Topic 3C: Troubleshoot Power and Disk Issues:

PC Components need a constant power supply to run. If the computer will not start, it will likely to be due to the power problem. If the PC suddenly turns off or restarts, power is a common issue. When a computer is switched on, the PSU converts AC to DC immediately. At first, PSU supplies **12V power** immediately, and the fans and hard disks should spin up. The PSU then tests its **5V** and **3.3V** supplies. When it is sure that it is providing a stable supply, then it sends a power good signal to the processor.

To diagnose no power symptoms, check the **LEDs** of the front panel of the system case are lit up and whether you can hear fans or not. A power issue might arise due to a fault in the PSU, incoming electricity supply, power cables/connectors, or fuses.

To isolate the power issues, following thing might help:
a. Check other equipment is working.
b. Try plugging another device in the same wall socket. If another device is also not responding, then may be there is problem with the wall socket.
c. Check PSU cable is connected to the PC and wall socket correctly or not.
d. Try another power cable.
e. Try disconnecting extra devices, such as graphics card. If this resolve the issue, then problem might be the PSU is underpowered, and you need to fit one with a higher wattage rating power cable.
f. Test the PSU using a **multimeter** or power supply tester.

If performing all the above steps still did not solve the problem, then the fault is likely with the motherboard. If you suspect that power supply is faulty, do not leave it turned on for longer than necessary and do not leave it unattended.

Troubleshoot POST Issues:

Once the CPU gets the good signal from the PSU, it performs a **Power On Self Test (POST)**. It is diagnostic program implemented in the system firmware like BIOS, that checks the hardware to ensure the components required to boot the PC are present and functioning or not. On modern computers, because of faster boot process, you are unlikely to see the POST messages. If the power is spinning and the fan sound is hearable, but the computer shows only **black screen** , then the error might be related to **display fault** or **POST** is not running. If the **POST** is not running, then do the following troubleshooting procedure:

- **Ask the user what has changed recently in the PC:** Sometimes when the firmware is updated in the PC, the problem might have been occurred due to upgrading firmware.
- **Ask if some maintenance has been done on the PC recently or not:** because while doing maintenance some parts gets loosely fit.
- **Check for faulty interfaces or devices:** Sometimes faulty devices can interrupt the **POST** test. Try removing one by one.
- **Check the PSU:** Even though fans are receiving power, there may be fault that is preventing the power good signal from being sent to the CPU.
- **Check for faulty CPU or system firmware:** If possible, check the faulty CPU and replace it or update the system firmware.

Some motherboards have **jumpers** in it to configure modes such as **firmware recovery** or **processor settings**. If the jumpers are set incorrectly, it could cause the computer not to boot. If a computer will not work after being serviced, check that the jumpers have not been changed.

When a **POST** detects a problem, it indicates the errors through the **beep codes.**

Beep Code	Meaning
1 short beep	Normal POST (system is OK).
2 short beeps	POST error (check screen for error code).
No beep	Power supply, motherboard, or speaker issue.
Continuous beep	Memory problem (RAM or memory controller).
Repeating short beeps	Power supply or motherboard issue.
1 long, 1 short beep	Motherboard problem.
1 long, 2 or 3 short beeps	Video adapter error.
3 long beeps	Keyboard issue (check for stuck keys).

Troubleshoot Boot Issues:

Once the POST tests are complete, the firmware searches for devices as specified in the **boot sequence**. If the first device in the sequence is not found, the system attempts to boot from the next device. For example, if there is no fixed disk, the boot sequence checks for **a USB-attached drive**. If no disk-based boot device is found, the system might attempt to boot from the **network**. If no boot device is found, the system displays an error message and halts the **boot process**.

Key Points:
- If the system tries to boot from the wrong device:
    - Check for unwanted media in removable drives.
    - Ensure the **boot order** is correct in the settings.
- If a **fixed disk** isn't detected:
    - Verify the disk has power (look for an LED or listen for spinning).
    - Check data and power cables for damage or proper connection.
    - Ensure the motherboard port isn't disabled by a jumper or system setup.

If power and cabling aren't the issue, suspect **boot sector problems** caused by disk faults, power failure, OS installation issues, or malware.

