

# Rising Stars of Linux Distros and Mini-Linux Users Factfile

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## The Rising Stars of Linux Distros:

When you have had experience of a Linux OS demo, and thenceforth know what to look for and, where to look, there is a wide choice of freeware Linux OSs that astound and amaze, and they are rapidly getting better in performance, and, more tailored for easy use by non-afficionados. Speed, stability, simplicity are dominant, especially if you just need no-frills Web access, and, online email. A new computer, and vast, complex, Apple or Win OSs, are simply not needed just for these purposes. Your older, still useful system, either laptop or PC, can be matched with a Linux OS that will rapidly boot, have good video, sound, speed, and, general easy useability. **Nofrillstech** has mixed and matched anything from Pentium 3s to dual-core systems, both laptops and PCs, with Linux OSs, and all performed with ease, especially when connecting to the Internet, using either cable or wifi. Smartfone tethering to Linux OSs is a breeze as well.

There are respective **Linux online updates** required at installation, including for security, but, never to the extent of using vital bandwidth and time, as do MS OSs, nor is there any validation to contend with. **Support for these Open Source distros** is up to you, so, if you like them, then either publicise them, and/or, send your favourites some useful \$\$\$\$. They do such a great job, as well as freeing you from the software hegemonies of both Apple and Microsoft, and, their respective hardware exigencies. **You may need to test-install for different hardware systems**, especially older laptops, as heuristics may apply as regards compatibility, but, this will be a small inconvenience for the resulting ease of Linux OS use, and, the Linux OSs will install quite quickly.

**Note that Linux OSs can be installed on Wintel-based Apple systems. This should still be the case in the age of UEFI booting, check before you buy a modern system for use with Linux.**

**Re peripherals**, such as printers, at this stage, you would be advised to check online for Linux printer drivers available for given brands, and, plan your printer purchase accordingly, although the general rule seems to favour more recent models. Note also, that, unless you need an inkjet printer for specialized printing, laser printing is much more economical, and reliable, check online to see if you can get generic refilled cartridges for your prospective laser printer. Cameras and smartfones should connect/tether automatically, though in general, heuristics may also apply for scanners, printers, media centre, etc. Linux OSs now have a large driver component, so there should be no problem with hardware recognition. (However, as backup, a faithful XP system, no longer powerful enough for fast Internet access, and still with its trusty peripherals, can be used for offline printing, and/Photoshop, hardware testing, etc.)

**Linux Mint, Linux Lite, PeppermintOS, PCLinux OS, Ubuntu, Ubuntu Remix, Lubuntu, Kubuntu, Xubuntu, Lxle, and Puppy** (>200 Mb!), are all Open Source Linux OSs that **Nofrillstech** has tested. **Also, there are 'lite' versions of these, requiring less resources.** **Linux Mint** is now the NFT favourite, especially since true dual monitors state is provided, and also comes in **Cinnamon, Mate, KDE, and XFCE versions**. See [DistroWatch](#) for the current top consumer choices. Some, such as **Linux Mint**, have **SMART technology** already present, making HDD checks much easier, plus, after all, if the HDD is failing, a timely warning of this event is surely worth having.

Finally, **Nofrillstech** has been able to duplicate all MS Win apps, via Linux OSs, necessary for basic Internet access, and, Web page support. Now the wheels have finally fallen off XP, online, anyway, for **Nofrillstech, Linux OSs have fully taken over.**

**Leaving even XP behind** is made possible by using particular Boot CDs/DVDs for troubleshooting hardware, beyond HDD/SSD checks with **Disk Utility**. Also, for disk cloning, partition management, erasing. These include **Nofrillstech's** own choices of **Memtest Boot CD, Hiren's Boot CD, Ultimate Boot CD, Parted Magic Boot CD**, (especially as Disk Utility is incorporated), **Gparted Boot CD**, and **Linux-Boot-Repair CD**.

Those wanting to study actual hardware and hardware peripherals in greater detail, plus troubleshooting, should avail themselves of any of **Scott Mueller's** Que publications, especially **Upgrading and Repairing PCs**. **If the hardware, et al, does not work, then nothing will, being the First Basic Law of Computing Functions..?**

Those wanting to know more about the evolution of, and, the vast public-spirited collaboration for continuing development of, **Free Software, Open Source Software**, and, of **Linux** itself, should consult these references:

**Free Software, Free Society**, R Stallman GNU 2001 ISBN 978-0-9831592

**Open Sources**, Voices from the Open Source Revolution, O'Reilly 1999 ISBN 1565925823

**The Cathedral & the Bazaar**, E S Raymond O'Reilly 2001, ISBN 1565927249

**Rebel Code**, G Moody, Basic 2001, ISBN 9780786745203

**Just for Fun**, L Torvalds, Harper 2001 ISBN 0066620732

**Weaving the Web**, T Berners-Lee, Harper 2000, ISBN 9780062515872

**Google** also offers a very wide range of Linux sites, and information, far beyond the scope of this small **Linux Mini-Factfile**.

## Linux User's Mini-Factfile

**Linux OSs** are becoming increasingly diverse and refined, and thus, more readily acceptable to ordinary computer users, being stable, easy to install and to use, with plenty of drivers, which is especially important for printers, plus, good Desktop layouts. Linux diversity means extra mix-and-match OS choices to suit systems of any age and size, and, a world-wide community of programmers, enthusiasts, and forums contributing to continuing advancement of both Linux OSs, and, improved budget IT access for ordinary citizens.

**Especially important is the fact that if you only want Internet and online email, then a compatible Linux OS on an older system, be it laptop or PC, is all you need, OK..!**

**Linux Mint** has good user manuals available, (just ask Google), which are very useful primers, and, a good basis for understanding at least any one of a dozen or so Distros that **Nofrillstech** has tried. (See [Distrowatch.com](http://Distrowatch.com)) All the steps involved in downloading a Linux .iso, burning this to disc, then following the installation steps common to all Linux OSs, are included in these easy-to-use manuals. Read and apply info from these Manuals, is **Nofrillstech's** recommendation, and discover just how straightforward Linux OSs really are. (Also the main reason this Linux Mini-Factfile is so small...!)

**Nofrillstech's** first Linux Distro choice is **Linux Mint**, in all versions, at present Mint 17.3 supported till 2019. **Linux Lite** is another good general-purpose OS that is compatible with older systems, laptop or PC, and, **Zorin** is a further useful standby as well. **Puppy** is first choice for legacy systems.

Whichever you choose, **be sure to update during/after any Linux OS installation**, the first is important, including for security. Subsequent updates will not be onerous, and, can be carried out at a local iCafe, monthly at most, to conserve home wifi resources, if this is necessary. Easiest, of course, when using a laptop. **Both Linux Mint and Linux Lite have sensible upgrade facilities, making OS upgrades very easy.**

**Note that Linux Lite may not initially engage the correct keyboard driver for laptops, if this is the case, just connect a standard USB keyboard, and then restart, the correct keyboard drivers should then be functioning. If this does not work, then there are other Linux OSs to choose from, which is one of the main factors in favour of using Linux distros.**

**Note that zeroing HDDs and/or partitions is advisable**, using third-party programs such as **D-Ban**, or **MirayHDDShredder**, etc, to ensure successive clean installations of **unlike** OSs, be they Linux, Apple, or Win, previous to a Linux OS install, thus eliminating all partitions, hidden or otherwise. Plus, ensuring complete erasure of unwanted data, in all cases, that may cause subsequent problems and conflicts. Then, **prior to any Linux OS installation, the HDD is left unallocated.** The Linux OS disc will then carry out any partitioning and formatting. **Just ensuring a drive is fully non-allocated may also be sufficient, thus, heuristics will apply, OK!** **Gparted** provides 'Device/Create Partition Table', which will effectively and quickly unallocate the HDD data area.

