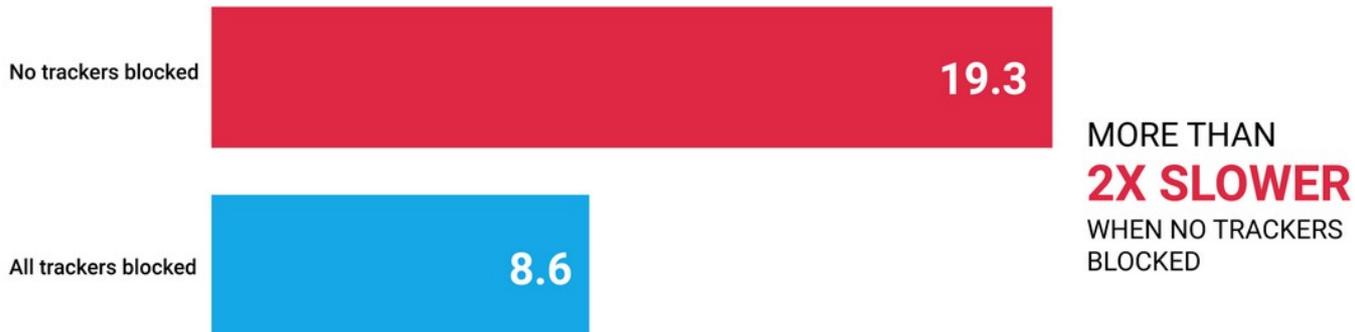


Source: SpeedCurve.com



Source: Yottaa.com

AVERAGE PAGE LOAD TIME WITH vs. WITHOUT TRACKERS



Average page load time (seconds) measured by Ghostery, of the top 500 US domains according to Alexa.

