

## Introduction

The PACS Troubleshooting Techniques course will teach the imaging engineer the technical skills necessary to understand help resolve “finger pointing” issues that resolve in today’s medical imaging departments. Students will learn to isolate problem areas between systems where vendor A blames vendor B, and vendor B blames vendor A. These issues can be time consuming and expensive to resolve, as there is no subject matter expert in the middle to determine which system is causing the issue.

We will begin with basic hardware troubleshooting between systems, then use tools such as DICOM emulators and network sniffers to analyze traffic between the problematic systems.

## Prerequisites

The seasoned service professional must have a basic understanding of computer fundamentals, be able to navigate windows operating system, and imaging experience on various modalities. Students are required to bring their own laptop

## Objectives

Upon completion of the course participants will be able to:

- Cut any PACS communication problem in half by eliminating one system or the other
- Perform day-to-day network troubleshooting
- Demonstrate understanding of architecture and communication between modalities
- Recognize DICOM and software related transmission problems
- Implement and troubleshoot specific problems using software emulators

- Implement and troubleshoot specific problems using non-invasive network sniffers

## Course Outline

### Day 1

- Networking technology
  - Hardware
  - Ethernet, TCP/IP
    - Addressing
    - Routing
    - Subnetting
      - Lay out hospital subnets
    - Configuration
    - TCP packet analysis
    - Troubleshooting
- PACS architecture
  - PACS components
  - Communication
  - Components
- DICOM Standard overview
  - DICOM configuration
  - DICOM header analysis

### Day 2

- DICOM Services
- DICOM SOP Classes
- DICOM transmission analysis
  - Association troubleshooting
  - DICOM PDU’s
  - DICOM error code standardization
- Configuration network modalities
  - Application entities
  - DICOM troubleshooting
    - DICOM emulators
    - TCP/IP ping
    - DICOM verification (echo)
    - Send/Receive test messages
    - Modify image headers
    - Image anonymization

### Day 3

- DICOM troubleshooting (Cont’d)
  - DICOM emulators
  - TCP/IP ping
  - DICOM verification (echo)
  - Send/Receive test messages
  - Modify image headers
  - Image anonymization

### Labs (dependent on equipment availability for on-site courses):

- Windows PACS Server:
  - Assemble Server with RAID Array
  - Configure & Format RAID Array
  - Install Windows OS
  - Install MySQL Database
  - Configure MySQL Database
  - Install Open-Source PACS software
  - Configure Open-Source PACS software
  - Test Open-Source PACS install using various modalities & laptop troubleshooting tools
- Linux PACS Server
  - Assemble Server with RAID Array
  - Configure & Format RAID Array
  - Install Linux OS
  - Install MySQL Database
  - Configure MySQL Database
  - Install Open-Source PACS software
  - Configure Open-Source PACS software
  - Test Open-Source PACS install using various modalities & laptop troubleshooting tools