You can also use **PartitionMagic**, **Gparted**, or similar, to make custom partitions to your own specification, suggest that a **Swap** Partition, of at least 2 x Ram in Gbs, is made at the beginning of the drive, then, the Boot partition beside that, so that the HDD does not have to work so hard with data transfer between the two, tho this is not relevant with SSDs. Be sure to set the **boot flag**, and **\**, to mark the OS installation target, plus, match file systems to the specifications of the OS, **eg, ext4 for Linux Mint.** Leave the rest of the drive unallocated, and later make a **Store Partition** via the installed OS, using **GParted**, or **Discs**, thus making partition ownership easier to instigate.

Meanwhile, keep a log of your activities, as with all your computer usage, especially when installing and uninstalling apps, and, be sure to use the **Update Manager**, which apart from aiding ongoing optimal performance, can correct software faults by overwriting with new/updated software. Forget defragging, file cleaning, and fussing with security and anti-malware, all is taken care of by Linux OSs, which are also not a target like Microsoft is, and now, even Apple, for malware. The public-spiritedness of Linux is well-respected. **Judicious online use is still advisable, however, regardless of OS choice.**

### Some useful extra programs for average users, if not already installed, are:

**Firefox**, tho note that **Opera** is faster, if not so easy to use, especially in relation to Bookmarks, recommend using either in conjunction with **Ghostery**, **http Everywhere**, and **Web of Trust**. **Thunderbird** for email is also recommended.

**psensor**, useful for monitoring temperatures and CPU usage.

**hardinfo**, useful for system info, including battery state checker

**gparted**, easy-to-use partition manager

**gnome-disk-utility**, monitors **SMART**, and/or, **gsmartcontrol**, aka Discs

**gnome-system-monitor**, monitors disk space, processes, network traffic

**gkrellm**, a useful system monitor, light on RAM, eg, **especially useful for online traffic rates.**

**libreoffice**, very useful Office program, that will read many formats, including MS Office.

**gwrite** for a simple html editor, **amaya** is complicated, **bluefish** even more so. **kompozer** html editor is the most complete and easy to use for non-professional website-building.

**justgetflux**, very useful for controlling monitor colour and 'heat', definitely recommended, **via Google**. If **f.lux** does not install, there is **redshift**, **sudo apt-get install redshift redshift-gtk** then **sudo apt-get install geoclue-2.0**

**xbacklight**, (for laptops), to control screen brightness if required.

**fireftp**, for uploading files, is also available for Linux, via **Firefox** as an add-on. When installed, **FireFTP** will be available via the **Web Developer Menu**. **bareftp** is another useful ftp app.

**Google Earth** is available via <http://community.linuxmint.com/tutorial/view/1710>

**clamav** can be used if any malware is suspected, using with **clamtk** interface if a GUI is required. **Especially useful to remove PUAs that may hinder performance, note.**

**bleachbit** will clean the few files that need this in Linux OSs, **tho not backup files**, these are best left unchecked, as are **free disk space, (for SSDs), passwords, and memory. Set accordingly, both versions.**

**Note also that TENDA wifi dongles generally work with Linux OSs, if others do not.**

**Terminal** can be useful, without being complicated, eg, when looking to install a program, as per preceding examples, above. Certainly, there is an availability of apps via **Software Manager**, or directly online, but, if you know what you want, **Terminal** usage is quite quick, given that the required app is available from the software repository of a particular **Linux Distro**, viz:

Thus, **sudo apt get-install xyz**. To uninstall, **apt-get remove xyz**, **sudo apt-get purge xyz**, or, via **Synaptic Packet Manager**

Eg, **sudo apt-get install gnome-disk-utility** will obtain for you that very useful app to test your HDD SMART, etc, when this is not present in any Linux OS that you may be using. ('**sudo**' being the '**superuser**' prefix)

## **NFT 's own Program Installation List, which includes website use:**

**xsensors, psensor, gkrellm, gtkorphan, gtkperf, bleachbit, hardinfo, gparted, gsmartcontrol,**

**kompozer, fireftp, gwrite, brasero,**

**pdfshuffler, pdfmaster, pdfsam, trimage, pinta,**

**ghostery, wot, https everywhere, LM firewall, Firefox/Thunderbird *plus tweaks***

## **Damaged Update files:**

**sudo apt-get update --fix-missing**

**sudo dpkg --configure -a** then:

**sudo apt-get update** to recheck. **Plus, always leave the system connected to the Internet until all updates are finished, with any Linux distro, as the OS may still refer back to the update repository, whilst still installing downloaded updates.**

**sudo apt-get install exfat-fuse exfat-utils** for reading exFat drives

**history -c** will clear Terminal history

**setxkbmap -option caps:none** will turn off Caps Lock, add to Startup Applications as **Disable Caps Lock**

**Linux driver info** is available via <http://www.howtogeek.com/213488/how-to-install-hardware-drivers-on-linux/>

**Linux TRIM control setup** is available via <http://www.howtogeek.com/176978/ubuntu-doesnt-trim-ssds-by-default-why-not-and-how-to-enable-it-yourself/>

**Speed up your Mint! - Easy Linux tips project** Useful tips for Linux, tho, at your own risk, note. **Easy Linux Projects** also has tips to speed up drives, marked improvements can result, especially for SSDs, look for the '**swappiness**' and '**noatime**' entries.

**For SSDs**, regular use of the trim **Terminal** command line **sudo fstrim -v /** will be needed. Note that **bleachbit** will clean free space on platter **HDDs**, though is not recommended for **SSDs**, which have the **TRIM** facility anyway, as the solid state components will be unnecessarily overworked, thus reducing useful life span. (**See Mueller, re SSDs, URPCs 22<sup>nd</sup> Ed**)

`sudo badblocks -w -s -o usbstick.log /dev/sd(..)` for scanning for USB drive bad sectors

`sudo e4defrag -c /dev/sda/b.. x.` , for dragging hard drives, tho not usually necessary for home computers

`sudo badblocks -sv /dev/sd(..)` for scanning for HDD/SSD drive bad sectors

`fsck.ext4 -cDfty -C 0 /dev/sd(..)` for HDD/SSD file check and bad blocks **as Root** via `sudo su`

`fsck.ext4 /dev/sd(..)` HDD/SSD file check, also as **Root** via `sudo su`

**Tips for using Linux** include not being impatient with the mouse, and keyboard, and especially, being aware of which icons need one click or two, plus, not having too many Windows open at once, and, allow full opening and closing of apps before or after use. When updating, be sure to spread any little windows apart and read each carefully, plus, do not restart immediately, even if requested, until all updates are fully downloaded and installed. **Uninterrupted updates/upgrades are recommended, as well. Reboots before a coffee also work for Linux, just as they do for Windows**, to re-jig functions, bleed RAM, or, to cure frozen systems. **Ctrl/Alt/Esc** should shut down, or, reset the system, if required, this works for **Linux Mint**, anyway.

**For overheating Linux laptops, see this link:** <https://itsfoss.com/reduce-overheating-laptops-linux/>

<https://www.howtogeek.com/55185/how-to-maximize-the-battery-life-on-your-linux-laptop/>

as well as:

<https://www.macissues.com/2014/12/29/radical-fix-drill-holes-in-your-mac-to-make-it-run-cooler/> **which is applicable to any model of laptop, not just Mac.**

**If there are other recurrent problems such as jamming, or sudden restarts, it is important to test for hardware problems first**, because Linux OSs themselves are inherently very stable. Test RAM with Memtest via a bootable disc, using a portable CD/DVD if necessary. **Plus, try a bootable Linux disc**, distro and/or troubleshooter, and, if this step shows performance problems, then hardware should be further checked, starting with turning everything off, and then re-plugging all connections. **Testing peripheral hardware on other non-critical systems is also advised, if practicable.** Electrical contact spray for connections, including RAM, is recommended, especially in damp or humid climates.

