RADIOLOGICAL SERVICE TRAINING INSTITUTE

Diagnosing Problems in a PACS Network Using Software Emulators



Todd Boyland, CEO, RSTI Training

1

RADIOLOGICAL SERVICE TRAINING INSTITUTE RSTI

Objectives

- Identify “finger pointing” issues that arise in PACS networks
- Introduce DICOM Emulators and basic operations
- Use DICOM emulators to troubleshoot problems between systems in PACS networks
- Demonstrate DICOM Emulator troubleshooting techniques and logging
- Make troubleshooting techniques so easy you have no excuse not to implement them

2

What we are going to cover

- What you need to implement basic troubleshooting using emulators
  - Client/Server relationship
  - DICOM SCU/SCP
  - Port #'s and DICOM listening ports
  - AE Titles

3

What we are not going to cover

- DICOM Information Objects (IO's)
- DICOM SOP Classes (Service Object Pairs)
- DICOM Transfer Syntaxes
- Enhanced DICOM Services:
  - Storage Commitment
  - MPPS (Modality Performed Procedure Step)

4

Important Concepts

- Client/Server relationship
  - What is a client?
  - What is a server?
  - Who initiates any network communication?
- Port #'s and DICOM listening ports
  - http://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xhtml

5

Important Concepts

- DICOM SCU/SCP
  - Service Class User
  - Service Class Provider
  - Who initiates any DICOM communication?
- AE Titles
  - Application Entity – Name for DICOM application
    - 16 Character max
    - Case sensitive
    - No spaces
    - Unique within LAN

6

Principles of Transferring Medical Images:

Networking – The practice of linking computers together for the purpose of sharing data

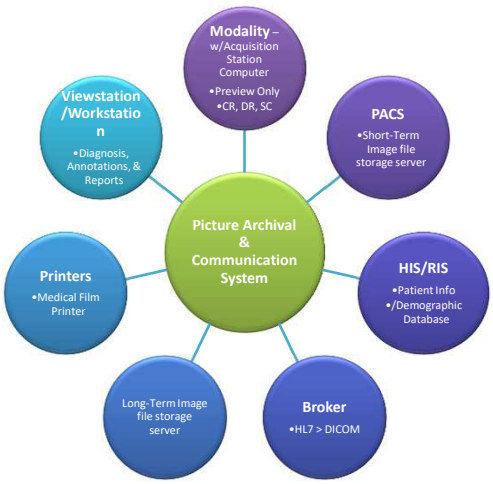
- TCP/IP – Refers to network communication
  - Transmission Control Protocol (TCP) is a Transport layer
  - Internet Protocol (IP) is a Network layer
- TCP transport is used to deliver data across IP networks

DICOM – Digital Imaging & Communications in Medicine

- Standard used to transfer medical images
- Includes a file format definition (.DCM) & a communications protocol (TCP/IP)

7

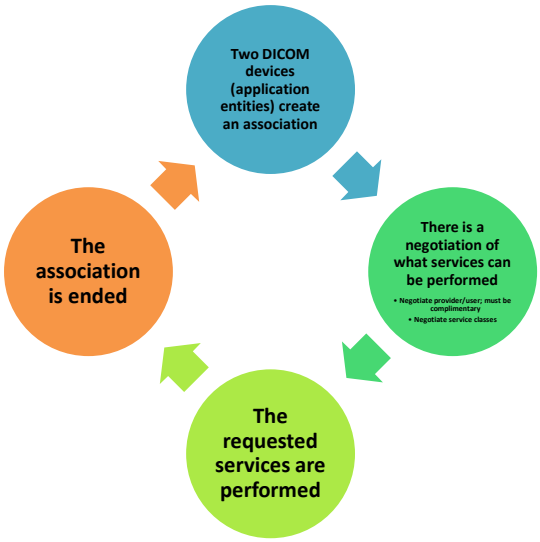
PACS/Digital Imaging Components



8

RADIOLOGICAL SERVICE TRAINING INSTITUTE RSTI

How does it work?



