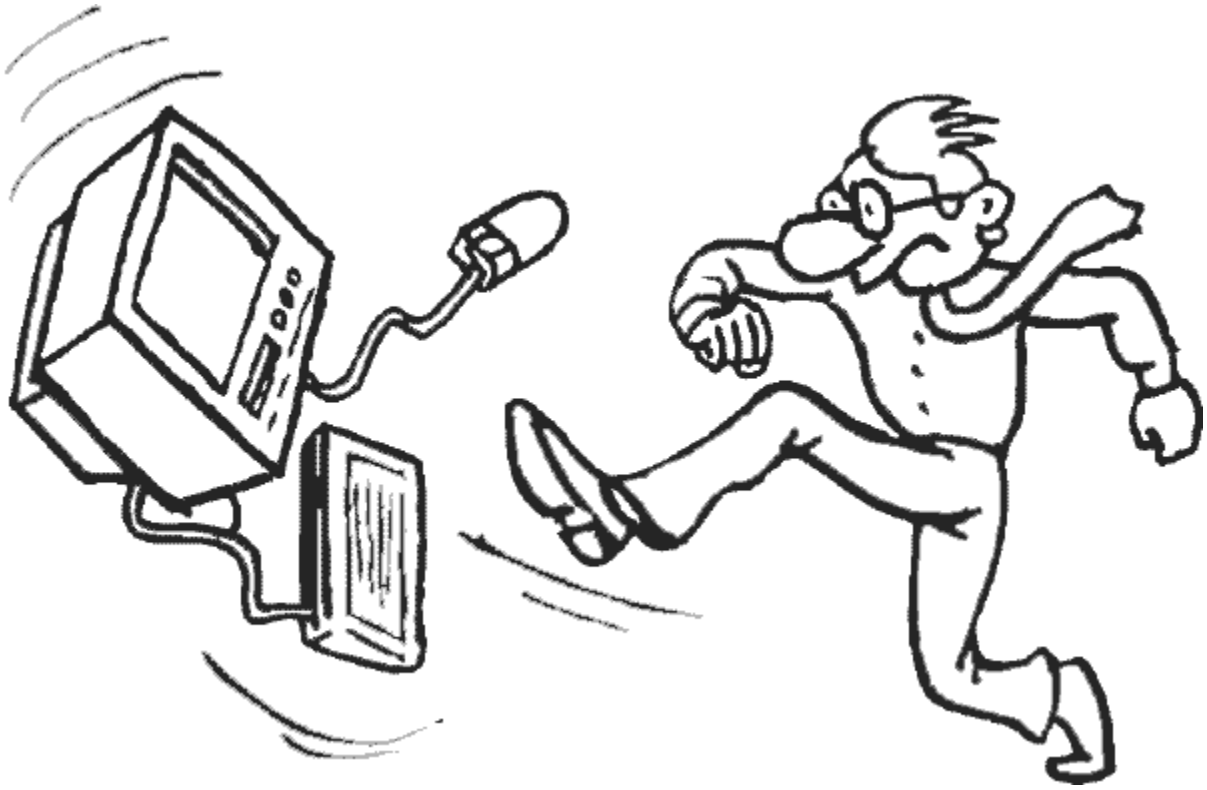
Computer & Network

Troubleshooting



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Computer & Network

Troubleshooting

- Do the easy stuff first
- Do one test at a time
- Keep an open mind
    - Don't jump to early conclusions or start guessing. Assess the situation objectively.
- Be methodical
    - Whether it's a machine that won't boot, a large network issue, or most other situations you may find yourself in, the process is going to be the same, only the details vary.
- Start at the 1/2 way point if there is no indication of where the fault may be.
- Only do things that will give useful results (either it is the problem or it is not the problem)
    - Take the suspect part to a known good environment

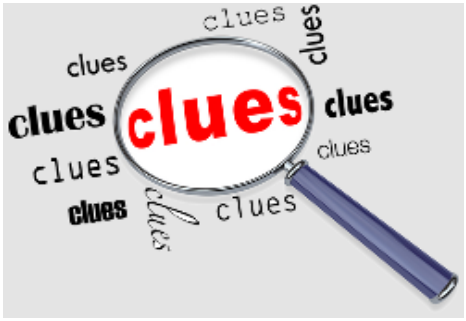
!! The exception: Do not test power supplies this way, you may fry a good board !!