**In addition, connect the HDD/SSD to another PC, if necessary, to check HDD SMART details. Seek advice if needed, and/or if the problem persists, after these initial steps, as a hardware fault is then most likely.** Note also that warming a system case interior with a hair-dryer may help with reluctant booting, in an emergency, when all else has been tried. **This is itself a sign of impending motherboard failure, because material stress over time has caused some conductive filament to finally fail, with repeated shrinkage, at a cool or cold temperature.**

Finally, **boot problems** that are definitely related to OS boot function, and file disruption, can usually be fixed by using **Linux Boot-Repair-CD**, which supplies an automatic remedy for the most common boot problems, including file and boot repair.

## Storage Partitions using Linux OSs:

To make a Storage Partition within a Linux OS, without head-scratching configuration trials, be sure to try installing an OS incorporating a Linux **Disk Utility**, such as Mint, EasyPeasy, or Peppermint. (**Gnome-Disk-Utility** can be downloaded post-OS install using the Terminal Command Line as above.) This app then generally enables Partition/Disk Ownership changes within its Disk Format facility. If this capability is not evident in any given Disk Utility, **you can make a storage partition after installing the Linux OS, using a bootable Partition Manager, (such as Parted Magic)**, to resize an existing Boot Partition, or taking over an unallocated zone of the HDD.

Then, after rebooting, use the native OS **Disk Utility**, or, **gnome-disk-utility**, for Labels and Flag Management, as well as for **Taking Ownership**, if present, of that particular partition. **The Boot Partition should also have a Boot Flag, plus / for boot point, and, the Store Partition can be flagged LVM, or, left unflagged, for general use. The Swap Partition does not have a flag. Note that, when using any Disk Utility, you will need to Unmount partitions before these steps can be taken, even to the extent of connecting the drive to another Linux system, or using a Linux OS CD/DVD.**

**Note that setting up a NEW partition, with Discs, after the OS is installed, re-formatting an existing one, or, even deleting and re-making a new partition, should render that partition automatically accessible, also.**

**If a Disk Utility cannot be thus utilised for Taking Ownership, partition permissions can be otherwise altered, in general, to allow access to the storage partition, viz, add the new Store Partition Ownership, eg 'root', to Admin/User Group Ownership, then right click within the opened Store partition, go to the partition Properties/Permissions, and then change the ownership of the Store partition to the main ownership name, eg, NFT always uses Linux as the Account Name, so, there needs to be a change from 'root' that will be the default partition ownership, to the new 'linux' ownership. When this change happens, right click in the new Store Partition, another window will open for **Special Privileges**, so, right click again for **Properties/Permissions**, confirm the new ownership and group name, plus, impose 'change and delete files'. The partition should now be accessible; otherwise a reboot may also be necessary.**

**Individual files and folders may still require alterations to their Permissions**, so, reconfigure via right-clicking the **icon**, thence to Properties/Permissions, and, confirm the new ownership/group name, plus, 'change and delete files'. **NFT** has also found that storage partitions made for **Puppy** are automatically recognised, but, In respect of other Linux OSs, your own heuristic trials will decide their capabilities, regarding incorporating useable Storage Partitions on any connected HDDs, Boot or otherwise. Also, recommend looking for additional solutions, such as for **Permissions**, *within the individual OSs*, before trying Online Forums, as some of that info can be both prolix, complicated, and, even outdated.

**Note also, that flash drives are useful for temporary storage or transfer purposes, but, they do have a limited life, and, if used daily, be sure to discard and replace them yearly..? SSDs perform well, but, like standard flash drives tend to do, they can fail catastrophically, so, safe longterm data storage is best achieved using good-quality platter HDDs, or optical CDs/DVDs. The Cloud is yet another storage option.**

**\*\* Finally, do not overlook extra portable storage such as external HDDs, or, transfer files to other systems for safekeeping. Anything hardware can be fixed and replaced in a computer system, but never lost or broken data, and, if data is not backed up 3 times, with any medium, it is not to be considered backed up at all...OK! \*\***

## Cloning Linux Partitions and HDDS:

**Easiest is just to do two OS installations**, one consecutively to a spare HDD, as Linux OSs install so quickly..? Update these additional HDDs when required. (See below.)

**Secondly, utilise a spare compatible HDD**, and, use an enclosure, or SATA port, **plus a basic cloning boot program, such as Easeus Disk Clone**. Do this when the OS is updated, and your chosen ancillary programs, storage partitions, etc, are all then secure on the spare HDD. Store the cloned HDD until a swap is required. Further such updates can be done when all is running well, at your own convenience, by again re-cloning. **Unused IDE HDDs now make convenient storage for this purpose.**

**Thirdly, use a Boot Partition program** to make both a Storage Partition, and, an unallocated partition, on a spare HDD/SSD, to clone the original Boot Partition to, (**Swap** will be shared by default), using a partition cloning program to achieve this effect. Reboot using **Linux-Repair-CD**, and a **dual boot** will then be created in Grub. Then, configure the **Storage Partition Permissions** within each **Boot Partition**.

**Note that Linux OSs do not stress systems, including HDDs, as much as does Microsoft OSs**, but even so, using dual booting to an OS Boot Partition set beyond the platter centre(s), will also help to spread the wear on a platter HDD, away from the beginning of the drive, and, **Grub** will thus enable this choice. **High usage systems with older platter HDDs could benefit in this way..?** Note also that there can only be four **Primary Partitions**, (this includes **SWAP**).

## Using Bootable USB Drives and Linux OSs:

**Installation of Linux OSs** is faster and easier if done via a USB flash drive, or flash SD card, plus, these OSs can also be installed and run from such drives. There are 2 types of installation, one being **a bootable installation version**, ie, a copy of the Linux .iso copied to the flash drive with a USB image writer, and also, **installing a fully bootable normal non-installation OS**. The latter will need a larger flash drive, 16 Gb would be suitable for most purposes, depending on files, extra apps, etc, being incorporated. It is also even quicker to install a Linux OS this way, via an image on a flash drive, than via a disc drive. Also, the installed OS can also be transferred to an additional HDD, via a port or enclosure, by making a back-up disk clone, to be stored until needed. **Make a Store partition**, as well, after the OS installation is completed. (**Gparted**, et al, can be used to manipulate partition sizes on larger HDDs/SSDs.)

**Thus, there is no real need to clone or image the entire original drive**, being just as easy to install or clone the fully developed OS boot partition to a spare HDD, update, and then store for emergency. If required, this boot partition can then be cloned back to the original partition, given that you have all your files in the Store Partition, and backed-up elsewhere. This is useful when changing to an updated, or other OS, viz, just install the OS to a partition on a spare drive, fully developed with extra programs and updates, then clone, ad lib, to respective boot partitions on other target drives. **Just take care that the cloned partition is the same size or smaller than the target partition, if this is situated next to SWAP. GParted or Partition Magic**, etc, can be used for any partition resize alterations. **Plan for standard-size Boot partitions from the outset, if practicable..?** Similarly, you can just install, or clone, an OS to an existing OS Boot partition, if you have only one computer/laptop.

You can boot to the USB flash drive via the **F12 one-off boot order**, (**F9** for HP, plus there may be other exceptions), or, via **BIOS** boot settings, then install the OS from that USB flash drive, also, updates could be added concurrently if you are connected to wifi/cable (and, if modem drivers are present), the cable Internet will usually work anyway. But, do also **check updates post-install**, when all available drivers will be installed with any further updates, and then everything should work, wifi included. Likewise, the F12/F9/FX/Boot settings option is used whenever booting from an additional Linux OS, if not installed on the native HDD of a computer or laptop.