9

RADIOLOGICAL SERVICE TRAINING INSTITUTE RSTI

DICOM Services



10

DICOM Services



Store SCU
Print SCU
MWL SCU

•DICOM Store
•DICOM Print
•DICOM Query/Retrieve
•DICOM Modality Worklist



Print SCP



Store SCU
Store SCP
Print SCU
Q/R SCU



Store SCP
Store SCU
Q/R SCP



MWL SCP

11

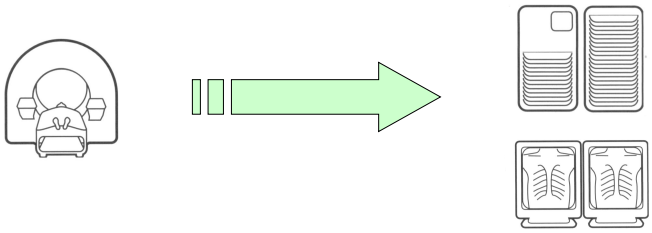
What is needed for DICOM communications?

- Application entity (AE) title
  - Name 16 characters & case sensitive
- IP Address
  - Address
- SNM
  - Sub Net Mask
- Port Number
  - Listening port #

12

What DICOM Service Classes Do You Need?

- DICOM Store

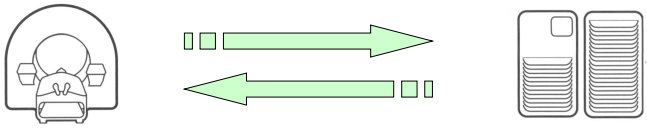


•Modality (SCU) Store to viewstation (SCP) or PACS (SCP)

13

Query Retrieve

- DICOM Query/Retrieve

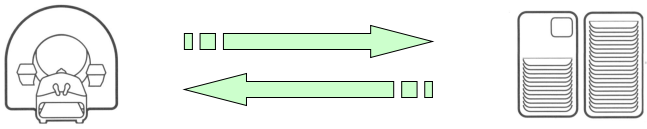


•Modality (SCU) Queries PACS (SCP)

14

Modality Worklist (MWL)

- DICOM MWL

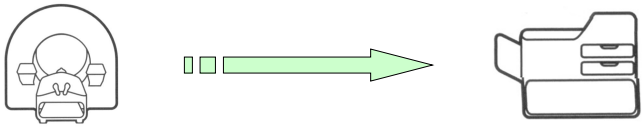


•Modality (SCU) Queries RIS/MWL (SCP) for scheduling data

15

Print

- DICOM Print

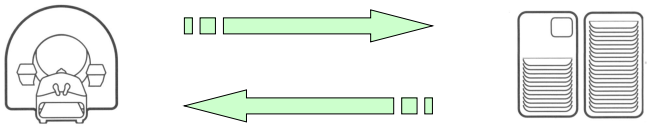


•Modality (SCU) Prints to Printer (SCP)

16

Verification

- Modality Verification – DICOM Verify



•Modality Verify (SCP&SCU) existence and readiness of destination (SCP)

•"DICOM Ping"

•SCP's are required to support Verification SCP

•How do you send a DICOM ECHO?

