

Data Communications Troubleshooting

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PREFACE

Data communication problems can be extremely difficult to solve. They can also be solved very simply. Why the differences? Let's look at modern medicine for a few examples.

A patient complains of a sore arm. The doctor takes his temperature (they always take your temperature), examines his arm, asks some questions about past medical history and sends him to X-ray. Looking at the x-rays, she sees an obvious crack in the bone and places a cast on his arm. That was a fairly simple solution. Now take the same patient back to 18th century Europe. Tools for diagnosing broken arms were lacking, but there was always blood-letting. If that didn't work, the doctor could try irritants, Phrenology, magnetism and magic.

Had the doctor possessed the proper tools to do the job, the time between complaint and correct treatment would have been shortened considerably.

The type of problem, the tools available, and the technique applied can shorten or lengthen the time re-

quired to solve the problem. This presentation will help you understand the problem, become aware of the tools, and improve your techniques.

From the viewpoint of most computer users, there are four types of malfunctions. They are usage, protocol, digital and analog. Usage problems are those arising from improper use of an otherwise working data comm link. Protocol problems go beyond the users' immediate control and involve the software that handles the link. Digital problems involve the interface between the data terminal equipment (DTE) and the data communications equipment (DCE). Analog problems are limited to the data communications facility, which is the wires between the modems or data sets.

There are many approaches to troubleshooting. The process of elimination by replacing equipment, stepping through software, and circuit checks by the halving algorithm are some ways. Symptomatic troubleshooting does not eliminate any of these methods, but it does reduce the time necessary by quickly pointing out the area of the malfunction.

HEATERS AND AIR CONDITIONERS 24-23

SYSTEM COOLS INTERMITTENTLY

Symptoms	Possible Causes
Electrical	
1. Unit operates intermittently.	1. Defective fuse, relay blower switch, or blower motor.
2. Clutch disengages prematurely during operation.	2. Improper ground, loose connection, or partial open in clutch coil.
Mechanical	
1. System operates until head pressure on builds up at which time clutch starts slipping; may or may not be noisy.	1. Compressor clutch slip.

Example: Troubleshooting guide from auto repair manual.

An example of symptomatic troubleshooting can be found in nearly any automobile repair manual. You may find a flowchart or table in which the axes are labeled **SYMPTOM** and **PROBABLE CAUSE**. The idea is to

find the probable causes for the condition (or problem) encountered, then by testing or a process of elimination, discover the remedy. Newer methods have been developed which can suggest solutions.

AUTOMATIC TRANSMISSION 21-30

General Diagnosis Chart

Symptoms	Causes (see list below)								
	1	2	3	4	5	6	7	8	9
HARSH ENGAGEMENT FROM NEUTRAL TO D OR R	X			X					
DELAYED ENGAGEMENT FROM NEUTRAL TO D OR R		X		X	X	X	X	X	X
RUNAWAY UPSHIFT		X		X		X		X	
NO UPSHIFT		X		X		X	X		
3-2 KICKDOWN RUNAWAY		X		X		X			
NO KICKDOWN OR NORMAL DOWNSHIFT				X					
SHIFTS ERRATIC		X		X		X	X	X	X
SLIPS IN FORWARD DRIVE POSITIONS		X		X		X	X	X	X

- 1 Engine idle speed too high
- 2 Hydraulic pressures too low
- 3 Low-reverse band out of adjustment
- 4 Valve body malfunction or leakage
- 5 Low-reverse servo, band or linkage malfunction
- 6 Low fluid level
- 7 Incorrect gearshift control linkage adjustment
- 8 Oil filter clogged
- 9 Faulty oil pump

Example: Symptom/Cause Chart from auto repair manual

Let's get back to the computer. Think of all of the possible problems one can have with a data communications network: hangs, disconnects, errors in the data, delays, retries, and on and on. What could be the possible causes of these problems? Noise, fade, delay, program bugs, faulty equipment, operator error, and more can all cause aggravating malfunctions.

This is what you need to know to solve these problems in a timely manner:

- A. The Basics — what is the environment, what was supposed to happen
- B. The Symptoms — what did happen
- C. The Causes — why
- D. The Tests — what tests will give the right information

E. The Tools — what tools will do the tests

F. The Solution — what action to take

This presentation will help you learn how to get from A to F.

EXCERPT

Let me give you an example to show how knowledge of the symptoms, tests, and tools can make problem solving easier. A problem occurred at a site where the symptoms were terminal hangs and garbage on the screen sometime after the session started. There was never any problem signing on. This was a point-to-point terminal on a switched line using BELL 212A modems.