**However, note that laptops usually have no problem booting, and quickly, from USB drives, but, note also, that for PCs, heuristics will apply, OK!! But, USB booting is still useful for PCs in an emergency, if workable.**

Similarly, SD cards usually cannot be booted to, unless in an SD card holder. Only motherboards such as Raspberry Pi have this direct boot facility. Heuristics may apply, OK! For the future...? Up to motherboard and BIOS manufacturers to change matters, and, OS software will also need changes. Only fast SD cards should be used..? Meanwhile, OSs that run easily in RAM, such as Puppy, will prolong the life of USB and SD card drives, when these are used in lieu of conventional HDDs. **Note that Puppy is quite fast when run as a normal OS installation from an SD flash card, via a USB holder, but, Easy Peasy and Linux Mint are not so, being much larger OSs. Puppy is the best Linux OS bet for speed, as an .iso or fully installed, on any sort of drive, unless using one of the more expensive and faster photo cards for other larger OSs.**

Laptops can usually boot quickly from USBs, PCs are the opposite, even some cannot thus boot, so, there will need to be wholesale changes to Mbs, BIOS, OSs, etc, if this alternative booting option is to be universally optimised in the future. Note that an HDD in an enclosure will be recognised, and function the same as, a USB flash drive, as long as the OS has drivers that recognise the drive. SSDs and SSHDs should also be recognised, just as platter HDDs are recognised. **Recommended is that dual boots with other OSs, especially non-Linux, is best done with BIOS/CMOS boot choices. So, what use are all these extra hard drive notes..?** Well, just having a good spare bootable USB flash drive, or hard drive enclosure, with an installed Linux OS.iso as backup, or, a fully bootable Linux OS, makes sense in case of HDD failure, or, just for using on any available compatible system. It is also possible to have a USB Linux .iso installed in 'persistence' mode as well, to save settings, although it will start more slowly. **See also the 'persistence' note at [pendrivelinux.com](http://pendrivelinux.com)**

**A bootable Linux installation .iso version** can be copied to a USB flash drive, (or SD card if useable), in a just few minutes. **Linux Mint** has a native USB .iso installer, just copy the .iso to the flash drive using this, an 8 Gb minimum USB flash drive will be needed. **Puppy** likewise has a native .iso installer, just follow the instructions, and, do have the actual .iso file copied to an accessible folder. The 'persistence' factor in Puppy is a file-saving option that is offered, and, saving to file, with faster boot and shut-down, is better than saving to the drive. A 2Gb USB flash drive will suffice for a Puppy .iso.

**A normal bootable non-installation Linux OS** is installed quickly via a USB flash drive, and, even quicker than via an installation disc. (The disk space required will be indicated at the beginning of the installation.) An entire operational Linux OS, including updates, will be installed, either way, in **30-45 minutes**, and ready to go, and even with any the extra attention and updates needed, versus **6 hours or more** for a Microsoft OS, especially with those large updates, driver requirements, and extra OS tweaks, that will be needed for installation completion. **Use a 16 Bb flash drive for this purpose, tho, for ample space.**

**Note that, a MS OS.iso can install from a USB drive, or SD card, but, not run from either, as fully installed.**

**The latest version of Easeus Disk Clone enables** cloning between flash drives, SSDs, and platter drives, as of 2015.

**Linux Mint HDDs/SSDs, including as USB enclosures, should interchange between respective PCs or laptops without problems**, especially if the same type of CPU, and bit-rate capacity, are present, although other hardware differences can also affect function. Note that 32-bit OS will also boot on a 64-bit system, **but not vice-versa**. This HDD/SSD swapping, if compatible, is especially useful for updates, as usually, a Linux HDD/SSD can be booted from an enclosure, or by direct connection, to a system with Internet an connection, and then updated, after which you can reconnect it to the original, or, to a similarly-resourced system.

**The true test of compatibility of given hardware and Linux OS software is, of course, whether the Linux OS boot medium, as in OS disc or USB, will boot to a given system, so, be sure to test thus for compatibility, if test-swapping an Linux OS installed on an HDD is not satisfactory. If a straight swap will not work, when the OS disc does, then a fresh install will, with appropriate driver, et al, configuration. The most likely hardware clash would be with video cards, easy to deal with using a PC, anyway, if spares are handy. AGP cards will not work with Linux Mint, but will with Linux Lite, as another example of hardware and OS mix and match.**

**Heuristics will apply with drive swapping, as is so common with computer affairs in general..! Just make sure that system core specs are the same, or, similar at least. Note that installed Linux OSs can be swapped between PCs and laptops, ad lib, plus SSDs/HDDs connected directly or via enclosures, given hardware compatibility, as there are no validation requirements for free Open Source Linux OSs.**

## Computer Workshop Setup and Troubleshooting Procedures:

Firstly, effective computer and/or laptop troubleshooting requires a tidy, well-lit, spacious, dust-free and organised workbench, plus a tidy, patient, organised, and logical mind. A 'feel' for electronic components, and appropriate tool use, are also necessary, some parts are very fragile, some are easily damaged by EMF, all require optimum conditions for storage, assembly, and continued use. A good basic supply of 'known-goods' is important for component testing, plus appropriate tools, including voltmeter, USB socket tester and/or light, laser heat-sensor, propyl alcohol, PSU tester, 'magic' contact spray, mains test lights, mice, keyboard, monitor(s), converters, soft natural fibre brushes, air-blowing/compressing source, magnet rod, magnets from HDDs for tool attachment, etc. **Most importantly, be well-rested and relaxed, with a clear mind, before tackling computer troubleshooting.**

**Note-taking, photos, online or other info sources, plus proper record-keeping, are also necessary.** For the beginner, checklists and reminders will be especially useful, a felt pen will always be useful. Marking components or systems will avoid double handling, and, help with part storage and search, etc. Shelves with marked storage containers are a must. One good desk system, always online, will be useful for checking facts, specs, etc, via Google. An extra test system or 2 can be useful for parts and/or software testing. **Note also that proficiency with computer assembly, disassembly, and troubleshooting, should precede such involvement with laptops, notebooks, etc.**

**Test all variables sequentially, to be more precise,** and, be ruthless with separating good parts from bad, the proper recycle is recommended for faulty and unwanted parts. Without observing all of these listed basic requirements, troubleshooting efforts may well fail. **A professional will need to deal with less-than-adequate conditions if out on call,** but, ability to deal well with lesser conditions is made easier with properly learned work-habits, and an orderly mental approach. **Encourage all computer work to come to your own workshop,** if possible, where familiar tools and surroundings make all such work much easier.

**Breaking down computers and laptops for recycle and/or spare parts** requires a careful approach, just as with repair and assembly, and all other workshop conditions should be met, plus, components should be carefully handled, cleaned, tested, and properly stored, in anti static bags or cardboard containers. **EMF is a problem that increases with lessening humidity,** also beware of synthetic materials, especially carpets, that can generate static. Use a bracelet, and/or exercise careful grounding, plus, rubber, wood or cardboard bench-covers, are important. Paper is also EMF-neutral, good for wrapping if anti-static bags are not available, never use ordinary plastic wrapping. **Note that WD-40 and similar liquids should not be used inside any case,** unless/except a discrete amount is used for loosening stubborn fasteners. Wipe off any remaining traces to prevent dust entrapment. Monitor screens are best cleaned with a DAMP sponge and dilute detergent, then dried with a paper tissue. Citronella is useful for labels and stubborn marks on cases, again, damp rather than wet application is advised, to avoid drips.