    - Do not put a known good component into a broken environment, it is inconclusive.
- Put the tested-good parts back or replace faulty parts, then test again. There may be multiple issues.

Methodical Considerations

Four things to consider:

1. what is actually supposed to happen
2. what is working
3. what is not working
4. what could stop it from working



The answers to these four questions can save a lot of time which may otherwise be spent sporadically trying different things which are of no consequence.

Without the knowledge or without the needed supplies to fix a problem you should still be able to locate the cause.

Use a troubleshooting table when working on complex issues.

Device	Status	Impacts	Impacted By	Actions
router #1	working from office side	network	cables, routers	none
router #2	no access from office	network	cables, routers	test from server side
web server	unknown	none	network	none
cabling	unknown	network	all	test

The Right Attitude

- Always approach a problem with a positive attitude. With a little knowledge and a solid process you will resolve the issue. Feeling confident can make it easier to suggest ideas when working on a team.
- Don't get overwhelmed by complex or multiple issues, start with the simple things, and resolve one issue at a time.
- If you get stuck on a problem and start to get frazzled, take a break. Go for a short walk, think about other things, and forget about the problem for a while. When you return, relaxed and with a clear head, you may just see something you had overlooked.
- Try not to get consumed by the pressure to resolve an issue. Rushing leads to mistakes and oversights which means it usually takes longer to find and fix the problem.
- Always be honest when reporting progress. If you have definitely identified the cause then give realistic time lines to fix things, but if you have not figure it out yet, then say so.
- Always push yourself to find a solution, but if you've exhausted all your ideas, and need help from someone with more expertise, it okay to ask for it.

What is the Actual Problem?

Although there is no specific set of actions that would solve every problem, there are general approaches and techniques you can use when dealing with any problem from computers to cars to almost anything else. You will of course need specific knowledge of what you are working on.

First and foremost, take the time to understand what the problem actually is. Problem descriptions can be vague or misleading. If you are not certain you understand the reported issue, try repeating it back to the person reporting it but in your own words. You can't solve the problem if you don't understand what is wrong.

“I can't print my document”

What does that mean?

- they can't start their computer
- they can't open the document
- there is no print menu
- they're not on the network
- or maybe the printer is out of paper

Personal Safety

There are a few basic precautions that can safeguard you when working on a computer.

Keep Yourself Safe:

- Avoid touching *capacitors*. These are electrical parts, usually cylindrical or wafer shaped, which build up and store electricity. Aside from inside the power supply, capacitors on computers are not of consequence but larger capacitors like ones used in laser printers can hold a dangerous amount electrical energy.
- Avoid touching the *heat transfer grease* between the CPU and heat sink.
- Generally, don't touch parts if you are unsure of the consequences.
- Computer cases and brackets often have very *sharp edges*. These can cut you when attempting to add or remove components in tight quarters.
- Staying safe while working on a standard computer requires only common sense, no special safety training.

Computer Safety

The biggest danger to computer components is ESD or ElectroStatic Discharge which may do immediate damage or may not become apparent for some time. The next biggest issue is corrosion of metal contacts which is quite slow to impact anything but just as damaging.

Avoiding ESD:

- Wear a anti-static strap whenever possible. These are not always feasible and not always the first choice for ESD protection because being tethered to the computer can feel quite cumbersome.
- When passing parts to or from another person, always touch the person before touching the part. You may get strange looks but you won't fry any components.
- Leaving the power cord plugged in (computer powered off) will provide a static drain and is therefore common practice, however you should not rely on this method as it does not balance the static between you and the components.
- Regardless of other preventative steps, try to stay in contact with the metal computer case, and always touch it before touching any internal components.

Computer Safety (continued)

- RAM that has been damaged by static electricity can take weeks to show any signs of a problem, depending on system use and memory pages utilized.

