

# Troubleshooting Methodology and Resolving Core Hardware Problems

# Troubleshooting

- Create a Backup
  - Ongoing backups are critical.
  - Need to check backups are fit for purpose
  - Data is valuable and cant be replaced
- Prioritising Tasks
  - One user having a printing issue or a room of PC's unable to see the file system?
  - Each task needs to be prioritized
    - Escalate or de-escalate
- Document the process
  - Very important
  - Not just the solution, but the actions tried and their outcome

# Troubleshooting Steps

1. Identify the problem
2. Establish a theory of probable cause
3. Test the theory
4. Establish a plan of action
5. Verify full system functionality
6. Documentation

# 1. Identify the Problem

- Problems can be complex, very complex
- Normally in one of these areas
  - A Collection of hardware integrated into one system
    - Each item has a specific task to perform
  - The Operating System
    - Needs hardware
    - OS issues can seem to be hardware issues and vice versa
  - Application Software
  - The User!

# The User

- Treat the User with respect
  - Your manner is to be professional
  - Believe them when they describe the problem
  - Can you show me the problem?
  - How Often does this happen?
  - Has any new h/w or s/w been installed recently?
  - Has the PC been moved?
  - Has anyone else used the computer recently?
  - Have any other changes been made to the computer recently?

# Gather Information

- What is working or not working?
- Has anything changed recently?
- What happens when I reboot?
- Is there any information in the system logs?

# Gather Information

- Determine if the problem is h/w or s/w
  - Is the user trying to use a specific piece of h/w
    - Faulty Integrated devices on Motherboards = replace
    - Laptops, very difficult to diagnose and repair
  - S/w problems are harder to discover
    - Might require a s/w reinstallation

## 2. Establish a theory

- Once the problem is identified, need to determine why it is happening
- Always question the obvious!
  - For example, make sure power is on
  - Or check network cable is plugged in
- Eliminate Possibilities
  - Start broad and narrow down
  - E.g. Assume that you cant access a hard drive
    - Drive itself, Cable, Connectors
    - Plug drive into another PC with a new cable
  - For H/W Remove all additional hardware and check operation.
  - For S/W Reboot into safe mode



## 2. Establish a theory

- Use External Resources
  - You might have identified the issue but have no idea how to fix it
  - Written materials
  - Service Documentation
  - Online
  - Co-Workers

# 3. Test the theory

- Check the simple things first
  - Does restarting the PC help?
  - Are the cables properly plugged in?
  - Are the peripherals switched on?
  - Is the system ready?
    - Can the user interact with it?
    - Printers showing green light?
  - Do chips or modules need to be reseated?
  - Check cables fully engaged?
  - Is the problem User error?

# 3. Test the theory

- If the theory is correct, determine the next steps of action
- If the theory is not confirmed, try a new theory
  - Be prepared to escalate the issue

# 4. Establish a plan of action

- If the theory is correct:
  - Verify full system functionality
  - If the fix didn't work, try something else
  - You might need to fix other PC's as preventative maintenance
    - Identified issue may affect more than one PC
    - For example an update may have stopped something working and it might be best to stop other PCs updating

# 5. Verify Functionality

- What the system couldn't do, can it now?
- Has the error stopped appearing?
- Can the user do what they couldn't before?
  
- You can't test everything, so ensure the basic functionality is there
- Need to check that in fixing one problem, we haven't introduced another
  
- Are there any preventative measures you can implement for the future?

# 5. Documentation

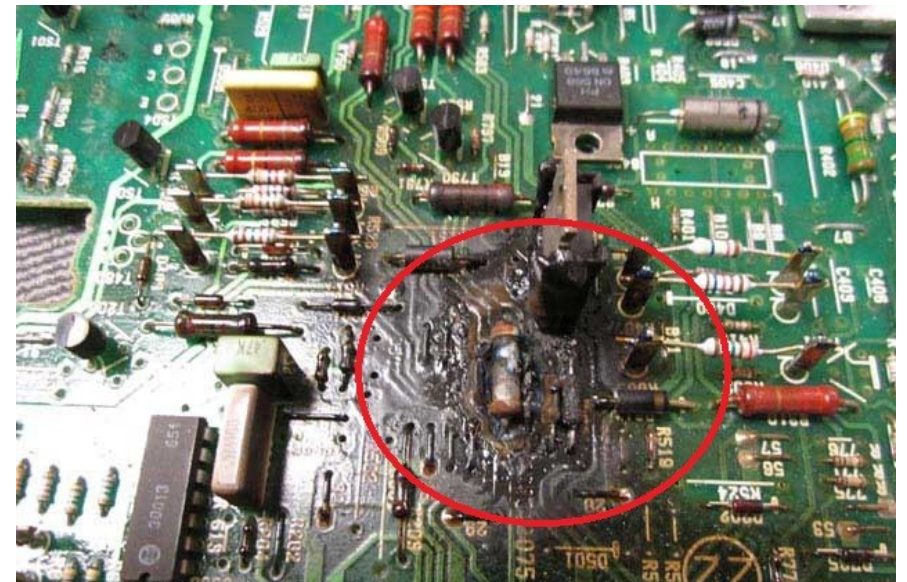
- The step that gets skipped most – Don't skip this step!
- Documentation allows other users to understand how to fix it
- Documentation means quicker resolution to a repeated problem
- System based – on ticketing system
  - Copy system log entries into the ticket
- Personal log book
  - Record resources used, especially website addresses