**Screws should always be saved,** and small fittings, cables, etc, as well as representative sets of fans, largest and smallest are usually least common. Make sure all good fans are oiled, behind the label, with a drop or 2 of light oil, even if a small hole needs to be drilled for access, then seal with insulating tape. Brighter tape colours are recommended, and, can be well marked with a felt pen, unlike black tape. **Larger salvage objects saved will depend on space, market demand, and workshop specialisation.**

Best initial troubleshooting steps are just basic checking, ie, magic (contact) spray, unplug and replug, component isolation, plus JP1 reset and/or battery removal, to reset CMOS to default. **Always press Start after power and/or battery has been disconnected, to drain capacitors, before attempting any component replacement, and/or testing with known-goods.** If booting is problematical after initial steps, leave systems off overnight, before reboot, to totally drain any power, some RAM drains less quickly than others, and, errors held in live RAM confuse troubleshooting. **Alternatively, stored RAM substitution will achieve the same effect, if available.** **These initial troubleshooting steps should precede component swapping, and further disassembly.**

**Visual signs re troubleshooting** are important, so, apart from a quick blast of compressed air, if needed, do not clean cases or parts until first testing bootup, as there may be useful hints as to the life and treatment of any given system that is being tested. When air cleaning is performed, mild compressed air is best, and be sure to do so outdoors and well away from workbench area, plus, for personal health reasons. Do not breathe in the dust, this contains microparticles, and, the origins of this dust could be hazardous to human health. **Keep all such dust and debris well away from the tech area.** Take photos of damage and/or contamination signs, for records, and to show interested parties. Recommended also is that any system be positioned at least a meter from the floor, to lessen dust accumulation. Household pets are also a source of dust and debris, and should be kept away from booted systems and tech areas. **EMF attracts dust and debris, that is the electrical nature of booted PC, laptop, et al systems.**

**Best also to plug untested systems directly to mains**, and not running them thru a UPS, in case of any PSU problems. (A fuse problem is easily dealt with, a damaged UPS less so.) UPSs should be used with any important systems, (there are 3 main types), next are power conditioners, and lastly, power surge monitors on plug boards are the minimum requirement to protect systems. Laptops have their own UPS, if a battery is present, and still still capable of storing charge. System capacitors can cope with very minor power fluctuations only, and damage can be catastrophic, or incremental, with repeated events. Consult Google.

RAM, motherboards, HDDs may have useful visible signs of problems, **a loupe or magnifying glass can be useful**. Blown capacitors being one such example. Replacement of capacitors is difficult with new high-temperature solder, motherboard damage is the usual result. RAM and peripheral card contacts should be cleaned with 'magic' contact spray, including the actual bottom underside strip in case of contaminant bridging, using a cotton bud or similar, but, **leave no fibres afterward. Propyl alcohol** on a cotton-bud is recommended to properly clean optical drive lenses, leave to dry before re-testing.

**CPUs are manufactured at high temps**, with thermostatic regulation built in, and thus rarely give problems, unless physically mistreated, or, due to careless handling when not installed. Careful scrutiny of CPU sockets will show up damage to tiny pins. These pins, in the past, were on the CPU, and now are transferred to the socket, nevertheless, care is still needed, **a damaged CPU socket usually means motherboard replacement**. Always carefully remove the CPU to check socket condition, most likely any suspected damage is caused by amateur tampering. **Reseat CPUs with magic spray, and then use fresh silver heat paste to reseat the heat sink, never 'convenient' heat pads, or cheaper paste products. A bare minimum is all that is required, see Intel's own thermal paste application instructions and pics online.**

**Non-booting** can mean a **JP1 reset or battery removal** to rule out BIOS tampering, and, beeps usually mean RAM faults, run such as Memtest, remember that RAM channels can also develop faults, test accordingly with known-good RAM. Sequentially remove/test all peripherals if necessary, including cards, and any drives. Note that **Linux boot disks usually have SMART reading capabilities**, will display system info, and also, give the option to run **Memtest** at boot, given that video card and monitor are operational. **A Linux OS on an HDD/SSD will usually boot to any PC or laptop**, which makes system specs and performance checks much easier.

**Locked BIOS and/or HDDs/SSDs** are growing problems, discourage such password practices if possible, or, owners risk tossing out a motherboard and/or disk-drive when passwords are lost. These problems can be rectified, but expensive expert help is required, unless you wish to specialise in such repairs. Also, as part of trouble-shooting, encourage regular back-up, **'if not backed up 3 x, then not backed up at all'**, so, flash drive, storage partition, and offline drive, makes three, and then the Cloud makes a lucky fourth. There should always be a storage partition on an HDD/SSD as well as a boot partition, so that if the boot partition fails, data is still available, and the OS is more compactly confined, especially in the case of MS Win OSs. **Sympathy should not be wasted on those who will not back up, and that includes password loss.**

**HDD/SSD SMART is a useful indicator of HDD/SSD wear**, even if not always precise, and, this is most relevant for computers that do not run continuously. HDD platter errors may be virtual, caused by power fluctuations, improper shut-down, etc, and these can be corrected with HDAT2 or similar, tho actual physical damage cannot be thus repaired, and such HDDs should never be used for other than testing purposes, with appropriate partitioning to isolate bad sectors. **Note that SSD failure can be catastrophic**, so, SSDs are not advised for long-term data storage, **replace SSDs ASAP if SMART indicates any problems.**

**SMART-test at least weekly for drives over 3 years old**, especially if secondhand, and note that **HDDs and SSDs drive, in general, will fail early, usually within 3 months if faulty when new**, or, will thenceforth perform consistently when 'good', tho only if treated well. 5-6 years effective lifespan is quite possible for a well-treated drive that is regularly in use. SSDs are getting better, both in transistor manufacture, and in management software development, best used for boot drives tho, especially for their speed benefits. See Google in this regard, also re **SSD TRIM requirements**.

**Troubleshooting inspections** mean looking for damaged/dented cases, both for PCs and laptops et al, plus, dust, wear and tear marks, cracked screens, stains, spills, dirty fingermarks, dusty/dirty keyboards, smells, etc, and if booted, cluttered desktops and poorly responsive software. Note that faulty and/or over-full HDDs will also show these same symptoms, the 80% Full Rule still applies for boot drives. All this is typical of the adage that **when troubleshooting computer systems, one problem may be hiding behind another, especially when possible problem symptoms are similar**. There are all sorts of tips online re troubleshooting, incl. flow charts, forums, etc., tho usually, just a concise and lucid Google Search question will bring results. **Commonsense, and patience, will be the keys to successful online searches.**

**Older systems are useful for learning**, pulling multiple PCs and laptops apart will show recurring patterns of

wear, and also, older systems that have been stored in indifferent conditions will display interesting signs of deterioration. **Materials may break down with age, and corrosion WILL occur**, in fact, PCs and laptops are built to WORK, and this means moisture accumulation is mostly minimised if running regularly, even if not continuously.

**Moisture settling will lead to corrosion, shorting, heat accumulation, as air is seldom pure, dust particles may be soluble, and thus prove to be acid or alkaline. Airtight long-term storage is thus essential for any electronic parts or systems.** As well, when passing from cold to warm surroundings, passive acclimatisation may take hours, condensation being the problem, especially for platter HDDs. An already running and warmed-up system should make the transition quickly, especially if passing thru an intermediate zone, resting say 30 minutes or so.

**Note, in the case of older systems being cleaned and repaired**, that years of material stress due to thermal shock, plus general expansion and contraction, will mean that system components, especially the motherboard, will need to be handled carefully. The motherboard should not be flexed unduly, and also, be sure to just lightly wield a cleaning brush, blow out any dust from inside the case and heatsink, then try to boot, and, if successful, be content with that. Only replace the CPU heat paste if absolutely necessary, as extra flexing of the motherboard will be part of this process. **Contact spray and system replug are also advised**, though do so as carefully as possible.

**Long-term storage of computers and laptops:** Run the system for 30 mins or so, to drive off any residual moisture, preferably on a fine day, or in a warm room, then shrink-wrap, preferably, and **render the wrap as airtight as possible**. Laptops should have the battery removed, and be then stored in the same container, fully charged, separately wrapped to avoid knocks, accidental shorting, etc. Gel sachets enclosed would be an extra benefit. Similarly, warm a non-booting system, or parts, with a hair-dryer, in similar surroundings, before wrapping, as above.

**Language**, written or spoken, should be concise and to the point, as for any technical situation, special care is needed if there is any sort of personal language difficulty, or, expensive mishaps may result. **Record keeping should be concise, organised, and kept dated and sequential**, especially important when there is battery of systems to care for, so, routine maintenance, parts, and repairs, all should feature as part of the history of any given system, if at all important, even if secondhand.