17

DICOM Header

0008,0005,Specific Character Set: ISO.IR 100
0008,0008,Image Type: ORIGINAL\PRIMARY
0008,0016,SOP Class UID: 1.2.840.10008.5.1.4.1.1.1.2.1.
0008,0018,SOP Instance UID: 1.2.840.1136817.754.3212254898.9
0008,0020,Study Date: 20021016
0008,0021,Series Date: 20021016
0008,0022,Acquisition Date: 20021016
0008,0023,Image Date: 20021016
0008,0030,Study Time: 170140
0008,0031,Series Time: 170144
0008,0032,Acquisition Time: 170744
0008,0033,Image Time: 170744
0008,0050,Accession Number: 48275
0008,0060,Modality: MG
0008,0068,?: FOR PROCESSING
0008,0070,Manufacturer: LORAD
0008,0080,Institution Name: RSTI Training Center
0008,0081,City Name: 30745 Solon Rd. Solon, OH
0008,0090,Referring Physician's Name: Todd Boyland
0008,1010,Station Name: selenia
0008,1030,Study Description: Standard Screening
0008,103E,Series Description: 1128472652
0008,1060,Name Phys(s) Read Study:
0008,1070,Operator's Name: Andrea
0008,1080,Admitting Diagnosis Description: Screening
0008,1090,Manufacturer's Model Name: Mammo-Clinical
0008,2111,?: 93.Breast.2.25456.2.0.1.0.46.151.151.151.59.41.341.143
0018,0060,KVP [Peak Output, KV]: 28
0018,1000,Device Serial Number: H1KRHR830f12f3
0018,1004,?: Array Temp 22.22C
0018,1020,Software Version: MAMMODROC.1.1.0.3
0018,1030,Protocol Name: 1128472652
0018,1110,Distance Source to Detector [mm]: 650
0018,1111,Distance Source to Patient [mm]: 610
0018,1147,?: RECTANGLE
0018,1150,Exposure Time [ms]: 540028982
0018,1151,X-ray Tube Current [mA]: 100
0018,1152,Acquisition Device Processing Description:
0018,1164,?: .070\.070
0018,1166,?: HTC.IN
0018,1170,Generator Power:
0018,1190,Focal Spot[s]: 540225072
0018,11A0,?: 808333881
0018,11A2,?: 0.0000000
0018,1200,Date of Last Calibration: 021124
0018,1201,Time of Last Calibration: 143000
0018,1260,Plate Type: aSe
0018,1400,Acquisition Device Processing Description:
0018,1401,Acquisition Device Processing Code:
0018,1402,Cassette Orientation: PORTRAIT
0018,1403,Cassette Size: 24CMx29CM
0018,1508,?: MAMMOGRAPHIC
0018,1510,Positioner Primary Angle: 8240
0018,5101,View Position: CC
0019,1028,?: 24x29
0028,0030,Pixel Spacing: .070\.070

18

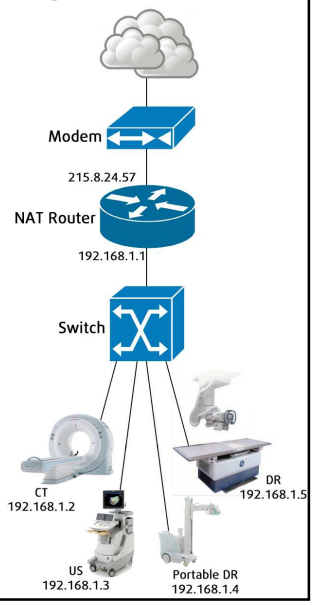
X

- XXXXXX
  - X
  - X
  - X
  - x

19

Connectivity Testing

- TCP/IP ping
  - Used to test and verify hardware communication between two devices.
  - TCP/IP command, which means it is part of the TCP/IP protocol stack, and not built into the OS (Operating System).
    - This makes ping OS independent and will function on Windows, UNIX, Linux, Solaris, etc...
  - Beware: firewalls



20

Connectivity Testing

- TCP/IP netstat
  - Command line tool that displays network connections, routing tables, and many more network statistics.
    - -a displays all active connections
    - -n displays all TCP connections

```
C:\Documents and Settings\Todd Boyland>netstat -a

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    TB:104                 TB:0                   LISTENING
  TCP    TB:epmap               TB:0                   LISTENING
  TCP    TB:microsoft-ds        TB:0                   LISTENING
  TCP    TB:104                 10.0.0.10:1099         ESTABLISHED
  TCP    TB:netbios-ssn         TB:0                   LISTENING
  TCP    TB:1099                10.0.0.10:104          ESTABLISHED
  TCP    TB:1030                TB:0                   LISTENING
  TCP    TB:1038                TB:0                   LISTENING
  TCP    TB:1069                localhost:1070         ESTABLISHED
  TCP    TB:1070                localhost:1069         ESTABLISHED
  TCP    TB:1072                localhost:1073         ESTABLISHED
  TCP    TB:1073                localhost:1072         ESTABLISHED
  TCP    TB:5152                TB:0                   LISTENING
```

