EET-1600: INDUSTRIAL ROUTERS, SWITCHES, AND OPERATING SYSTEMS FOR SMART MANUFACTURING

Cuyahoga Community College

Viewing: EET-1600 : Industrial Routers, Switches, and Operating Systems for Smart Manufacturing

Board of Trustees:
May 2024

Academic Term:
Fall 2024

Subject Code
EET - Electrical/Electronic Engineer

Course Number:
1600

Title:
Industrial Routers, Switches, and Operating Systems for Smart Manufacturing

Catalog Description:
Provides a basic understanding of networking fundamentals in manufacturing, Topics include connectivity, LAN and WAN, OSI model, subnetting, and addressing, identifying router and switch models, accessories, cabling, and interfaces between machinery and other equipment in the industrial setting.

Credit Hour(s):
2

Lecture Hour(s):
1

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
MATH-0955 Beginning Algebra or concurrent enrollment; or departmental approval.

Outcomes

Course Outcome(s):
Apply knowledge of basic networking fundamentals in modern manufacturing settings and solve common service issues.

Objective(s):
1. Explain networking fundamentals including connectivity, LAN and WAN, OSI model, subnetting, and addressing.
2. Identify router and switch models, accessories, cabling, and interfaces.
3. Describe IOS Software operating modes.
4. Identify commonly found software such as Cisco, Philips, and Rockwell.
5. Use the Cisco Command Line Interface (CLI) to connect and service products.
6. Recognize the interfaces on equipment including the Cisco Catalyst 6500, 4500, 3560, 3750 and 9300 and 2960 series switches and Cisco 2800, 2900, 3800, 3900, 7200X series integrated service routers.
7. Utilize cabling on Cisco/Rockwell or similar equipment for connecting machinery to each other over an industrial network.
8. Describe the different operating modes for CatOS/IOS software.
9. Determine the current mode of the device.
10. Use and interpret the basic IOS software commands.
11. Perform software upgrade or downgrade using TFTP, xmodem, tftpdnld, flash memory, memory card reader, or USB.
12. Perform password recovery on a Cisco or similar device.
13. Describe IP addressing and subnet.

14. Differentiate between these Layer 2 technologies: Ethernet, Fast Ethernet, Gigabit Ethernet, Serial, ATM, ISDN, DSL, Optical.
15. Explain what TFTP does.
16. Explain what a CSU/DSU does (such as loop back processes).
17. Explain Telco termination point (such as demarc).
18. Explain what Telnet and SSH do.
19. Describe what ping and extended does.
20. Use the OSI and TCP/IP models and their associated protocols to explain how data flows in a network.
21. Identify and correct common network problems at Layers 1 and 2.

Course Outcome(s):

Apply the basic concepts of networking in industrial automation systems.

Objective(s):
1. Perform support and maintenance of routers, switches, and operating environments.
2. Diagnose, restore, repair, and replace critical networking and system devices.
3. Demonstrate understanding of the IOS by configuring, connecting, and troubleshooting the device.

Course Outcome(s):

Apply industrial networks knowledge and configure a wireless network within an industrial environment.

Objective(s):
1. Recognize the contrast between enterprise and industrial environments.
2. Configure tools for industrial ethernet switches.
3. Recognize layer 2 considerations.
4. Explain layer 2 resiliency using spanning tree protocol.
5. Explain troubleshooting methodologies.
6. Configure ethernet/IP communications.
7. Describe the basic PROFINET devices.
8. Explain ring network requirements.
9. Identify common ethernet/IP Issues.
10. Describe ethernet/IP troubleshooting methods and tools.
11. Perform maintenance of routers, switches, and operating environments.
12. Diagnose, restore, repair, and replace critical networking and system devices.
13. To understand the IOS software operating modes and identify commonly found software.
14. Demonstrate ability to use the command line interface (CLI) to connect and service products.

Methods of Evaluation:
1. Tests
2. Quizzes
3. Laboratory Reports
4. Homework
5. Projects

Course Content Outline:
1. Networking fundamentals
   a. Connectivity
   b. LAN and WAN
   c. OSI model
   d. Subnetting
   e. Addressing
2. Identification of networking equipment

     a. Routers
     b. Switch models
     c. Accessories
     d. Cabling
     e. Interfaces
3. IOS software.
     a. Operating modes
     b. Identify commonly found software
     c. Use of the Command Line Interface (CLI) to connect and service products
4. Cisco equipment interfaces
     a. Cisco Catalyst 6500, 4500, 3560, 3750 and 9300 and 2960 series switches
     b. Cisco 2800, 2900, 3800, 3900, 7200X series integrated service routers
5. Ability to use cabling on equipment
     a. Hardware memory common terms and use in routers and switches
     b. Different operating modes for CatOS/IOS software
     c. Determining the current mode of the device
     d. The basic IOS software commands
6. Upgrading/downgrading software using TFTP, xmodem, tftpdnld, flash memory, memory card reader, or USB
     a. Perform password recovery on a device
     b. Describe IP addressing and subnet
7. Differentiate between Layer 2 technologies: Ethernet, Fast Ethernet, Gigabit Ethernet, Serial, ATM, ISDN, DSL, Optical, etc.
     a. Purpose and function of TFTP
     b. Purpose and function of CSU/DSU
     c. Purpose and function of Telco termination point
     d. Purpose and function of Telnet and SSH
     e. Description of what ping and Extended does
     f. OSI and TCP/IP models and associated protocols of how data flows in a network
8. Identification and correction of common network problems at Layers 1 and 2 application
     a. Cabling mismatch
     b. Disabled port
     c. Operator error
     d. Incorrect protocol

Resources

Roberts, Richard M. and Chuck Easttom. *Networking Fundamentals*. 3rd ed. Goodheart-Willcox, 2020. https://www.g-w.com/networking-fundamentals-2020

Hanes, David, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, and Jerome Henry. *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things* . 1st ed. Cisco Press, 2020. https://www.ciscopress.com/store/iot-fundamentals-networking-technologies-protocols-9781587144561

Lammle, Todd. *Understanding Cisco Networking Technologies, Volume 1: Exam 200-301*. John Wiley & Sons, 2020. https://www.wiley.com/en-us/Understanding+Cisco+Networking+Technologies%2C+Volume+1%3A+Exam+200+301-p-9781119659020

Odom, Wendell. *CCNA 200-301 Official Cert Guide, Volume 1*. 1st ed. Cisco Press, 2020. https://www.ciscopress.com/store/ccna-200-301-official-cert-guide-volume-1-9780135792735

Odom, Wendell. *CCNA 200-301 Official Cert Guide, Volume 2* . 1st ed. Cisco Press, 2020. https://www.ciscopress.com/store/ccna-200-301-official-cert-guide-volume-2-9781587147135

Russ White. (2023) *Cisco Certified Support Technician CCST Networking 100-150 Official Cert Guide,* Cisco Press. https://www.ciscopress.com/store/cisco-certified-support-technician-ccst-networking-9780138213428

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