**Never fix any sort of computer for friends, relatives, or idiots...**at least for idiots, only if done professionally, charging well for services rendered, and, for the others, well, make sure there is a fair quid pro quo agreed upon, that recompenses time, margin of skill, etc, however constituted. This will avoid the all-to-common problem of such skilled work just being taken for granted.

**Computer education** is necessary when The Market does not want educated consumers...and this should emphasise that temperature dust, excess heat, liquids, vibration, shock, static, and power anomalies, all will take their toll on systems, either instantly or incrementally. **SMART is especially useful if G-sensor stats can be read**, important for life span of HDDs, tho **having an SSD does not mean that other details of system care can be overlooked**, even if the shock hazard for platter HDDs is circumvented.

**Computer Software Maintenance:** MS Windows systems will always need extra cleaning and tweaking, and **Toolwiz, CrapCleaner, Auslogics Defrag, or similar, are recommended, Speedfan will show operating temps, and SMART. CrystalDisk Info and Victoria** are also useful for SMART. Carefully check program tweaks for best results. Turning off unneeded Win Services will also increase speed, consult Google, and proceed with care, and records. **Mac and Linux OSs are less likely to require cleaning and tweaking**, and, **Linux OSs installed on HDDs/SSDs can be plugged into any system for specs, testing stats**, performance, etc., as can bootable Linux OS discs. **Hiren's Boot CD** has many test programs that are worth investigating, even if just out of curiosity, and individual programs of interest for troubleshooting can be sourced separately.

**There are other electronic consumer items that require service and repair**, such as tablets, smartphones, etc, should you wish to specialise, and, in general, all the above principles of workshop mnagement, record-keeping and troubleshooting will still apply. Tiny parts and screws at assembly or disassembly should be best dealt with over a patch of light-coloured and well-lit natural short-fibre carpet, and, even by utilising a bench-apron such as watchmakers use, both help to prevent fretting over lost screws, and lost time. A magnet rod is very useful for pickups, tho, always best to prevent the problem of dropped parts in the first place.

### Three Golden Rules Of System Troubleshooting:

- 1) If there is more than one solution to a problem, utilise the lowest-tech first, and, one problem may hide behind another, but, act first on most recent changes.
- 2) Plus, if it is not broken, do not 'fix' it, and risk causing more problems..!
- 3) Also, perform consistent and orderly testing, one variable at a time, log your activities, and think calmly about what you are doing.

*So, assuming that the system has been running properly hitherto, and is protected by a mains power surge monitor and/or UPS, and a Telecom surge monitor:*

- 1) Replug everything, inside and outside the system, including mains and phone, if the Internet is being used, and include motherboard switch/light connectors, and Startup switch. Similarly, loose connections such as USB sockets or fan connectors that contact metal projections can cause problems, so make sure these are properly located. Test any new leads or connectors, these can be faulty, even when mass-produced. Ensure that all USB or similar secondary motherboard connections are plugged correctly. Check that the PSU switch is on, then attempt Restart.
- 2) Ensure at restart that the CPU fan runs, and, that drive lights show, plus, normal systems sounds ensue at Startup. Check by touch for any signs of overheating or unusual vibration.
- 3) If not successful, and, using known-good substitutes, check all drives and controllers, plus RAM and channels, for full functionality, noting that intermittent faults will/may not show in pre-Boot warnings. Also use CD/DVD-ROM and/or floppy-based testing programs if the system does boot.
- 4) Perform a JP1 reset, or, at least perform an ESCD reset. Replace the CMOS battery, if necessary, and reset the time and date in BIOS, and the Boot Order
- 5) Remove all plugged drives and plugged cards, as practicable, then re-add units individually with restarts. Adding or replacing parts to upgrade systems is best done after successfully migrating to a more modern case, to reduce the number of possibly fault-prone variables, including that of drivers..? Electrical contact spray on all physical connections...? Expansion cards should be situated either in their respective slots, or, in antistatic bags, do not place on or near any potential EMF source such as a monitor, PSU, or UPS during handling and/or system assembly.
- 6) Test the system with a bootable CD/DVD, and/or an HDD with Puppy Linux or Ubuntu O/S installed.
- 7) Ensure at restart that the CPU fan runs, and, that drive lights show, plus, normal systems sounds ensue at Startup. Check by touch for any signs of overheating or vibration.
- 8) Check for any hidden fuses in the system, eg, UPSs or PSUs can have fuses at the power switches, and, if blown fuses are found, check for reasons why they blew, or, just accept that age and constant use can weaken a fuse.
- 9) Leave the computer off for 30 mins or so, this will effectively remove any residual circuit EMF, and, drain power from the RAM. A cup of coffee at this time will be good for you as well. A JP1 reset or battery removal at this stage will also be beneficial, if not already performed. Leave overnight or, consider installing similar RAM, if available, then retest. Reconfigure the BIOS at next Startup.
- 10) **One Special Fourth Golden Rule of Faultfinding** is to periodically check all known-good components for their current integrity, then retest with these as installed system components once more, for more successful troubleshooting. *Quis Custodiet Ipsos Custodes, OK!*

The Last Resort for locating motherboard problems is to uninstall, and then check the case and baseboard for any loose screws or improperly located base contacts that may be causing shorts. Check the board itself, both sides, with a magnifying glass for any visible damage. Beyond step that lies known-good CPU testing. However, always consider that a major or minor system part fault can occur at any time, regardless of your current activities. Computer system parts eventually fail, one way or the other, and, that is a fact of machinery life, especially complex machines, down to the smallest fuse or diode. If something has failed at the time of reassembly, and this was not necessarily due to a handling mishap, you should accept that failure was imminent anyway, especially with an older system. **Better now, than when processing valuable data later! Time to**

**upgrade for motherboard and CPU, at least.**

***A final note about 'making do', notwithstanding the preceding system upgrade information:***

**Nofrillstech** has a much-treasured **500 Mhz Intel Coppermine CPU/256 Mb SDRAM Mini-ATX system** set up as a standby for reading papers, journals, and emails online if there is such a need, due to possible problems with larger and more modern systems, or, even made available as an occasional 'loan' computer for others in similar need. **On the twin cloned 4Gb HDDs is Puppy Linux.**

Furthermore, the **ex-circa-2001 Gateway**, utilising just the PSU and CPU fans for cooling, is quite sufficient for housing the system, with provision for 2 HDDs, one floppy, one multi-purpose CD/DVD, USB or similar, and, for adequate system temperature regulation. **This stalwart system remains on active Internet standby.** In addition, **older laptops** run Puppy very effectively, which also prolongs their useful lives, and, conserves \$\$\$ resources.

For data rescue, **Linux Mint and Puppy Linux** will both read **Windows files**, but, **do plug required USB drives before booting to the CD.** MiniPE, Puppy Linux and Parted Magic will also copy or image your drives or partitions to an external drive, especially useful for laptop drive backup where there is usually only one HDD present. **EaseusDiskClone(f)** is another boot alternative, and, being a dedicated cloning program, will use less resources, when and where this is important.

**Linux Mint XFCE(f)** loaded onto a spare HDD makes a very handy O/S standby, just plug into any modern Wintel system, and boot. **You can use Firefox and Thunderbird for Web and email access, and there are many other downloadable programs to choose from. Physical system care is still the same, but, Housekeeping and Security are not as important as with Microsoft's OSs.** (Note, however, that Open Source custom boot discs, including O/S discs, may not boot when extra or incompatible graphics/video cards are present.)