Avoid Touching Metal Contacts:

- The second biggest concern is touching the metal contacts where components interconnect. The oil left from your skin can slowly corrode the contacts, ruining the component, and possibly causing additional residual damage to the motherboard, electrical paths or other components.

Pinpointing the Real Issue

Four aspects to pinpoint the issue:

symptom: what is reported by the impacted user.

problem: the actual issue. This is not the cause but a better idea of what is failing from the users perspective. Usually determined by further talking to the user, reviewing any error messages, and possibly having the user run some tests on their system, like sending mail or trying a web site.

impacted chain: this is determined by thinking through the communication sequence and identifying each component along the way.

cause: to narrow down the cause we first look at what is easy to test, then we try to divide the problem into a smaller areas starting at half way along the chain, then we test individual items.

Pinpointing Example

symptom: users cannot get email

problem: email client times out when connecting to the remote email server (mail box)

impacted chain: email client, computer/network card, cable, local network, local gateway router, external network, remote gateway/network, cable, email server, email box

cause: at this point we know it is going to be something in the impacted chain that is not working

1. Easy Stuff First: check if other users can get email
    - if Yes: Problem is likely on users machine (but it is possible the user could not check email because of an issue with their account on the remote email server)
    - if Yes or No: can user access devices like network printers. (if they can then the problem is not at the users computer or the local network).
2. Lets say the problem is not at the users end. Lets check other access from the users end.
    - check if they access a remote web site
    - if Yes: the problem is further out on the network, likely at the far end where the email server is

Pinpointing Example (continued)

    - if No: it could be a bad switch port or something wrong with their IP assignment (this may apply if they use NetBios or Apple Talk internally)
- Now we want to run a command like traceroute to see how far we can get to the email server.
- if it gets through then the issue is likely at the mail server and possibly related to a user account
- if it fails along the way then it is likely at the point of failure, but to be sure, if we have access, then run the same test but from the email servers network to see if it fails at the same router. This can require a network administrators assistance or knowledge of the network topology including router details.

Simple Troubleshooting Tests

Computer appears frozen or unresponsive

- Use the keyboard to see if the system is just very slow or if it is not working at all.

1. take note if the Number Lock Light is lit (or the Cap Lock light)
2. press and release the Num Lock key (Once Only!)
3. wait a minute to see if the Number Lock Light changes

- When you press the num-lock or cap-lock keys the keyboard does not turn on the light. It sends a signal to the computer indicating to use the number pad keys or capital letters. To verify the action the computer sends back a signal which activates the light.

A real quick email test

- Send an email to your regular email address, then check to see if it arrived.
- Sending an email is done by connecting to a server set to accept incoming mail.
- Receiving email is done by connecting to the mail server which holds your mailbox file and checking for new messages.

Simple Troubleshooting Tests (continued)

- Sending and receiving are unrelated, so sending to yourself is a valid test. It's like putting a letter to yourself into a mailbox. The source of the letter is irrelevant.
- There could still be issues for mail connecting from outside your ISP's network so this is more of a “is my end working“ test.

Can't get a web page to load?

- There are many possible reasons ranging from the web site is down to your computer is off the network.
- The exact method used to determine the issue will depend on what tools you have on your computer. Also these steps presume only one computer to test with.
- Generally we see if the the problem is local or remote, which splits the problem in half, then we investigate the components involved, gathering information to guide us as we proceed.

1. try another unrelated web site (if it's okay then the issue is likely at the web site end)
2. ensure the system is active on the local network by connecting to any other internal systems (PC, printer, server, etc)
3. unless the URL is known to be valid, you may also try with or without “www.” as inclusion or exclution of www may be impacted by one or both of:
    - poorly configured in DNS
    - poorly configured web server
4. use 'wget' (linux) to display any errors when trying the broken site (if it cannot connect it will give some indication of where it failed)

   (command and output on next page)

Can't get a web page to load? (continued)

wget www.badexample.com

--2015-02-22 16:26:21-- http://www.badexample.com/

Resolving www.badexample.com (www.badexample.com)... failed: Name or service not known.

wget: unable to resolve host address 'www.badexample.com'

- Above, the web site name cannot be resolved, so if the name is valid there is a DNS issue

5. Here is an example of wget indicating the web site is accessible but the page does not exist:

wget www.example.com/nope.htm

--2015-02-24 14:48:43-- http://www.example.com/nope.htm

Resolving www.example.com (www.example.com)... 93.184.216.34, 2606:2800:220:1:248:1893:25c8:1946

Connecting to www.example.com (www.example.com)|93.184.216.34|:80... connected.