# Core Hardware Issues

- Motherboards, CPUs, RAM, and Power problems
- Heat is always a problem in any PC system
  - Overheating will damage components
  - We looked at heat sinks and case fans in Wk1
  - Overclocking
  - Dust and dirt insulate – heat cant dissipate
- Chip Creep
  - Systems warm and cool. Eventually chips can move in their sockets.
  - RAM is an obvious component susceptible to this

# Core Hardware Issues

- Listen for abnormal and loud noises
- POST beep codes (more later)
- Any moving part will have bearings that can break down
  - DVD, CDROM, HDD, FANS
- Burning Smells and Smoke
  - PC's get hot, but they should never burn or smoke
  - Switch off instantly
  - Replace anything damaged





# Core Hardware Issues

- Look for indicator lights
  - Network cable slots
  - Lights on the front of the PC
  - Printer status lights
- Log Entries, Alerts, and Error Messages
- Intermittent Device failures
  - Hard to diagnose
  - Indicates a slow breakdown
  - Try replacing items one at a time

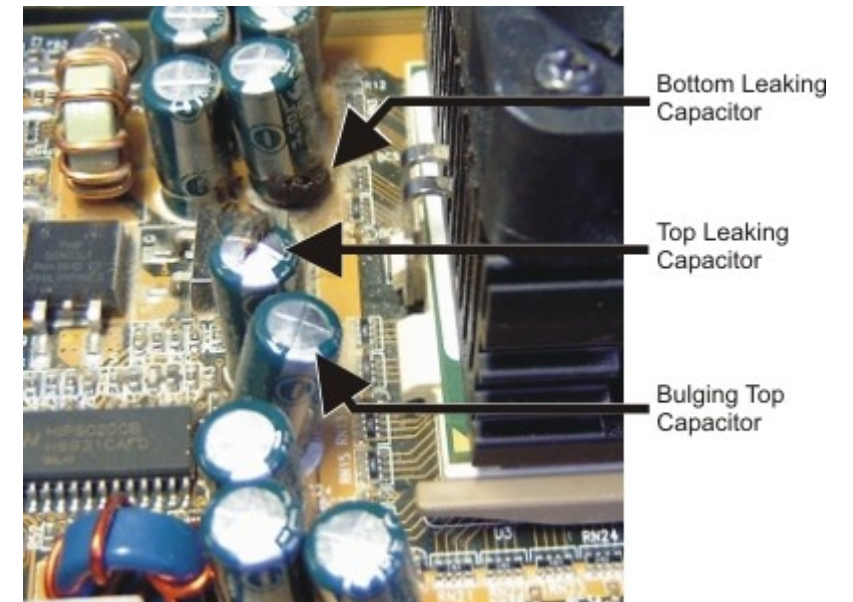


# BIOS

- BIOS can be updated
  - Essential – Follow manufacturers instructions precisely
  - Process is called flashing the BIOS
- BIOS contains system settings
  - Clock, Boot Sequence
- Settings stored are lost
  - CMOS battery requires replacement
- BIOS configuration
  - Entry by pressing a key e.g. F2 (Manufacturer Specific)