21

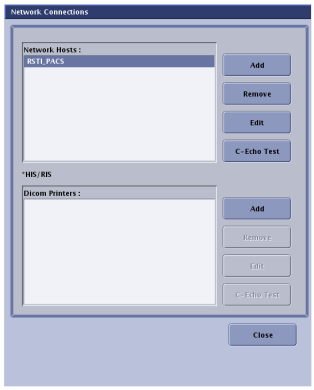
Connectivity Testing

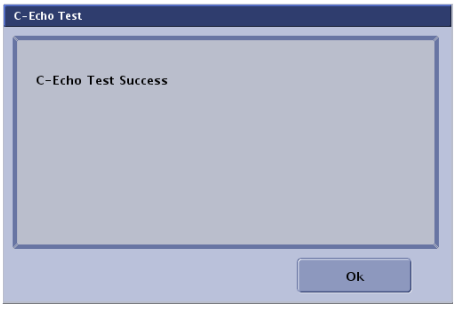
- DICOM ECHO
- Understanding:
  - What does a failed ping tell you?
  - What does a successful ping, but failed DICOM ECHO tell you?
  - What does a successful DICOM ECHO tell you?
  - Troubleshooting starts by isolating hardware vs content

22

Connectivity Testing

- DICOM ECHO
  - May not be available, results may not be intuitive
  - Examples: GE DR

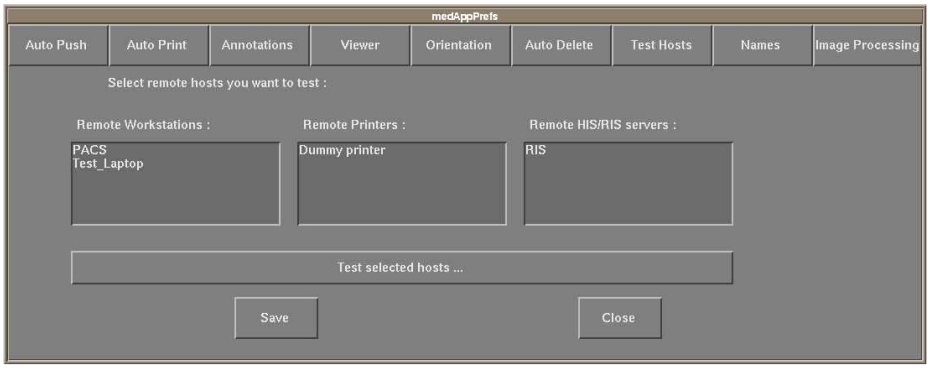




23

Connectivity Testing

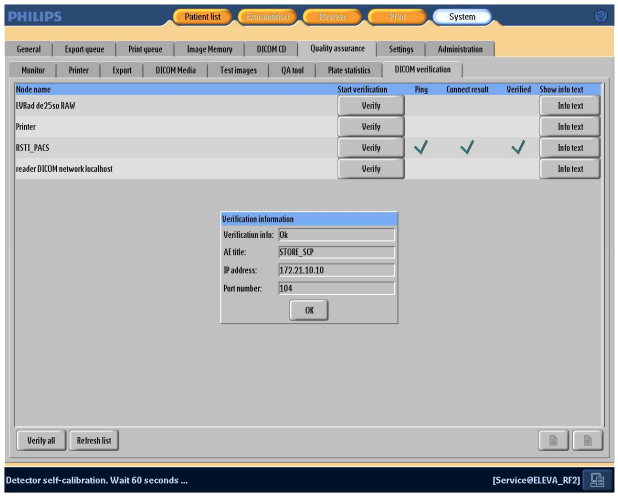
- DICOM ECHO examples: GE MG



24

Connectivity Testing

- DICOM ECHO examples: Philips DR



25

Advanced Troubleshooting Tools: DICOM Emulation

- DICOM Emulators:
  - JDICOM (<=Win XP)
    - All tools built within 1 application
    - No longer supported, but works great for basic troubleshooting
  - DVTk (>=Win7)
    - Separate application for each tool
      - Send image
      - Receive image
      - Request worklist
      - Provide worklist
      - Etc…
    - Currently updates being released

