

Lecture 4

"PC Troubleshooting"

Administration of computer systems, 2008

Lecture goals

- You should be able to analyze and solve PC-related problems in a structured way
 - Methodology
 - Tools
- Preparation for exercise 2
 - Analyzing and repairing a malfunctioning PC

9/9

0800 Antan started
1000 " stopped - antan ✓
1300 (032) MP-MC ~~1.982147000~~ { 1.2700 9.037847025
2.130476415 } 9.037846795 correct
(033) PRO 2 2.130476415 4.615925059(-2)
correct 2.130676415

Relays 6-2 in 033 failed special speed test
in relay .. 11.000 test.

Relay
2145
Relay 3370

1100 Started Cosine Tape (Sine check)
1525 Started Multi Adder Test.

1545



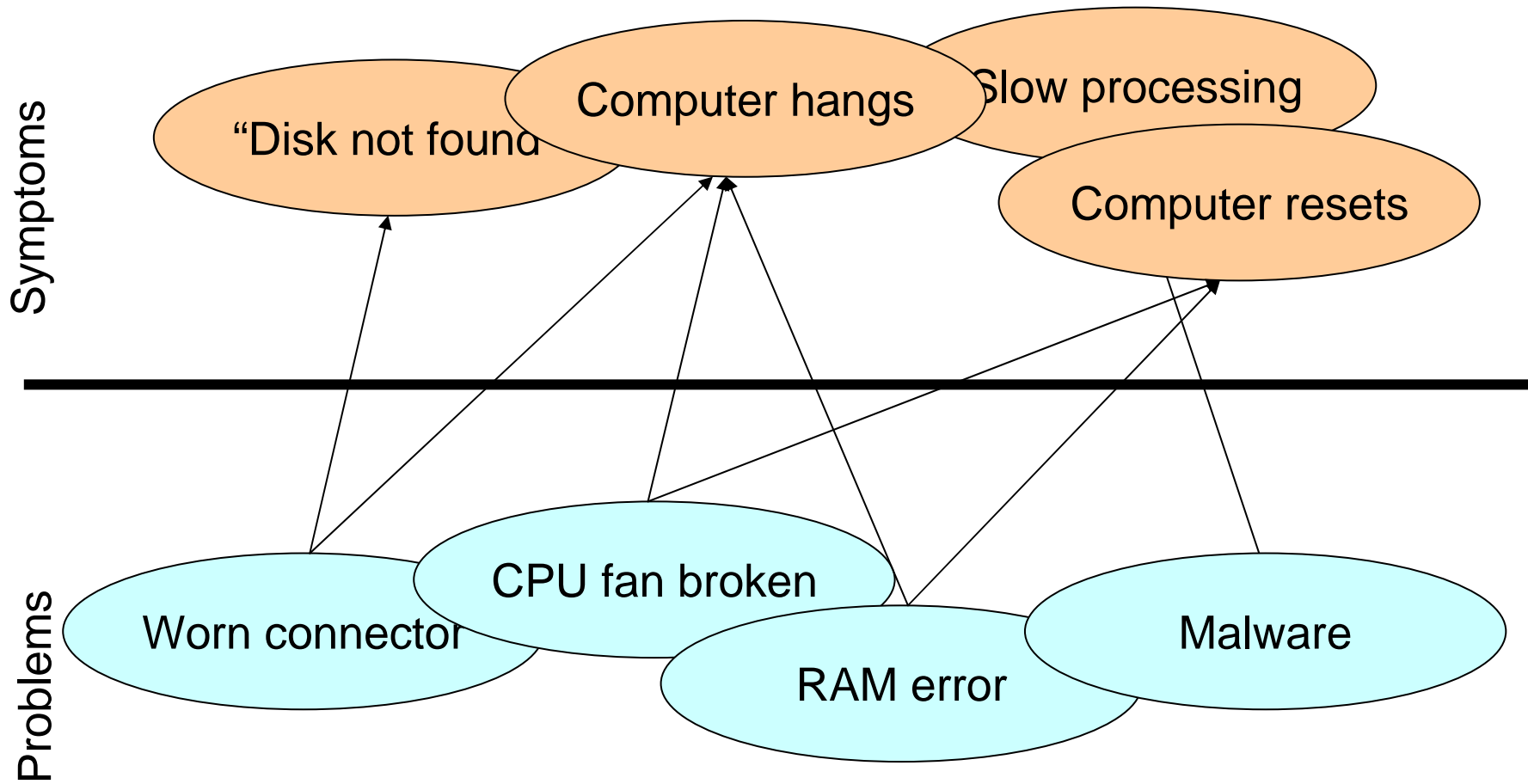
Relay #70 Panel F
(moth) in relay.

