

# Troubleshooting

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## 10 Steps to Finding and Fixing Technical Issues

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# 1. Be prepared (be a Boy Scout)

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## Knowledge

- Know how Linux and its services log information
- Know how to use your tools (of all kinds)
- Know your own limitations

## 1.1 Tools

## 1.2 Information

## 1.3 Connectivity

## 1.4 Data Storage

## 1.5 Spare Parts

## 1.6 Personal Comfort Items

# 1.1 Tools

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## □ Software

- LiveCDs are wonderful things:
  - Your usual distro of choice
  - System Rescue CD <http://www.sysresccd.org>
  - Imaging software (G4U, Clonezilla)
- Ultimate Boot CD (hardware diagnostics) <http://www.ultimatebootcd.com/>
- Be prepared to handle 64bit and 32bit systems
- A bootable USB key (or a few of them!)
- If you are old-fashioned: a bootable floppy, tomsrtbt
- Use the command line tools that already exist:
  - top, ps, netstat, vmstat, iostat, lsof, find, grep, nc, dd, tcpdump, ...

# 1.2 More Tools

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## Hardware

- Tools to disassemble a PC/other hardware
- Flashlight
- Compressed air
- Roll of shop towel (for cleaning systems, and you!)
- Keys (physical keys to gain access to premises, open cabinets, etc.)
- Network cable tester (cheapie, not a Fluke \$x000 one!)
- PC power supply tester
- AC power tester
  
- Optional Extras to Consider
  - Extension cord (long beefy one, short small one)
  - Power strip (surge protected)
  - VGA, USB and PS/2 extenders
  - Multimeter??
  - USB LED light on gooseneck
  - Digital camera (screenshots, photos of cabling, etc)
  - Multitool (for cutting things, and emergencies)

# 1.3 Even more Tools

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## □ Information

- Pen and paper
- Paperwork re. this site/customer/system config
  - May include usernames/passwords/alarm codes...
- Who to call (boss, experts, vendors, spouse, ...)
- System documentation (paper, CDs, URLs to vendor site)
- Books and reference materials?

## □ Connectivity

- Phone - charged and working cellphone (charger too?)
  - Charger? Earpiece?
- Data - 3G card? Wifi card?
  - Network cable
  - Netbook or laptop?
  - USB cables - different connectors!
  - Serial cables and adaptors (if you still deal with this)

# 1.4 Yet More Tools

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## □ Data Storage (for emergency backups)

- Writable CDs/DVDs
- Spare USB key
- Maybe a USB/eSATA external hard drive

## □ Spare Hardware

- You know what commonly breaks on the systems you work on
  - Fans
  - Power supply
  - DVD burner
- Networking gear
  - Switch (small 5 or 8 port is fine)
  - Router
  - USB wifi adapter
  - USB NIC
  - PCI NIC (becoming less common)
- Keyboard and Mouse (PS/2 and USB)

# 1.5 The last set of tools!

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- Personal Comfort
  - Food, Water, Clothing
  - Medicines, Cash
  
- Vehicle:
  - Gas, Water, Oil
  - Spare Tire, Toolkit
  - First Aid Kit

## 2. First, do no harm (Be a Doctor)

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- Make backups - because the value is in the data
  - Backing up from a rescue CD
  - Backing up over the network
  - Verify your backups!
  
- Document the current state
  - Connections, location, lights, switch states, ...
  - Hardware configuration, OS version, application version
  - Use paper, or a text file on an independent machine

# 3. Get full description (be a counsellor)

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## □ Who

- (is the reporter? is the owner? is affected?)

## □ Where

- (are the affected people and systems?)

## □ What

- (parts of the system/network/business are affected?)
- (What has been done already to troubleshoot the issue?)
- (What exactly happens?)
- (What does the reporter think should happen?)

# 3.1 Get more description

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## □ When

- (did this issue start?)
- (and what else happened around that time?)
  
- (by when do we absolutely need a working system?)
- (Until when will a workaround/kludge/manual approach be OK?)

## □ How

- (can the problem be duplicated?)
- (and is it always reproducible?)

## □ Why

- (does the reporter think this issue happened?) - if appropriate

## 4. Reproduce the issue

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- Try it yourself
- Ask the reporter to reproduce it
- If appropriate, ask whoever first noticed it to reproduce it
- Correct your "How" description to reflect reality
- Document specific error messages/log entries/indicators
- Dealing with intermittent issues

# 5. Preventive Maintenance

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- Do only maintenance that is:
  - quick
  - safe
  - likely to fix the issue
  
- If the hardware is dirty/dusty, consider cleaning it
- If it is noisy, replace noisy fans(s) if practical
- If it seems too hot, find out why, and cool it down
- If a software subsystem is far behind on updates,
  - think about updating
  - (be *\*sure\** you have good backups first)

## 6. Narrow it down (box it in)

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- My PC has 5000+ executables and 3300+ config files...
- Divide and conquer!
- Tests divide the problem space, leaving smaller
  - sets of things which might be the cause
- Binary search (or close to it) is highly efficient
- Googling for error messages can help decide what tests to use
  - Do not follow blindly the ideas you see "out there"!

# 6.1 Thoughts on narrowing it down

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## Test carefully, at *\*every\** step

- Keep checking for error messages and log file entries
- Write down your tests and their results (legibly!)
- If in doubt, simplify rather than add complexity
- Increase verbosity (debug logging, for example)
  - Best done when you know the subsystem or application
- To find a performance bottleneck:
  - Get a repeatable baseline first
  - Slow down the suspected bottleneck component
  - Speeding it up may be hard or expensive
- Don't let the problem get "outside your box"
- Don't "know that it must be X, or can't be Y..." - test!

# 7. Fix or replace what broke (Be Mr. Fixit, at last!)

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- Follow safety guidelines
  - (unplug stuff before opening it!)
  
- PC hardware replacement is usually simple
  - Remember/document how it came apart
  - Use that info to put it back together again
  - Sometimes opening the PC case is the only hard part!
  
- Software config changes are often not so simple
  - Backup the original files!
  - Use package management tools
  - Use version control if appropriate

## 8. Is it really gone? (Be a QA Dept)

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- Test it yourself
- Have the reporter test it, and agree it is gone
- Try hard to make it happen. Multiple times.
- Reboot and retest, if appropriate.
- If it was intermittent:
  - Ask the reporter to contact you if it returns
  - Express your willingness to return
  - Set expectations.
- Instruct and educate -- avoid "free return visits"!
- If appropriate, have someone sign something saying you fixed it

## 9. Take pride in your work (Be happy!)

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- Troubleshooting is stressful, savour this moment!
- Take appropriate credit - be a hero for a minute
- Document the solution for your friends/colleagues
  - Write it down now, while the details are still in your head

# 10. Prevent recurrence (Learn your lessons)

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- Determine how this could/should have been prevented
- Take steps to ensure it won't happen again
- Apply lessons learned to other systems/sites/customers
- How could you have arrived at this result faster?
- Could someone have been alerted automatically?

# Summary

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- You can systematically troubleshoot any technical issue
- It takes preparation and careful systematic testing
- Any questions?
- Are there specific tools or ideas you would like demonstrated?