Key Concepts:
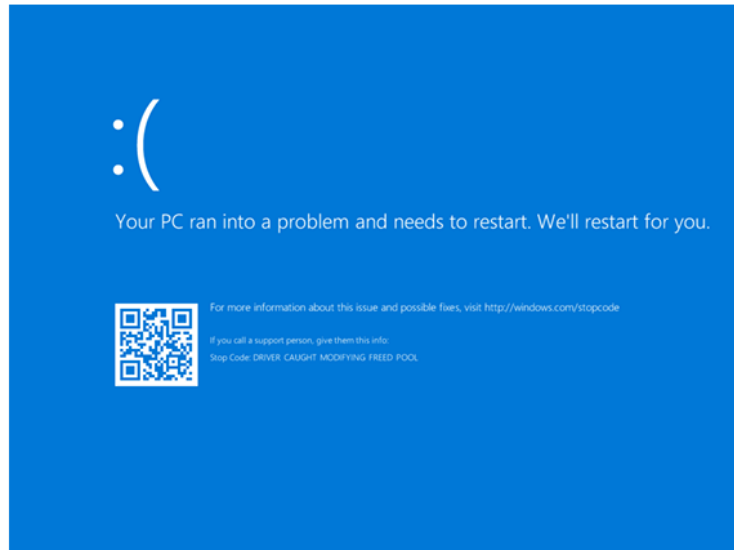- **Boot Schemes**:
    - **MBR (Master Boot Record)**:
        - Stores partition info and boot code in the first sector.
        - Only one partition can be active.
        - Used by legacy systems.
    - **GPT (GUID Partition Table)**:
        - Stores boot info across multiple sectors.
        - Supports modern systems and larger disks.
- **Boot Errors**:
    - Examples: "Boot device not found," "OS not found," or "Invalid drive specification."
    - Likely caused by boot sector corruption.
- **Fixing Boot Problems**:
    - Use an **antivirus boot disk** to scan and repair malware-damaged sectors.

o   If unavailable, use the **repair tools** on the OS setup disk.

Troubleshoot OS Errors and Crash Screens:

If your system passes POST test and Boot process, then the boot sector loads the rest of the operating system files into system memory. Error messages received after this point can usually be attributed to software or device driver problems rather than physical issues with hardware devices.

If there is a **serious fault,** then Windows system will display a **blue screen of death (BSOD).** This typically indicates that there is a system memory fault, a hardware device/driver fault, or corruption of OS files.

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Your PC ran into a problem and needs to restart. We'll restart for you.

For more information about this issue and possible fixes, visit http://windows.com/stopcode

If you call a support person, give them this info:
Stop Code: DRIVER CAUGHT MODIFYING FREED POOL

Blue screen of death (BSOD) preventing a Windows PC from booting. (Screenshot courtesy of Microsoft.)

In this case, scan that QR code with the camera of the phone and open the URL. The error should be written to the **System Log** with **BugCheck** as the source. From the event description, use the first **hex value** such as **0 x 0a,** to find information about the event online.

BSOD is for Windows, for macOS it shows a **spinning pinwheel (of death),** also called **spinning wait cursor.** Linux displays a **Kernel Panic** or **"Something has gone wrong"** message.

Troubleshoot Drive Availability:

Hard drives fail due to mechanical issues (HDDs) or wear over time (SSDs). Power loss during write operations can also cause damage or file corruption. Watch for these symptoms:

- **Unusual noises (HDD only)**: Clicking or grinding sounds indicate mechanical problems.
- **No LED activity**: Either the drive or system is not receiving power.
- **Constant LED activity**: Disk thrashing caused by low RAM. When there is low RAM, hard disk is constantly used for **paging** right. So, in this case, the OS is constantly accessing the fixed drives. Another problem may be from faulty software, or malware.
- **Bootable device not found**: Indicates disk failure or corrupted boot files.
- **Missing drives in OS**: If a disk doesn't appear in the system, check for initialization, formatting, or hardware faults.
- **Read/write errors**: HDDs may have bad sectors, while SSDs develop bad blocks over time. Both indicate a failing drive.
- **BSOD (Blue Screen of Death)**: Severe read/write errors or file corruption can cause system crashes.

What to do: Back up your data immediately and replace the drive to avoid losing files. For failing HDDs, run a utility like **chkdsk** to check for bad sectors. For SSDs, watch for firmware warnings about bad blocks.

Troubleshoot Drive Reliability and Performance:

Most fixed drives like HDDs and SSDs have built in self-diagnostic program called **Self-Monitoring, Analysis, and Reporting Technology (SMART).** SMART can alert the operating system if a failure is detected.

