Teaching Tip

Using the OSI Model to Teach Problem Solving

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ABSTRACT

This teaching tip can help data communications and networking instructors use the Open Systems Interconnect (OSI) model to teach the problem solving approach.

Keywords: OSI model, networking, problem solving

1. INTRODUCTION

The Open Systems Interconnect (OSI) reference model organizes the processes required for network communication into seven different layers. This framework can be used to break large technical problems into a series of interrelated but smaller sub-problems, which can be solved individually and then be applied to the larger problem.

2. USING THE OSI MODEL

I have conducted lab sessions in my NTCOMM 445 (TCP/IP) class where students have used the OSI model to divide a general networking problem into its component parts. The following procedure was used:

1. Students were divided into small groups and a description of the problem was distributed.
2. A table similar to that shown in Figure 1 was drawn on the board, allowing ample space in column two to enter student suggestions.
3. A guided discussion was conducted. Group members suggested the steps required to complete the table using a bottom-up approach (Physical Layer first). Students were encouraged to be as complete as possible.
4. Groups used the table to guide them through the actual installation and configuration of hardware and software on lab computers.

Figure 1 – The OSI Model Template

OSI Layer	Steps Required
Application	
Presentation	
Session	
Transport	
Network	
Datalink	
Physical	

3. AN EXAMPLE

The following example provides additional detail on how this procedure was implemented. Students were given a problem statement similar to the following: You support a local area network for a small business and have been assigned the task of expanding your current network to accommodate additional workstations. Your supervisor wants you to create three distinct subnetworks, one for each department in your organization. Multi-homed workstations will be used as routers. Your organization has purchased additional workstations and network interface cards (NICs) for this purpose. The operating system (non-networking)

The discussion phase of the activity proceeded as mentioned in step 3 above. Students suggested the steps required for configuring the Physical Layer and I entered the information into the table or we discussed and

Figure 2 – Completed Discussion Table

OSI Layer	Steps Required
Physical	1) Determine topology. 2) Diagram the network layout. 3) Obtain the required hardware 4) Using appropriate safety procedures install and label hardware. 5) Test network for functionality
Datalink	1) Obtain and install network interface software 2) Assign or check that appropriate resources have been assigned to adapters. 3) Test functionality of adapter using diagnostic tools.
Network	1) Determine naming conventions 2) Determine IP addresses and subnet masks 3) Install and configure network layer software 4) Install routing software 5) Test connectivity using ping and traceroute

refined their suggestions prior to entering them into the table. The other layers were discussed and the table was completed. At the conclusion of the discussion a table similar to the following had been completed.

I have found that the added structure this process provides has proven to be quite beneficial to students. In labs where this approach was not used, students tended to install software before hardware, and configure it haphazardly. Students would encounter problems they could not explain or fix and would repeatedly install and reconfigure software components. The approach discussed in this paper appears to help minimize these types of student behaviors.

AUTHOR BIOGRAPHY

Dr. Thomas Cavaiani is a Special Lecturer in the Department of Networking, Operations, and Information Systems at Boise State University. He received his Ph.D. in Mathematics Education from Oregon State University in 1988. He has published in the Journal of Research on Computing in Education, has published two books on computer support, and has written and edited numerous computer application training manuals. His teaching interests include C++ programming, operating systems and the TCP/IP protocol suite. His professional credentials include MCP, MCT, MCSE, CNE, and CNI.

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