Source: Ghostery Study

Ultralight Example -> Retro Games Box

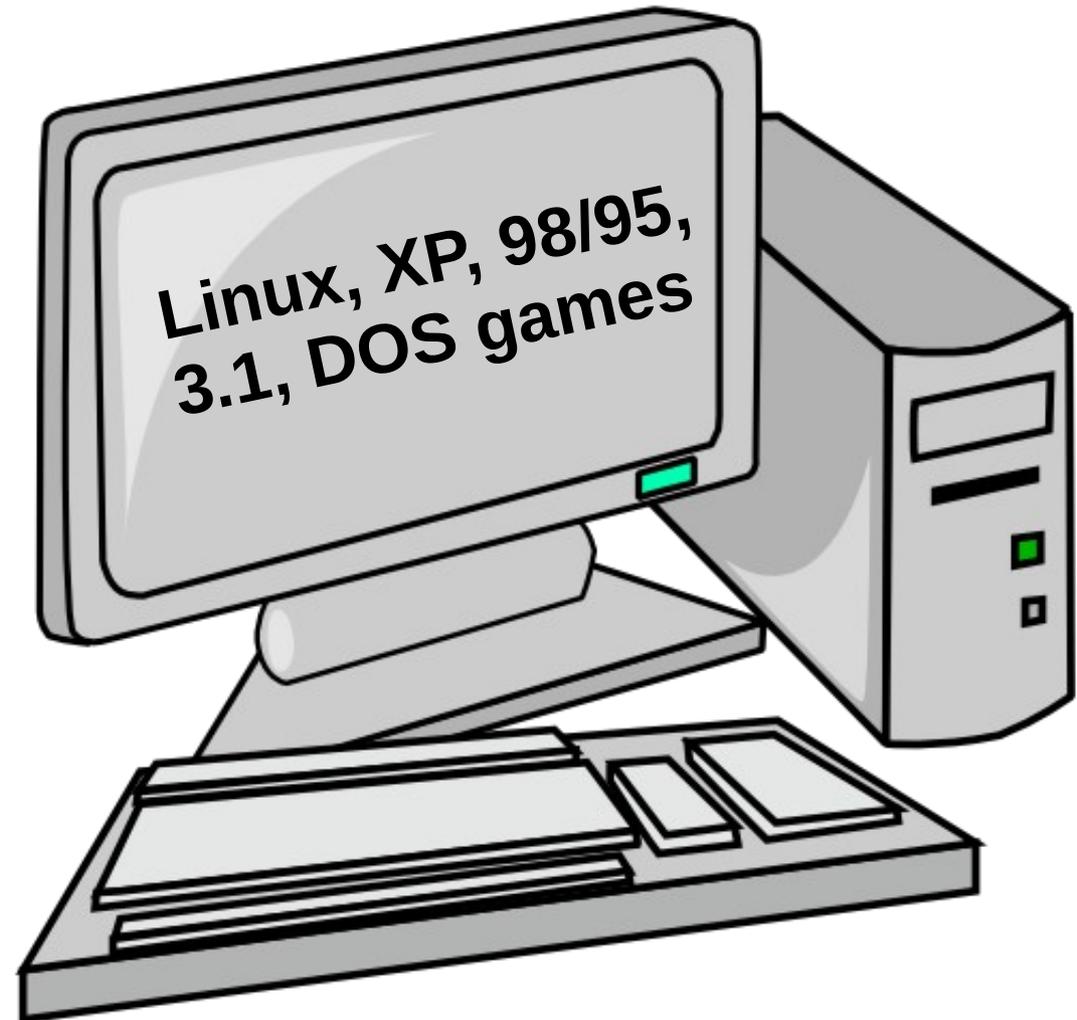
-> Dedicated kids' computer

* Pentium 4
(3.2ghz, 2g, 40g, 256m vram)

* antiX Full

* WINE, Dosbox

+ Strategy, logic, board, dice,
card, educational games,
puzzles, old action games



puppy Linux

- + Older computers
- + Fast!
- + Big user community (lots of help)
- + Complete desktop
- + Ubuntu or Slackware Repository

Puppy was my choice for years...

Then PCs became more powerful.

- Expert install & configure
- Inflexible desktop
- Effort to get into Puppy World

**Everyone
runs
Puppy !**



file help mount install setup edit console

write calc paint draw

browse email

plan play

connect quickpet

lock

zip

trash



lucid puppy 5.2

sr0

menu

19:58



- + Easier to get into than Puppy
- + Same benefits & shortcomings
- + Complete desktop

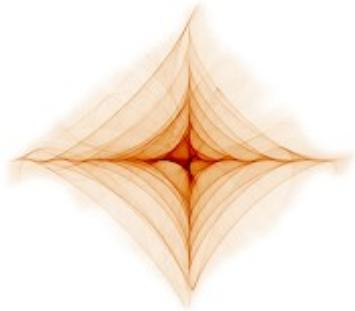
Default
Desktop





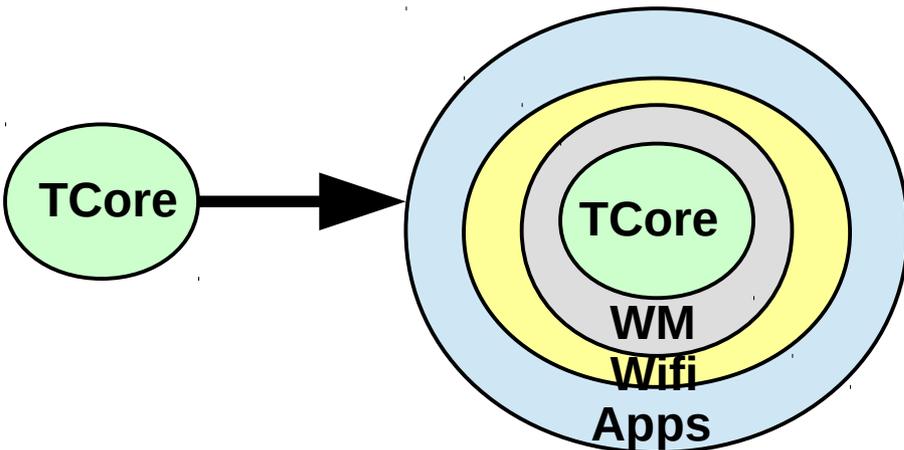
Tiny Core

Lauri Kasanen
Into the Core
A look at
Tiny Core Linux



Free Book!

- > Different philosophy
- > Build up from kernel
- + Great for learning
- + Great for dedicated box
- Not a complete desktop



How to Run Windows Apps

1. Equivalent apps:

<http://alternativeto.net/>

http://wiki.linuxquestions.org/wiki/Linux_software_equivalent_to_Windows_software

2. VirtualBox

3. WINE

- + Look up app in WINE database
- + WINE is efficient (not an emulator)