**For those who do not need MS O/Ss for email and online research**, consider installing **Puppy** on older laptops to prolong their useful life. The instructions for installing from Puppy's ISO CD are straightforward, and many programs such as for word-processing, email and web-browsing are included in the install, as is the case for **Mint. Puppy is quite effective as an O/S, yet the resource needs are modest, and, Puppy is seemingly untroubled by dual monitors. Puppy is also a handy all-systems O/S standby when installed on a spare HDD.**

Note that either of these installed Open Source O/Ss may be useful for boot-testing a system, beyond just using a bootable CD/DVD. **Open Source/Linux testing** programs could be also included in either installation for further system testing procedures. Certainly, both of these O/Ss are useful in an emergency for other reasons, as above. If you have spare HDDs under 20 Gb that are otherwise unused, just install these O/Ss from their downloadable ISOs when burnt onto a CD with an image-burning program. Not needing a DVD is an added bonus, and, makes for a smaller O/S installation as well. **Swappable HDDs with O/Ss that boot with any CPU are so adaptable..! Puppy can also boot from a USB drive.**

So, these particular examples of **computing, system testing, and Internet minimalism** are hereby proffered to **provide an extra dimension to any upgrade decision** you may be contemplating, and as to **why** you are doing it. Also, to emphasise that there always needs to be **hardware backup**, including, as in this case, a **spare system for Internet access**, if this is important to you. Thus, if you still want to upgrade and migrate a present system, bear in mind that a suitable older, and smaller, system will still have very important backup uses, and, **if all you want to do is read papers, journals, and email online, then 'going large,' system-wise or software-wise, is definitely not necessary for quality Internet access.**

Even easier, given a handy computer-access plug-in opportunity, you can nowadays do this all of this, as well as in lieu of even laptop use, by using a portable flash drive loaded with those handy Linux OSs especially when 'on the road,' and travelling light! All you need is another system to plug into, be it at a private home, in an Internet Café, or whatever.

**Bootable USB Drives:** Whole customised O/Ss can now be loaded onto USB external and large flash drives, given that the parent computer will boot to USB in BIOS, and, these MiniPE, BartPE and Vista/Win7PE, which can also be loaded to a flash drive for emergency HDD data access.

## **Uninterruptible Power Supplies, aka UPSs:**

**The importance of uninterruptible or standby power supplies for the smooth and trouble-free operation of computer systems, (and other sensitive electronic equipment), is paramount.** Not only is data preserved

from untimely deletion or corruption by power fluctuations and/or outages, but CPU and other transistors, and circuits, are also guarded against untimely death as a poor or inconstant electrical diet inevitably takes its toll.

**Even if there is no actual hardware or software damage or shut-down with a power disturbance, RAM performance may still be inhibited, which also jeopardises interim data integrity, and, current program performance integrity, plus any updates, defrags, installing of programs, or flashing of BIOS. An uninterruptible power supply draws directly from a charged battery, and a standby power supply, (less expensive), simply cuts in to draw from a charged battery, when mains power supplies falter, fluctuate, or fail. Line Boost is the intermediate specification, and, is recommended as a good balance between effectiveness, and, budgetary constraints. PSUs do have some resilience against power fluctuations, but this is limited, and they do fail more often than any other PC hardware component.**

**If you care about your own digital investment, and the data contained within it, invest in a UPS/SPS, the standard versions of which are not expensive, (usually they have lead-acid gel/AGM batteries, ie SLA or Sealed Lead-Acid Batteries, with low-maintenance lead-calcium plates), in return for what essential service they will provide; the first time your UPS/SPS 'cuts in' to maintain system function during a power disturbance, the investment is definitely realised. Nofrillstech will not boot-up any computer without filtering power via a powerboard, and then utilising further power filtering via an ancillary UPS/SPS, to guard both systems and data. For battery details see Car and Deep Cycle Battery FAQ/7.1, et passim.**

**Clean power outages may not harm the computer, although data may not be so lucky, but, mains power can surge, brownout, fluctuate, or cut out, while your electronic system needs constant voltage and cycles to operate smoothly, and, to ensure optimum health and useful life. The mains power is AC, (alternating/cycling current), this is converted to DC, (direct current) by the UPS/SPS to charge the battery, then inverted to AC again for use by the system power supply unit, PSU, which then converts the power again to DC in the respective voltages required by the motherboard and drives, etc. The economy SPS is usually a standby unit, (as opposed to the more expensive inline type), whose electronics is fast enough to sense a power disturbance, and subsequently cuts in between Hertz cycles(!), to ensure that power flow to the system is continuous. The always-stable direct current that ultimately reaches your motherboard and peripherals in required voltages is required for smooth electronic function. Note that 'power conditioners' are no real substitute for a matched UPS/SPS.**

An in-line powerboard, or power conditioner, sophisticated or otherwise, is still important to guard the overall function of inter-connected electrical computer devices, and must also have a modern surge protector, (not just a circuit breaker), to be fully effective, as well as phone line filter, regardless of what the UPS/SPS may also provide. **This ensures that the UPS/SPS is always preserved and protected, as well as all the other peripherals.** Your phone line should also have a plasma fuse outside the building, and you may need to consult your utility provider to obtain installation. Only a plasma fuse has any hope of containing a damaging surge down your phone line.

Your UPS specifications should also exceed expected loads, so do your sums. To test a UPS/SPS, connect a known-good PSU, then, test that with a standard PSU tester, as well as with momentary disconnection from the mains supply. **Irrespective of testing methods, there should be a draw, and no voltage fluctuation. If the results indicate less than optimum performance, or failure, then repair or replace the UPS. As always, faultfinding should be a systematic search, and, power problems that may involve a UPS are no exception. UPS/SPSs should also be set to the correct mains voltage, like PSUs.** Do not connect laser printers or other high initial power draw units to UPS/SPSs.

Remember always, that without a UPS/SPS, any software or hardware problems, **with no apparent explanation as to cause, are most probably due to power fluctuation, and then there is that consequent slow and cumulative CPU transistor death, if not actual catastrophic failure, as well as probable RAM damage. Smoother system operation is also immediately noticeable with UPS/SPS operation, and this includes monitors if the UPS/SPS is large enough to accommodate them on the circuit as well. Note that wattage should be read as 60% VA (Volts/Amps), as applicable.**

Once again, do not use electrical equipment, especially electronic, and/or phones and modems, during thunderstorms or other wild weather, if this can possibly be avoided, so unplug from power and phone lines completely. Copper lines for power and phone use are subject to inductive accumulation of charge during electrical atmospheric disturbance; 160 km<sup>2</sup> is a minimum buffer zone, and there is no certainly safety in urban numbers, with extra copper cable present to aid inductive charge accumulation and transfer! Your own safety is also at stake!

Connection and installation of a programmed UPS/SPS is not difficult via either serial, or increasingly, USB ports; in general, just set up as per the instructions, though note that usually there is an 8-hour battery charging period before standard system usage begins. All that means is, do not plug in any potential loads during the initial

charging period. **Nofrillstech** has found that it is worthwhile to check the **UPS/SPS** manufacturers' websites for updated software, which should contain necessary drivers as well as **GUI** programs.

**Windows** has an APC, and, a generic UPS/SPS program, plus, there is another **generic UPS/SPS program**, Winpower, which you could try, if you have difficulties with finding an original, and **not-quite-recent**, dedicated UPS/SPS program and its required drivers. **Be sure to download and read the Winpower Quick Start Guide** after you download the program, plus, after the downloaded program is unpacked, you can also find the **Setup Icon** in the **Program Folder** of the relevant O/S. You will need a relevant **UPS/SPS serial number** to open and run the **Winpower GUI** program, however.

One O/S Setup caution: **when installing or upgrading O/S software, always disconnect the UPS/SPS:system interface cable, if in use, as this may cause software conflicts. Reconnect/reinstall the UPS/SPS after the O/S installation or upgrade is complete.**

If you want **regulated power shutdown**, this can, of course, be set up via the **GUI** program, but if preferred, **the UPS/SPS can be run just as effectively without reference to the software**, and can just sit and hum along and do its work **if you are always close by** to make a decision of normal shutdown, if an outage is sufficiently prolonged to warrant this. If you have a separate desk light on mains power, even if you cannot hear the UPS/SPS click-in, then you will be made aware of a power fluctuation incident when this occurs.