First actual case of bug being found.
1630 Antan started.
1700 closed down.

Examples of problems

- Hardware
 - Malfunctioning memory modules
 - Worn connectors
 - Cooling/ventilation issues
- Software
 - Driver incompatibilities
 - Viruses/Malware
 - Construction problems, *bugs*

Problems have symptoms



Have a plan

- Keeps you from “panic mode”
- Rank problems by their likelihood
 - Avoid unnecessary work
 - Avoid fixes that cause more problems
 - Avoid cost of unnecessary fixes
 - Avoid only treating the symptom, “false fix”

General “soft” tips

- Have enough time
- If you get stuck, do something else for a while
- Get help from others
 - Online and in person

Lots of good advice from PC techs online, e.g.
pcguide.com

Troubleshooting elements

- Maintenance journal
- Diagnostic checklist and questions
- Identification of possible causes
- Identification of possible solutions
- Application and testing of solutions
- Follow-up/validation



Troubleshooting tools

- Hardware
 - “Known-good” replacement parts/identical systems
 - Voltmeter, mechanical tools
- Software
 - Bootable diagnostic software
- Documentation
 - System manuals
 - Diagnostic flowcharts
 - Journals
- Experience

Maintenance journal

- Keep a log for each machine
 - Hardware and software specification
 - Maintenance record
 - Rescue disks etc.
 - Warranty/manufacturer information

Component	Configuration	Date in service	Notes
CPU	Intel Celeron 1.6GhZ	2008-01-01	Upgraded cooling 2008-02-02
RAM	256MB, 1 DIMM DRAM	2008-01-01	

Identify the problem

- User-description/Observation
 - What are the symptoms of the problem?
 - Error messages
 - Beep codes
 - Has it occurred before?
 - Have changes been made recently?
- Check the maintenance journal
- Retrieve system logs
- Try to reproduce the error