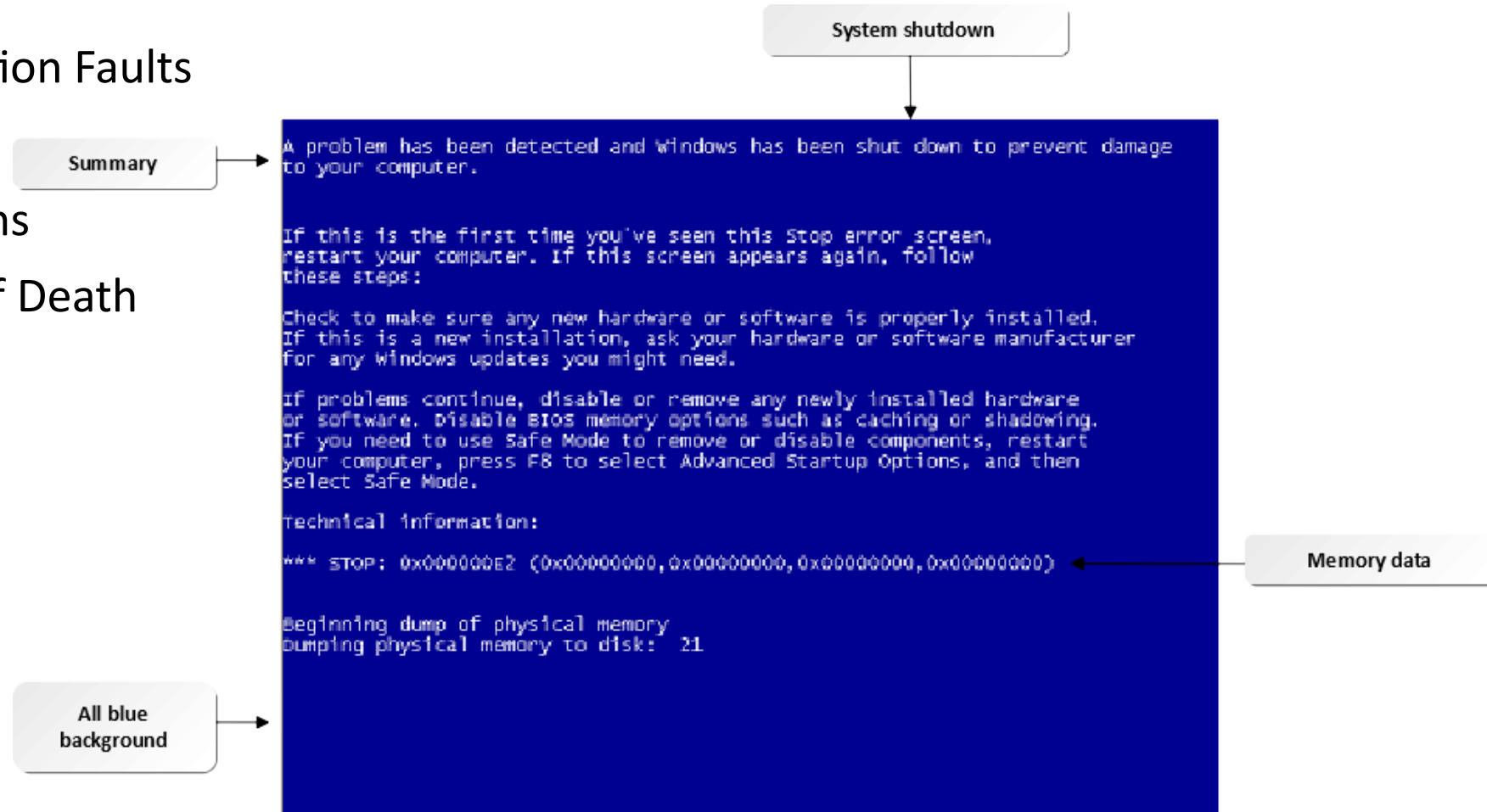
# Motherboards and CPU

- Removing Components, follow ESD principles
- Keep fluids away
- Use the brass standoffs with insulating washers
- Use thermal paste sparingly where appropriate
- Distended Capacitors
  - Cylindrical Tubes
  - Store electrical charge
  - Do not touch residue
  - Replacement is hard



# Memory Issues

- GPF – General Protection Faults
- Fatal Errors
- Unexpected shutdowns
- BSOD – Blue Screen of Death



# Need to Know

- Know the steps to take in troubleshooting
- Understand the POST function
- Know problems related to the BIOS
- Know what causes unexpected shutdowns, lockups, reboots, intermittent failures
- Understand PSU issues
- Know which system devices make a noise
- Know how to alleviate component heating issues
- Know what basic indicator lights do
- Know the screen crashes for windows and OSX
  - <https://www.youtube.com/watch?v=pem7T32F4XM>
- Understand what a distended capacitor is