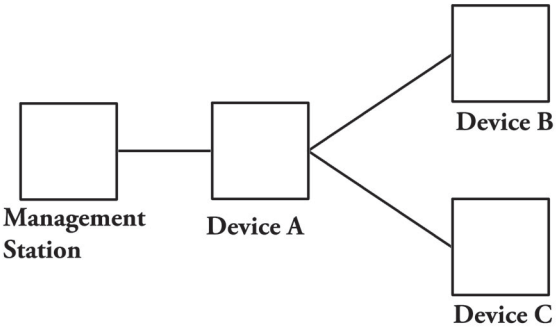

Device A	Device B	Device C	Probable Problem
1	1	1	No Problem
0	1	1	Impossible
1	0	1	Device B
1	1	0	Device C
1	0	0	Device A (Input Ports)
0	0	1	Impossible
0	1	0	Impossible
0	0	0	Device A

Pattern Matching

Note that only the most likely source of the problem is identified. For example, in the 1-0-0 situation Device A may be working fine and Device B and Device C may both be down. Perhaps this cause of the problem should be presented to the network operator as a much less probable alternative. A term used in the management industry for finding reasons for problems is "root cause." Finding the root cause of a problem implies an isolation process that will identify the cause and even a proposed solution. This is a deterministic (logic) approach. An alternative approach

is based on stochastic (probability) methods. If the known probability of Device A failing is .001 or 1/10th of one percent, and the chances of Devices B and C failing are each .005 or ½ of one percent then the chance that both B and C failed at the same time is .005 x .005 or .000025. Thus, the probable cause of a 1-0-0 pattern is .001 that the ports on Device A are broken and .000025 that Device B and C have failed. In other words, the probability that the problem is in Device A's ports is 98% .001/(.001+.000025), and the probability that it is in both Device B and C is 2% or .000025 / (.001+.000025). In this situation, it is clear that one possible solution to the problem should be pursued and the other ignored until further information suggests otherwise. But what if the probabilities had suggested two nearly equal possibilities? If the impact of the problem is severe enough, then two operators should be dispatched. Each should try to fix one of the possible causes of the problem. Of course, only one of the operators will be fixing the problem; the other operator will be conducting a priority-justified wild goose chase.

Expert Systems – In the previous example, a great deal of information was needed to determine what to do. The state of all three devices was needed. The probability of failure for each device was also needed. In addition, this example was for an extremely simple environment. Extrapolate the problem across hundreds of devices in much more complex networks, and the solution is far more difficult. A lot more information will be needed to begin the analysis process. However, top operators in the management field can