Three things were done in an attempt to resolve the

problem: the MPE I/O configuration was checked, the modem options were verified, and a 1640 data scope was put into the line. The 1640 showed that a DC1 was received followed by garbage. This was either printed as garbage or hung the terminal. The assumption that followed was that something was wrong with the terminal. The configuration of the terminal showed that it was "providing clock," as was the 212 modem. At this point, it was decided that the modem options listed in the Data Comm Handbook must be wrong.

This bit of troubleshooting had gone way off on a wild goose chase. No attempt was ever made to test the most basic part of the network, the telephone line. Simple modem self-tests and loop backs were completely ignored. The 1640 served no useful purpose at this point.

A more reliable approach would have been to start by defining the exact symptoms, determining the possible causes, and making some appropriate tests. Using the new information gained through this technique, troubleshooting would have been more directly related to the problem.

The Basics

- HP262X terminal
- Point-to-point terminal connection to a port
- Switched public line
- Full duplex modem with good complement of diagnostics

The Symptoms

Apparently random terminal hangs and garbage occurs only on one line

The Causes

- Fortuitous line problems
- Faulty modem
- Faulty terminal

The Tests

- Modem loop back with test pattern
- Modem self-test
- Terminal data comm test

The Tools

- None needed

The Solution

Switched lines are susceptible to noise and other problems. Since each new connection uses a different route, conditioning is not available (and would not help noise anyway). Therefore, the terminal should be reset if it is hung or the data retransmitted if it was garbaged. If that doesn't help, redial the connection.

SUMMARY

This excerpt is an example of what my presentation will cover in much more detail. I am currently working on flowcharts and decision tables to make solving data comm problems easier by encouraging the use of symptomatic trouble shooting. This should lead to using the proper tools in the proper order.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud.

2. The second part of the document outlines the specific procedures for recording transactions. It details the steps involved in the accounting cycle, from identifying the transaction to posting it to the appropriate ledger account.

3. The third part of the document discusses the importance of internal controls. It explains how internal controls can help to ensure the accuracy and reliability of financial information and to prevent errors and fraud.

4. The fourth part of the document discusses the importance of external audits. It explains how external audits can provide an independent assessment of the accuracy and reliability of financial information and can help to identify areas for improvement.

5. The fifth part of the document discusses the importance of transparency. It explains how transparency can help to build trust and confidence in the financial system and can help to identify areas for improvement.

6. The sixth part of the document discusses the importance of communication. It explains how communication can help to ensure that all parties involved in the financial system are aware of the latest developments and can help to identify areas for improvement.

7. The seventh part of the document discusses the importance of training. It explains how training can help to ensure that all personnel involved in the financial system are equipped with the necessary skills and knowledge to perform their duties effectively.

8. The eighth part of the document discusses the importance of monitoring and evaluation. It explains how monitoring and evaluation can help to ensure that the financial system is operating effectively and can help to identify areas for improvement.

9. The ninth part of the document discusses the importance of reporting. It explains how reporting can help to ensure that all parties involved in the financial system are aware of the latest developments and can help to identify areas for improvement.

10. The tenth part of the document discusses the importance of documentation. It explains how documentation can help to ensure that all transactions are properly recorded and can help to identify areas for improvement.

11. The eleventh part of the document discusses the importance of security. It explains how security can help to ensure that financial information is protected from unauthorized access and can help to identify areas for improvement.

12. The twelfth part of the document discusses the importance of compliance. It explains how compliance can help to ensure that the financial system is operating in accordance with applicable laws and regulations and can help to identify areas for improvement.

13. The thirteenth part of the document discusses the importance of ethics. It explains how ethics can help to ensure that all parties involved in the financial system are acting in a fair and honest manner and can help to identify areas for improvement.

14. The fourteenth part of the document discusses the importance of innovation. It explains how innovation can help to improve the efficiency and effectiveness of the financial system and can help to identify areas for improvement.

15. The fifteenth part of the document discusses the importance of collaboration. It explains how collaboration can help to ensure that all parties involved in the financial system are working together effectively and can help to identify areas for improvement.

16. The sixteenth part of the document discusses the importance of leadership. It explains how leadership can help to ensure that the financial system is operating effectively and can help to identify areas for improvement.

17. The seventeenth part of the document discusses the importance of risk management. It explains how risk management can help to ensure that the financial system is operating in a safe and sound manner and can help to identify areas for improvement.

18. The eighteenth part of the document discusses the importance of sustainability. It explains how sustainability can help to ensure that the financial system is operating in a way that is consistent with the long-term interests of society and can help to identify areas for improvement.