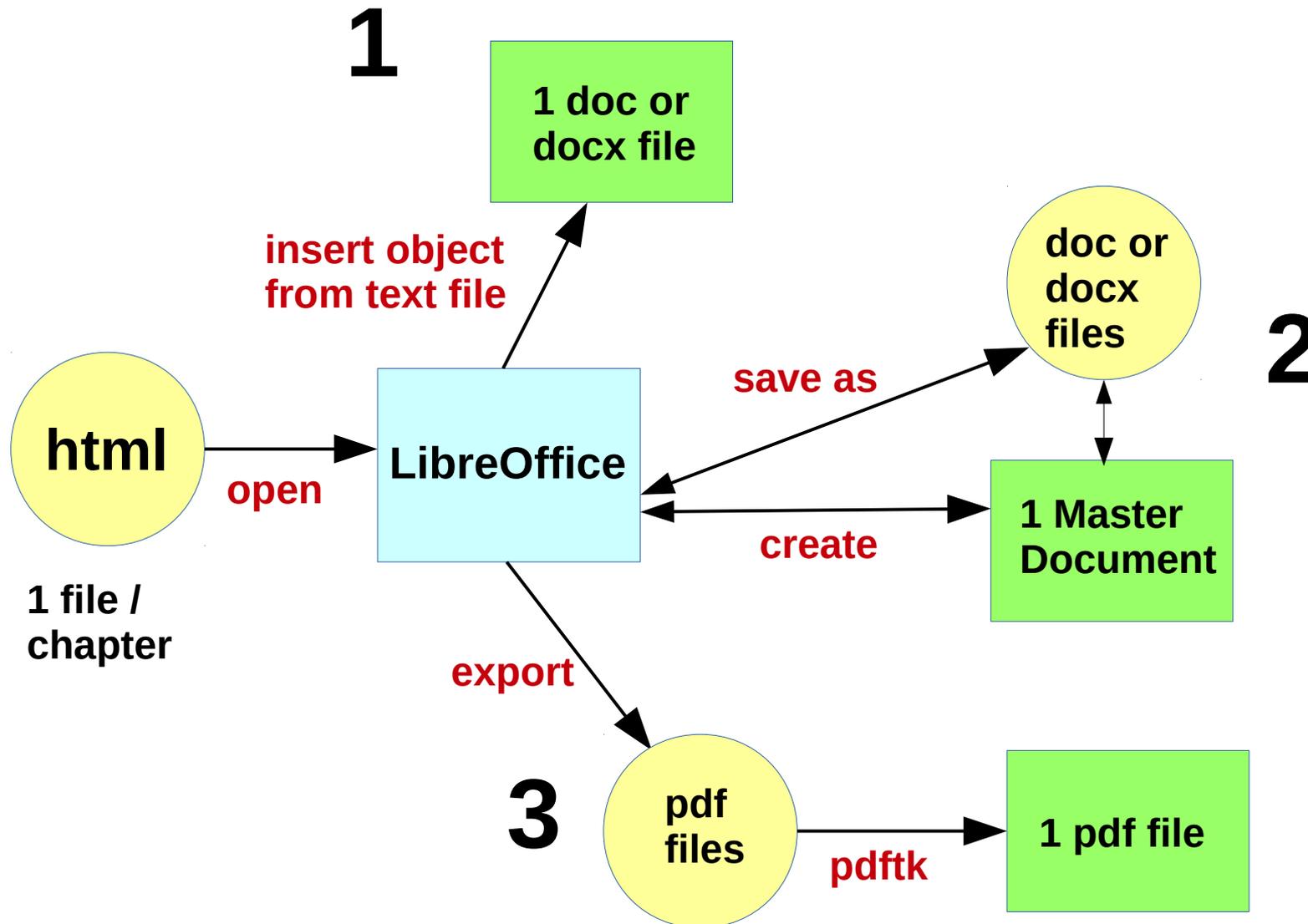


- + WineTools
- + PlayOnLinux



Example – Word Compatibility

- + Created novel in html
- + Publisher requires either 1 doc or docx file –or-- 1 Pdf file





FreeGeekChicago.org

- + Donate PCs
- + Refurbish
- + Teach a class



Recommended Refurbishers / Recyclers

+ All operations in USA

+ Meet all environmental & safety standards

Free Geek

FreeGeekChicago.org
on Diversey

SWANCC

SWANCC.org
various locations

COM2

COM2recycling.com
Carol Stream
(Store in Lombard)

An Ode to Chopper

– In gratitude to a loyal Pentium D



I took you from the trash when no one wanted you, and nursed you back to health.
You were thankful and said I need not work by stealth.

Before you said they didn't care about you, all they did was use you.
But I cleaned you out, and never again did you pout.

You ran fast! (for an old machine)
And did your work! (and I always kept you clean)

Chopper, Chopper, where did you go?
Nothing left now, nothing left to know

You waved goodbye with a blinking yellow light
and though it didn't seem right
I knew you had to leave, as we all must, one sad April night.

Love,
Howard



?

?

IV. Questions ?

?

?

?



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Other Credits In Order of Appearance --

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- * Photo of junked computers courtesy of eWaste Direct in Livermore, CA taken from their posting at Yelp at www.yelp.com/biz/ewaste-direct-livermore
- * Clipart of man pondering from Clipart@Toonday at <http://vecto.rs/design/vector-of-a-cartoon-man-pondering-coloring-page-outline-by-toonaday-22769>
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