**UPS/SPSs can be equally effective, and more budget-priced, if they support only system cases and external modems**, and, even if the **GUI** program is not utilised, this will ensure **>30 minutes**, (depending on actual battery capacity, naturally, plus your correct sums), to either ride out a power problem, and/or time to quickly connect a monitor to the **UPS/SPS circuit** to achieve a normal shut-down if this is required. This time lag is especially useful if you are periodically away from your computer, and, **if you have backed up before you left**, then only a **Folder Scan** ensues at re-boot, **even if you do not get back in time** for a conventional shut-down. The main point being, whatever else happens, the system itself is saved, and all of your current, (backed-up!), data.

The **UPS/SPS** may also be required to support the system for sufficient time to cover the lag before a **supplemental power generating system** is enabled, this certainly would be a factor in maintaining digital integrity of **essential or medical services**, businesses, public service administration, and etc. While the supplemental generation is functioning, the **UPS/SPS** would again continue to operate as power filter and battery standby once more. **Nofrillstech has lost count of the times, over the years since Home SPS use began, in towns and cities as well as rural districts, when the installed SPS has literally saved the day, both for system and operator.** To hear that brisk, reassuring click even as the desk light falters, (and the monitor, if on the filtered mains circuit), while the computer never misses a beat, **is such a relief, and believe it, OK!**

**Defrag, cloning, or BIOS upgrade**, are the times of maximum system vulnerability if mains power fluctuates, **as data lost then may never be able to be replaced**, even with O/S or other program repair, and/or there may be HDD or other 'collateral damage', with the inevitable full erase, partition, reformat, and complete reinstall, being needed to restore both functional and data integrity, whether any consequent physical repair is needed or not. **What is \$150 or so, paid one-off for at least an SPS, if not a UPS, and \$35 minimum every 3-4 years for battery replacement, if that sort of needless chore can be averted?**

**Nofrillstech** uses a Web interface computer system, plus work computer system when necessary, both being operated simultaneously on the same **UPS/SPS**. Each circuit is also power and phone double-filtered, including the **UPS/SPS** circuits. **Whilst normally running systems and modems only via the UPS/SPS power**, monitor plugs are marked for quick CRT transfer to the UPS/SPS circuit if ever required. **Most mains power problems are 95% transitory, and/or of less than 5 minutes** duration, but knowing you have extended shut-down time while temporarily absent from the computer is also of great comfort! **So, with this method, you can concurrently run two, or more, computer systems and modems on the one conventional home UPS/SPS of sufficient capacity, with peripherals for each on separate filtered power boards and phone line(s).** Flat-screen monitors use less power than CRTs, so, running **them** from a UPS/SPS full time is reasonable, but, still do the sums required to ascertain the running wattage load versus the UPS/SPS wattage rating.

Note that VA = Watts x 1.6, or, Amps x Mains, all summed, when calculating UPS/SPS needs. **Note that computers have a safe Power/Loss Factor of 60%.** (See Troubleshooting, Maintaining and Repairing PCs, References, especially the accompanying standard **Runtime/Load Table.**) The Power Wattage Calculator **gives good results, though should an on-board video card be included?** Also, note that **not all full draws may be present, especially in hibernation, or, are all concurrent when in use.** Working wattage values should thus be read as **2/3 of the total VA calculation.** Note that, in regard to battery amp-hour ratings, conventional UPS/SPSs will usually protect 25% of their stored charge. Always test units, and their chargers, using known-good batteries, **as UPS/SPSs will not charge defunct batteries, only batteries within acceptable 'health' limits.**

**An ad hoc UPS/SPS** could also be a solar battery, or similar, such as a suitable conventional lead-acid AGM/Gel/VRLA standby-battery with an appropriate inverter, although that does mean matching voltage type as well as suitable wattage capacity. As well, this basic standby battery could still be on a mains supply charger while you work when used with a matched inverter, this would also suit financial budgeting, and the battery is easily replaced as required. **Most importantly, during this ad hoc 'UPS/SPS' usage, an ultimately smooth flow of DC system power is assured where this is needed most, within the computer system.** Note that a software interface program is really only necessary for always-on or unattended systems. Opinion seems to be divided re using a surge monitor on the mains plug, ahead of a plugged-in UPS, however, Nofrillstech had had no problems over 20 years, living with indifferent mains power, and with frequent UPS cut-ins.

**Your computer will also require this system of power transfer via a UPS/SPS, of whatever form, if independent and steady non-mains current is not available,** such as from a mechanical generator, so testing is advised before operation if using a power supply that may not deliver optimal current for electronic well-being. **Laptops** have their own UPS/SPS, of course, but be very careful to match their mains supply carefully, (and phone lines), especially when travelling. **Utilising the conventional interface program, and either serial or USB connections,** is a matter of personal choice, but certainly advisable if a computer runs autonomously, or unattended, for any length of time, and this would apply especially for **businesses or utility monitoring.** **However,** what is important is **how much run time it will deliver when the main supply fails, noting that the unit will protect at least 25% of its charge prior to closing down.**

HWMonitor, SpeedFan(f), CPUCool(s), or Sensors View(\$), (using MS OSs), **show PSU voltages in real time,** so, if you have an intermittent computer power supply problem that is not apparently attributable to mains supply or to the **UPS/SPS,** if present, then check these readings against system specifications; eg, voltages may appear as 1.54, 3.3, 5, and 12, or, similar readings that are both very close to prescribed standards, and most importantly, steady. **For Linux PC systems with lm\_sensors installed, run 'sensors' command. Programs such as this are recommended to be installed in PCs, Macs, laptops, or any other computer system where such readings can be made, especially given that PSU failure is the most common major computer component malfunction. PSU voltage integrity can also be measured by a voltmeter while systems operate, if you have the skills required. An electronic PSU tester is strongly recommended.**

Be sure to test any unknown and previously used PSUs directly on the mains, with a load such as a test motherboard or system, or, an electronic PSU tester, **before plugging into a computer and UPS/SPS, as any internal short in the PSU will cause damage to the UPS/SPS, from blowing a fuse to something much worse, that may result in costly repairs. Burnt odour and fan irregularities, such stiffness or resistance when revolving, are also pre-test indicators that a PSU may be faulty, thus the unit should be disposed of, and replaced by a new one of good quality, before any further operations. If in doubt, buy a new one; PSUs are mass-produced units, and priced accordingly, including for better quality units. Look for o/off switch, separate fan grills, and appreciable weight that indicates quality.**

**Set PSU mains voltages correctly, 120 or 240 volts, and do ensure that replacement PSUs have correct voltages and connector wiring and plugs for the motherboard,** most important for non-standard older systems, eg, Dell and Compaq. Modern ATX power supplies may also have a missing lead for a voltage, (-5v for ISA), that is no longer required by modern motherboards.

**Of course, without installed batteries, laptops are susceptible to power fluctuations just as unprotected desktop PCs are,** plus, both thus need overall surge protection anyway, and for their peripherals, as well as that all-important uninterrupted system power supply. **Remove battery packs if using AC mains power for extended periods.** RTFM re batteries, OK! (See **Upgrading and Repairing Laptops,** and, for world travellers, **Eaton Powerware posts world main grid voltages.**)

**Finally, all of your computer and peripheral systems must be running on 3-core and properly-earthed power leads, whether you have power filters or not, and this is also for your own safety. Your computer-related systems should all be on the same dedicated circuit, and, not shared with any heavy loads; plus, if necessary, get your dwelling circuits checked if you suspect poor earthing due to faulty or incorrect wiring. This can be done with a just circuit tester, but you must know what you are doing, of course, electricity being what it is, so, all you do-it-yourselfers, preferably CONSULT about mains power circuit integrity, OK!**

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