HTTP request sent, awaiting response... 404 Not Found

2015-02-24 14:48:43 ERROR 404: Not Found.

- Above, wget resolved the name, connected to the server, and finally received a 404 error

Can't get a web page to load? (continued)

6. 'ping' the site. If ping times out or otherwise fails it may give some indications why
    - could it resolve the host name which will indicate whether DNS is working or not, or possibly a bad dns entry
    - it may show sporadic times which indicate either a network issue or possibly, but less likely, a very busy web server
7. try the 'route' command. If it takes a long time try 'route -n' (no dns lookup) to check that your local gateway (router) is working.
    - 'route -n' should return two lines, one for your local network and one for the outside (some data not shown).

      Destination *Gateway*

      0.0.0.0 *192.168.1.1*

      192.168.1.0 *0.0.0.0*
    - above, inside a home network of 192.168.1.0/24 we're seeing:
        - the first line is a gateway/router address of 192.168.1.1 pointing to 0.0.0.0 (represents everywhere else) so we can get to the network edge
        - if the results do not show a 'Gateway' entry for the 0.0.0.0 network then the problem is internal (including the gateway), on the network or local computer.
8. ping the local gateway router. If this fails there is a local issue, or if you have a single connection to your ISP then the ISP is your gateway and may be having issues.

Can't get a web page to load? (continued)

9. try to ping or do a dns lookup ('dig' in Linux) on the IP of the first DNS server listed in your local settings (/etc/resolv.conf in Linux)

10. If that fails, try the next DNS server to see if you can access it.

11. if multiple dns servers fail, there are two likely issues:

    - your access to the Internet is not working
    - if you can access your local gateway but not your ISP's local servers then the issue is in the ISP's network.

- if all DNS servers are on an ISP's internal network their network may be broken.
- try a look-up using a public DNS server such as google (8.8.8.8 or 8.8.4.4)

12. at this point, presuming it was not a local issue and presuming it was not any of the DNS related issues, we can focus on the journey to the web sites server and on that server itself. These aspects may not be within our control but any additional information we can collect and pass on may help resolve the problem.

Can't get a web page to load? (continued)

13. traceroute is the best next tool to use because it gives us a clear indication of what router or server the communication fails at, but rarely will it tell us why.

traceroute -T -p 80 www.example.com

traceroute to www.example.com (93.184.216.34), 30 hops max, 60 byte packets

1 192.168.1.1 (192.168.1.1) 8.855 ms 8.478 ms 8.093 ms

2 10.11.136.1 (10.11.136.1) 26.390 ms 26.118 ms 24.632 ms

3 h64-251-80-225.bigpipeinc.com (64.251.80.225) 53.303 ms 52.977 ms 53.555 ms

4 rc1st-tge0-0-0-1.vc.shawcable.net (66.163.68.221) 49.398 ms 49.106 ms 48.832 ms

5 66.163.74.114 (66.163.74.114) 46.387 ms 66.163.74.94 (66.163.74.94) 46.086 ms 66.163.74.106 (66.163.74.106) 45.788 ms

6 rc5wt-be5.wa.shawcable.net (66.163.74.158) 48.501 ms 39.932 ms 39.895 ms

7 paix1.sea.edgecastdn.net (198.32.134.27) 40.280 ms 35.227 ms 34.881 ms

8 192.16.54.88 (192.16.54.88) 45.952 ms 45.614 ms 45.277 ms

9 93.184.216.34 (93.184.216.34) 42.661 ms 43.262 ms 42.271 ms

14. above, traceroute shows the path through each router and how long each hop took.

    - in this case there are no apparent network issues, unless there are intermittent problems which can be time consuming to resolve.
    - we can confidently contact the remote network administrator explaining our finding and sending screen shots of relevant results.