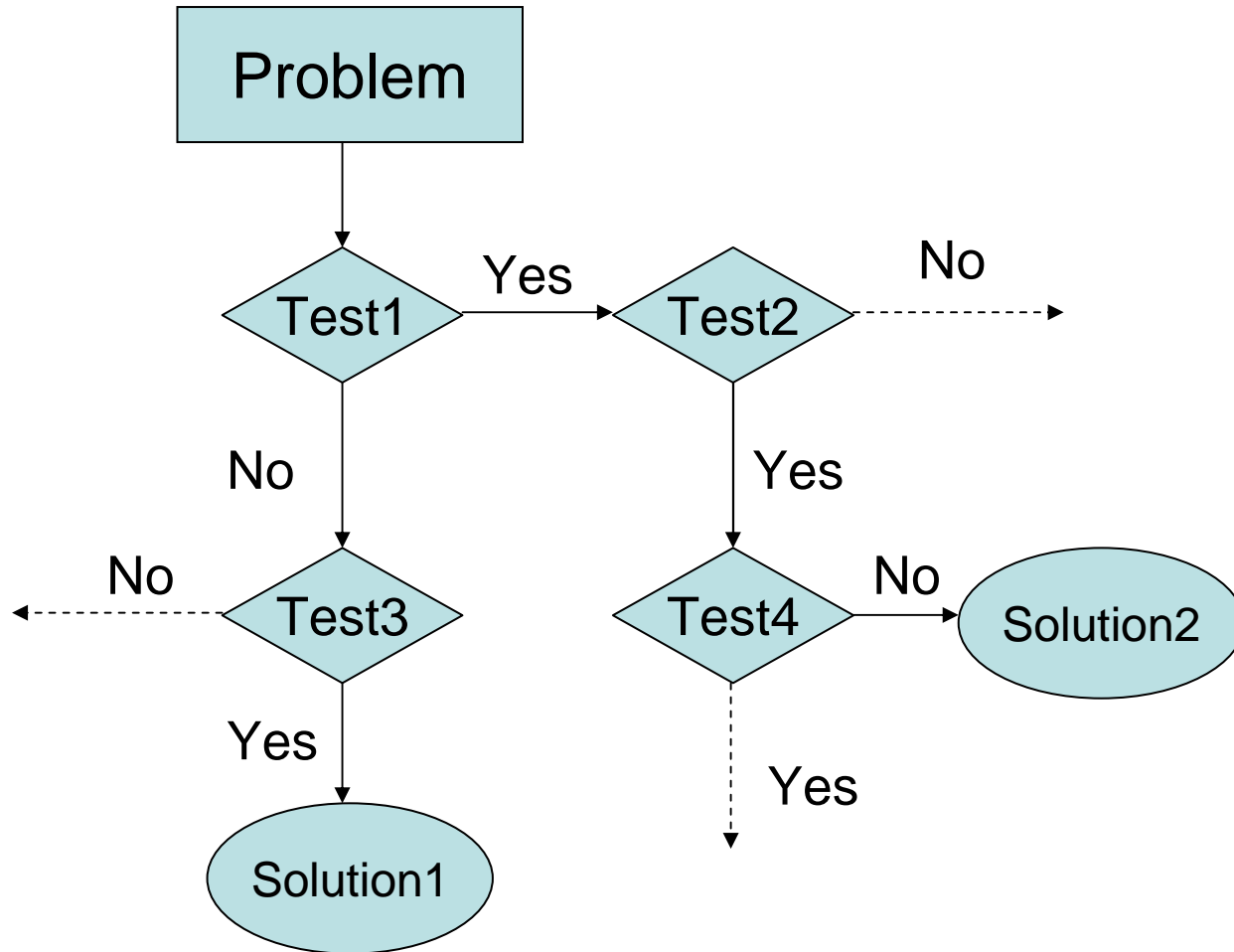
Identify possible causes

- Create a list of possible causes ordered by likelihood
- Create test cases for each possible cause
- Stepwise elimination
 - Only make one change per step
- “Known-good” method
 - Switch identical components
 - Minimal working configuration

Plan your work

- Rank causes
 - Likelihood
 - Ease of testing
- Create a diagnostic checklist or flowchart
- Gather more information
- Repeat as many times as necessary

Diagnostic flowchart



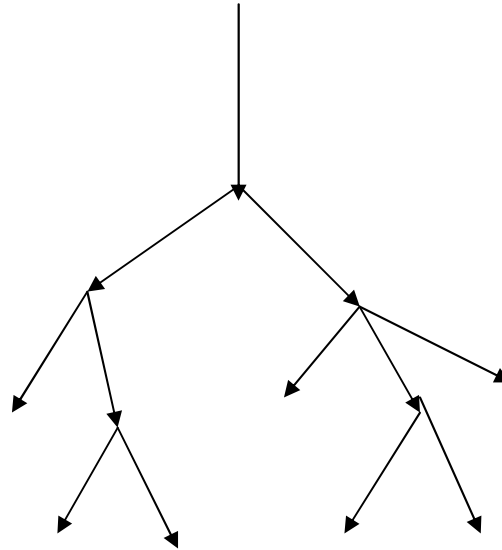
Example

- Bob is contacted by a user whose computer doesn't start. He troubleshoots and finds that the PSU is broken and replaces it. A week later the same problem occurs, and he applies the same fix. A week later...
- What would you do?

Root cause analysis (RCA)