If you notice problems like **slow read/write speeds** or suspect the drive is failing:

- Use tools provided by the drive manufacturer or system diagnostics software.
- **Windows utilities** or third-party tools (e.g., SpeedFan) can check SMART data and run tests.

What Do Tests Show?
- Tests check for:
  - **Damage to storage mechanisms** (e.g., bad sectors on HDDs or bad blocks on SSDs).
  - **Performance issues** like reduced speed compared to vendor benchmarks.
- If performance is fine under test conditions, slow speeds might be due to:
  - **System issues** (low resources, heavy application load).
  - **File fragmentation** (on HDDs).
  - **Limited storage space**.

Data Loss & Bad Sectors/Blocks:
- **Bad sectors (HDD)** or **bad blocks (SSD)** can corrupt files or make them disappear.
- The drive firmware marks these areas as unusable.

Recovering Data:
- If files are corrupted and no backup exists:
  - Use **file recovery software** for HDDs.
  - For SSDs, recovery is difficult without specialized tools.

Key Tip: Use diagnostic tools to catch problems early, back up your data regularly, and replace failing drives to avoid data loss.

Troubleshoot Raid Failures:

- **RAID (Redundant Array of Independent Disks)** protects data by:
  - **Mirroring**: Copying data to a second drive.
  - **Parity**: Storing extra data across drives to recover from failures.
- RAID can be managed by hardware controllers or operating system features.

RAID Scenarios and Failures:
1. **Device Failure (Degraded Volume)**:
   - If one disk in the array fails, the volume remains accessible but runs in "degraded" mode.
   - Replace the failed disk quickly to prevent further issues.
   - Use **hot swapping** if supported (insert a new disk without shutting down).
2. **RAID 0 Failure**:
   - RAID 0 has no redundancy—if one disk fails, all data is lost.
   - RAID 0 prioritizes speed, not reliability.
3. **Whole Array Failure**:
   - If too many disks fail or the controller fails:
     - Use a **backup** to recover data.
     - Replace the controller if that's the issue.

Key Tips for RAID Maintenance:

- **Rebuilding**: After replacing a failed disk, the RAID array needs to be rebuilt, which may slow down system performance temporarily.
- **Hot Swapping**: Be careful not to remove a healthy disk by mistake—it can cause the array to fail.
- **Disk Indicators**: A red LED typically signals a failed disk.
- **Backups**: Always maintain a backup in case RAID fails completely.

Troubleshooting RAID Issues:
- **Boot Problems**:
  - Use the RAID configuration utility to check the array status.
  - If the controller fails, replace it or move disks to another system to recover data.
- **Corrupted Data**:
  - Possible during a controller failure if a write operation was interrupted.

RAID provides data protection, but regular backups are still critical to prevent data loss!

Questions and Answers:

1. After servicing a computer, it won't turn on. What's the most likely cause?
- **Answer**: A power connector might be disconnected. Check the **P1 motherboard connector**, **4-pin CPU connector**, and **SATA or Molex connectors**. Also, ensure the cable for the **power button** is connected to the motherboard.

2. After adding memory, the system won't boot. What should you do?
- **Answer**: Verify the **memory type** and installation guide. Check the memory is seated correctly and in the right slots for dual-channel memory. Try rearranging the memory in the slots.

3. The computer won't boot from the Windows setup disc. What should you do?
- **Answer**: Check the **boot order** in the system setup. Ensure the disc isn't scratched or dirty. If the disc works in another computer, check the optical drive's **data and power cables**.

4. After a power cut, a computer won't boot, showing "BCD missing." What's the first step?
- **Answer**: Use a **system recovery disk** to repair the boot information on the drive.

5. A user reports a loud clicking noise when saving a file. What's the first step?
- **Answer**: Check if a **data backup** exists. If not, try to create one immediately.

6. A CAD workstation shows "RAID volume degraded." What should you do?
- **Answer**: A degraded volume means a disk has failed but the system still works. Add a **new disk** as soon as possible and rebuild the RAID array. Be aware this process may slow performance temporarily.

7. A user hears noises from the hard disk. Does it mean the drive is failing?
- **Answer**: Not necessarily. Hard disks make noises, but not all indicate failure. Ask the user about the noise type or inspect the system yourself.