

No matter what tools are available to assist you in problem determination you will have to select the appropriate ones when the problem occurs. Knowing how to approach problems logically is your best hope of resolving a problem.

A student once told me his first professor in the computer science curriculum said the three most important things you can learn about computers are:


- Read the Screen
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He was right, many times administrators miss their most important clue because they did not fully understand the message or the error on the screen.

Where to Start

- Systems problems make themselves known in many ways
 - User reports of difficulty or performance degradation
 - Automated Error Reports
 - System Hang
 - System Crash (often with dump)

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The source of your awareness of the problem, may help you determine which tools to use first. For instance a automated error report would logically direct you to the AIX error log.

Is there actually a problem

- Why are you getting the indication of a problem
 - Systems loads may have increased
 - Are other users affected
 - Are there known issues that would cause the indications
- Are there other indications that were not reported

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When a user reports a problem, the odds are there really is one. On the other hand the problem often exists in a different place that the user has assumed. Make sure you have the clearest description of the problem possible. This means ask more questions.

Communication

The issue of language becomes very important when a problem is reported. Users often describe things from a different point of view than the Systems Administrator would.

Be careful not to assume the user is just making things up or is not smart enough to recognize a problem.

If the reported problem does not make sense, ask questions to explore what the problem appears to be from the user point of view. The screen on the monitor being blank could mean the building power is off, or it could mean that the application the user was running has failed.

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People reporting problems do not normally intend to confuse the issue, but if you do not make sure you understand what the problem is before you stop asking questions, you will not be likely to find it.

The First Question

- 39 years ago, in a conversation with an IBM Area level Sr. Technical Specialist I learned the following.
 - The first question is **“What changed”**
 - The answer is predictable – **“Nothing”**
 - The question is seen as a accusation
 - The answer is not true
 - If nothing changes machines perform as before

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The specialist was Leroy Kaump. I knew him from 1965 to 1985, and I never knew him to be wrong about a machine problem in all that time. He was the absolute best diagnostician I have ever encountered. Most of what I learned from Leroy was from observation and questioning. Leroy did not believe you could teach someone to be a better problem solver. He said, “You either have it or you don’t.” that is the one thing I believe Leroy was wrong about.

Why Ask?

- If you can determine what has changed you are on the way to correcting the problem.
- Since the person reporting the problem may not be able to tell you what changed, or if the indication came from the system itself
- You will have to find the answer yourself

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If you know that the answer to “What Changed” is most likely going to be nothing, it is tempting to just not ask it, and start at the machine. But the person reporting the problem knows more about the problem than he thinks he does. Your job is to discover what it is that he knows, because he may not be able to.

The Procedure

- The best diagnosticians follow a standard approach to problem determination.
 - They proceed from what they know, *not from what they don't know*
 - They theorize the possible causes based on the symptoms
 - They consider other symptoms of each possible cause
 - They eliminate possible causes which would display symptoms that are not present
 - They keep notes and eliminate items that check ok
 - They restore changes that did not fix the problem

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Most people learning something new are intimidated by a structured process. Not only do they have to learn how to approach it, but some guy is trying to get them to memorize a list of actions by their names.

But if you will follow this approach, including the note taking, and stay disciplined as you do so, I am confident you will be a better problem solver than you are today, no matter how good you are right now.

If your name is Leroy Kaump, I retract the previous statement.

Proceed from what you know

- Since you are unlikely to get an answer to “What Changed?” you should compare the actual operation to the expected operation.
- If you do not know what the system should do, you are not likely to be able to determine why, or if, it is not doing what it should.

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Since it is almost impossible to get someone to tell you accurately what changed, your best option is to know what it should do in the circumstances. Comparing what it should do to what it is doing provides essentially the same information that an answer to “what changed” might have provided.


Illustration

I once watched a Sr. Technical Specialist read the principle of operations manual for a system that had been down for 7 hours. Several other people had been working on it.

He was not trained on the system and had no knowledge of how it should work, but his level of skill suggested he might be able to repair it.

The time from when he began scanning through the manual until he had identified the problem, acquired the part and repaired the system was 1 hour and 15 minutes.

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Yes, it was Leroy. The Area Technical Specialist on the system had worked on the problem for two hours and only knew the general area of the problem. But he had to leave for important personal reasons, and Leroy was the only person available to relieve him.

Leroy knew he could not solve the problem until he knew what was supposed to happen. So he set out to learn what he needed to know. He really did read the manual, find the problem and repair it in just over an hour.

By the way, you should note that a principle of operations manual exists for HACMP at the level you are using.

Only a few items can cause a given problem

- It is unlikely that a failed disk drive is causing a network problem, or that a flakey Ethernet adapter will prevent a file system from mounting.
- List the things you know might cause a problem.
- If you are not sure how it works find out.


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Don't just make the list in your head, write it on a notepad. Make sure you review the list often in case you have missed something that could be the problem. As new possibilities present themselves write them on the pad also.

What if?

- For the things on your list of possible causes:
 - Think about other symptoms that might also appear.
 - Look to see if any of them occur.
 - Continue to investigate the items to which all of the symptoms are common.

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There are often several items that could cause a given problem. Some of them will also cause other symptoms as well. Make sure you understand all of the symptoms you are dealing with and the ones you are not. Eliminate the items that would have symptoms you do not see.

How do I tell?

- Once you have a list of possible causes for the problem ask yourself:
 - What commands or procedures can I execute to test each of these things?
 - If there is more than one command available, to check with, try them all and compare the results.
 - Different sources or different format may reveal useful information.
 - Are any of these tests disruptive?
 - Make sure you announce the possibility.
 - It doesn't matter, if the system is down.
 - Did I have to change anything to test this?
 - Then change it back before you proceed.

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There are six books of commands for AIX, the HACMP software adds additional commands. Learn about the commands that will allow you to collect data. If you are not sure what command you need try the man -k option. The HACMP documentation includes a problem determination manual, it can help you determine which commands will be helpful while investigating a problem

Keep Notes

- Make a list of the things you are going to check.
 - Make a note when you have done each one.
- Note the results of your tests.
- Note anything you changed, and whether you changed it back, along with outputs of commands before and after the change.

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If a problem takes more than a few minutes to solve you are not likely to remember everything you have done or what the results were. Get in the habit of making notes as you conduct tests. Document what you did and what the results were. When you need to know again, check your notes.

Don't add new problems

- If you have changed something and it has not fixed your problem, change it back before proceeding.

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People who are not sure how to approach a problem are likely to just start trying things they have seen others do or have had success with in the past. If an action does not get them further toward the solution they abandon it, but seldom remember to undo any changes they have made. It is not surprising that they then notice a “change” in the problem.

Proceed as before

- If you have used this approach and the problem is still not fixed you may have to cycle back through the steps.
 - Either you don't know what has changed or are not aware of all the things that might cause it.
 - Make sure to keep logs, and your notes, until you are certain you have corrected the problem. If you don't you will wish you had.

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If you use a process and it does not produce the results you want there are two possibilities, it might be the wrong process, or you may not have noticed all of the indications that would have made it work. Keep in mind that something has changed in the system, or it would still be doing what it has always done.