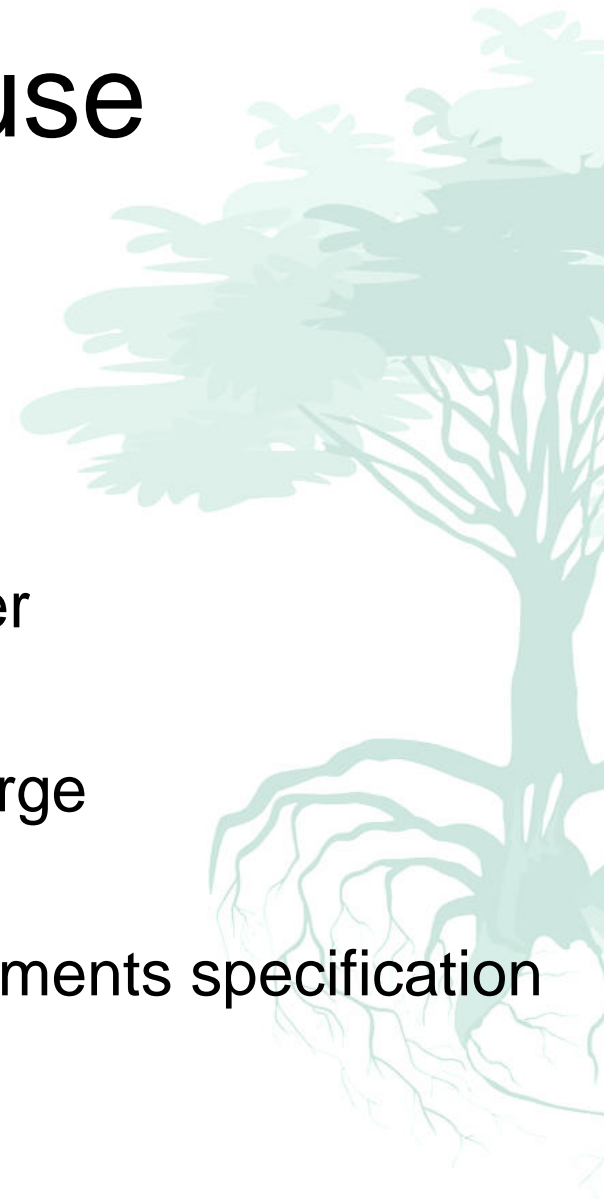
Root cause(s)



PSU Broken

Find the root cause

- “The five why’s”
- Example
 - The PC does not start
 - Why? The motherboard has no power
 - Why? The PSU is broken
 - Why? PSU damaged by electrical surge
 - Why? Insufficient surge protection
 - Why? Surge protection not in requirements specification
 - Why? ...

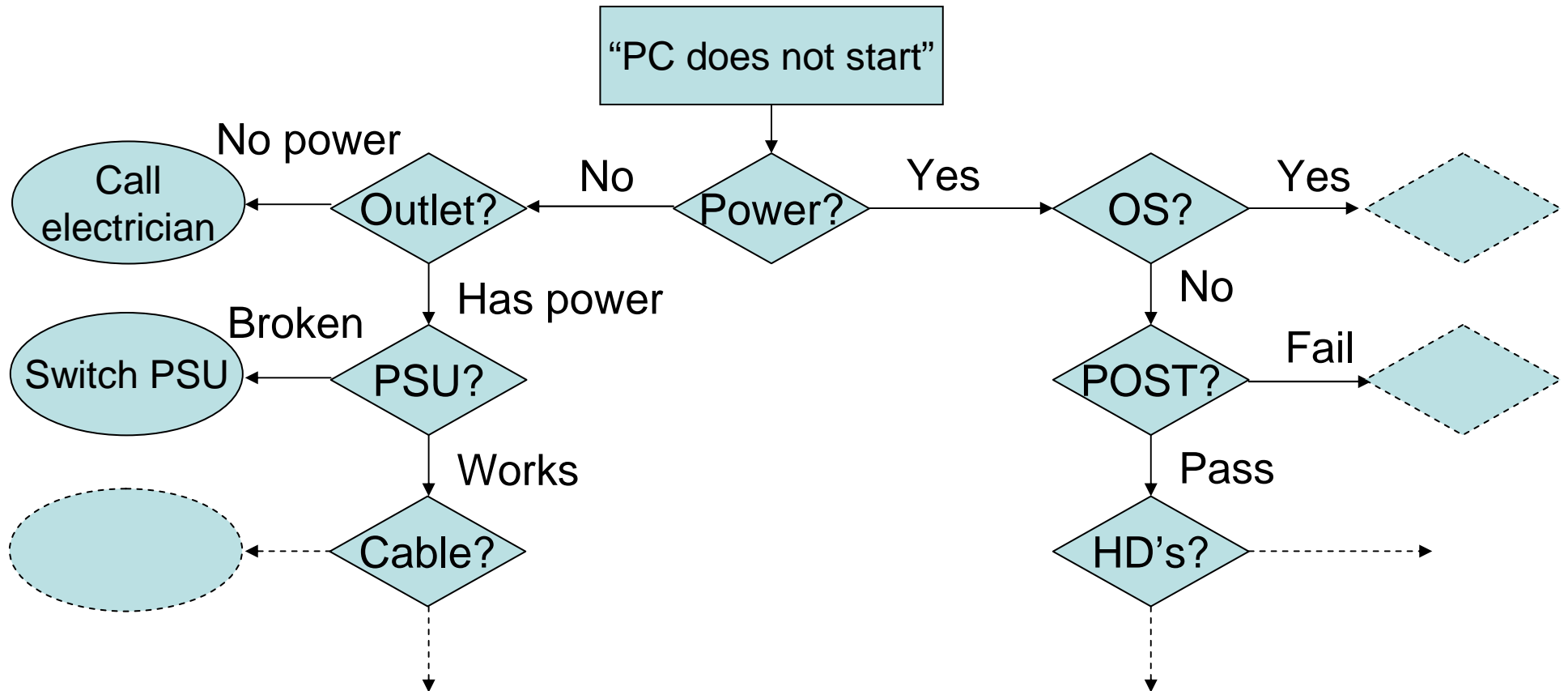


A troubleshooting example

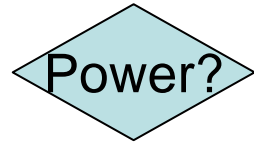
“I arrived this morning and my computer doesn’t work!”

- Identify the problem
 - “It worked yesterday”
 - “The lights flash and I can hear the hard drive”
 - “At first I see a lot of text that appears and disappears quickly”
 - “Then the screen is black except for a blinking underscore”

Identify possible causes and test cases



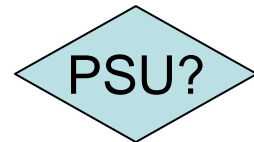
Test cases



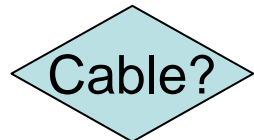
Does the computer power on? HD spins up, lights flash, etc.



Is there power in wall outlet? Test using voltmeter/desk lamp



Switch PSU from broken machine with known-good PSU



Use voltmeter to check continuity of power cable



Does operating system boot? OS logos, messages, etc.



Do any beep-codes occur?



Jumpers, cables, switch with known-good HD's

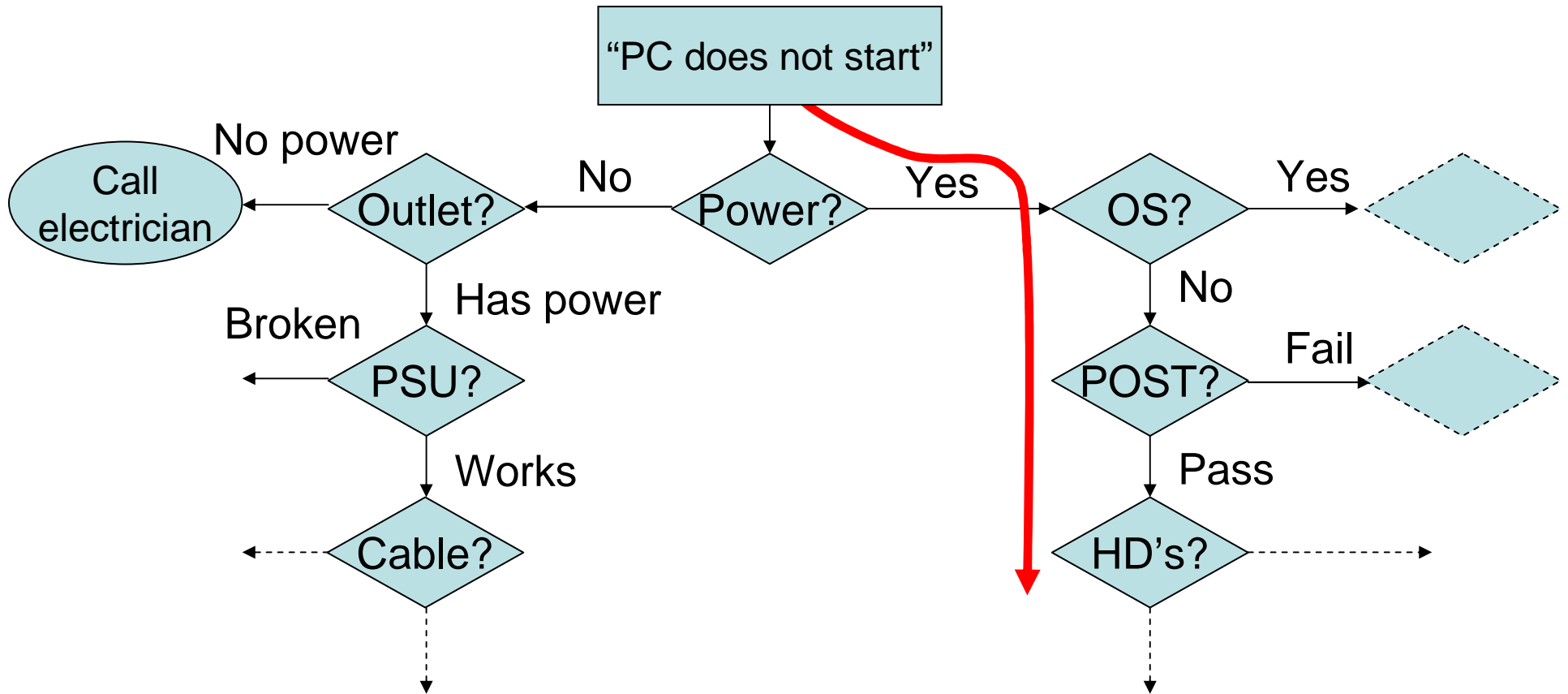
Stepwise elimination

One change per step

- Make sure you know what changes solved the problem or did not help



Perform stepwise elimination



Solution and verification

- Apply solution and record it in the maintenance log
- Verify that the solution solves the problem and that no new problems have been introduced.
- Comparing to previously made benchmarks is useful

Root cause analysis

- The computer was not booting the OS
- Why? The primary HD had wrong jumper settings
- Why? The service log says it was switched overnight but jumper settings were not changed from default.
- Why? Poor instructions to install personnel, no verification step after installing new HD. (Possible root cause)

Getting help

- Chances are that others have had the same problem
- Use detailed search terms
 - “boot” “blinking underscore” “windows 2000”
- Include detailed error messages
 - “Error performing inpage operation”

Getting help

- Manufacturer support
 - Helpline
 - Online, e.g. MS Knowledgebase, Dell tag
- User-based support
 - Forums
 - OS communities, e.g. Ubuntu Linux
- All are indexed by search engines

Ask correct questions

- Include as much information as possible about your system and problems symptoms
 - HW configuration
 - SW configuration
 - Steps to reproduce the error
 - Logs
 - Any troubleshooting steps you have taken
- First try to find the answer on your own
 - RTFM “Read The Fine Manual”

Examples of problems and symptoms

Power supply

- Under-dimensioned PSU
- Fan failures
 - Check for exhaust obstructions, e.g. dust
- Voltage selector set wrong (230V in EU)
- Grounding failure/short circuit
 - Blown fuses, ground-fault protector tripped
- Do not service, replace

Motherboard

- Loose connectors to PSU
- Cracked/broken connectors
 - Too much force used when inserting memory, expansion cards, CPU etc.
- Short-circuits
 - Metal objects, typically screws that fall onto the MB
- Bad jumper settings

RAM modules

- Module not correctly installed in socket
- Module incompatibilities
 - Different types/manufacturers
- RAM speed/bus frequency mismatch
- ESD damage
 - Often causes random bluescreens
 - Run e.g. memtest86

Hard drives

- Jumper settings wrong
 - Verify that drives are correctly identified in BIOS
- Listen for atypical HD noise
 - “Click of death”, try to salvage data as soon as possible
- Insufficient cooling
 - Drives get hot, make sure there is sufficient airflow

HMI devices

- Depleted batteries in wireless devices
 - Dust and dirt in mechanical mice
 - Too reflective surface for optical mouse
 - Cabling
-
- Easy to test with “known good” components

Networking

- Network Interface Card (NIC) drivers
- Static/dynamic IP assignment
 - Is the closest hub/switch reachable?
- Correct type of cabling, crossover/straight

Review

- Troubleshooting framework
 - Analyzing
 - Planning
 - Solving
 - Recording
- Root cause analysis
- Common problems and symptoms

Visit the course page!

- Now you should be done with preparatory questions for exercise 1, have fun in the exercise sessions!
- Exercise 2 is on the course web page
- Exercise groups are on the course web page, check back often!

<http://www.hh.se/te2003>