26

DICOM Emulation - DVTk

- DVTk is an open source project for testing, validating and diagnosing communication protocols and scenario's in medical environments. It supports DICOM, HL7 and IHE integration profiles.
- Each SCU/SCP is a standalone application:
  - Storage SCU Emulator
  - Storage SCP Emulator
  - Query/Retrieve SCP Emulator
  - RIS Emulator
- Definition Files
  - Contain validation rules that enable DICOM Messages and DICOM Files to be validated against the DICOM standard. These DICOM Definition Files are used by all DVTk based applications.
  - Required to ensure SCU/SCP applications are up to date w/ changes to the DICOM standard

27

DVTk - Installation

- Install desired DVTk application on service laptop based on troubleshooting scenario:
  - Storage SCU Emulator
  - Storage SCP Emulator
  - Query/Retrieve SCP Emulator
  - RIS Emulator
- Install DVTk Definitions

28

Before You Begin

(With any emulator/sniffer troubleshooting)

- Determine & record connectivity parameters for all systems involved!
  - For all systems:
    - IP Address (always required)
    - Subnet Mask (may be required)
    - Default Gateway (may be required)
    - AE Title (always required)
    - Listening Port (always required, If system is SCP)
- Eliminate the obvious:
  - Has this ever worked?
  - What has changed recently?
    - Product upgrades/patches/reconfiguration/vendor visit?
  - Ping
    - A > B
    - B > A
    - A > C (default gateway)
    - B > C (default gateway)

29

Problem Scenario: Modality cannot send image to PACS

- Modality OEM: “Our unit is working fine”
- PACS Admin: “PACS is working fine”, “We haven’t changed anything lately”

30

Scenario 1, Emulate SCU

- What settings do I use on my laptop?
  - Can I make up any settings?
    - IP
    - SNM
    - AE Title
    - Port #
  - Can I getting static IP settings from IT to verify there is no conflict?
  - What would be the best solution?
  - Why is this the best solution?
  - How do I accomplish this if those settings are already in use by other systems?

31

Scenario 1, Emulate SCU



32

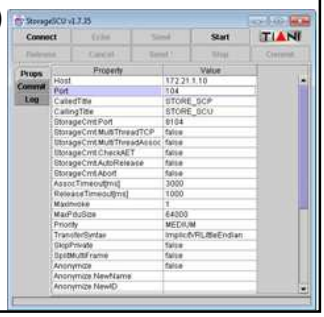
Scenario 1, Emulate SCU



33

JDICOM – Scenario 1, Emulate SCU: DICOM ECHO

1. Set static IP in OS
2. Run JDicom program “StorageSCU”
3. In the “Props” tab, fill in:
   - Host = IP Address of SCP (of the PACS/destination)
   - Port = DICOM port # (of the PACS/destination)
   - Called Title = AE Title (of the PACS/destination)
   - Calling Title = AE Title of Your Laptop (Modality/Store SCU)
   - Set Verbose to:
     - 1 for no PDU logging
     - 2 for DIMSE logging in PDU’s
     - 3 for detailed DIMSE logging in PDU’s
4. Click: Connect



34

JDICOM – Scenario 1, Emulate SCU: DICOM ECHO

5. Click Log Tab
   - Log should now read (Where STORE_SCP is the AE Title of the PACS/destination):
     - jdicom: #2:STORE_SCP << A-ASSOCIATE-RQ PDU
     - jdicom: #2:STORE_SCP >> A-ASSOCIATE-AC PDU
6. Click: Echo (or Send, to transfer an image)
   - Log should now read:
     - jdicom: #2:STORE_SCP << C-ECHO-RQ Verification SOP Class
     - jdicom: #2:STORE_SCP >> C-ECHO-RSP , status #0000H[Success]
7. Click: Release
   - Log should now read:
     - jdicom: #2:STORE_SCP << A-RELEASE-RQ PDU
     - jdicom: #2:STORE_SCP >> A-RELEASE-RP PDU
     - jdicom: #2:STORE_SCP closing socket

35

DVTk – Scenario 1, Emulate SCU: DICOM ECHO

- Set static IP in OS
- Open "Storage SCU Emulator"
  - Configure/Verify SCP settings
  - Configure/Verify SCU settings
  - Ping SCP
  - Perform DICOM Echo
  - Review Logging (tab)
  - Select: Display Validation Result
  - Select: Detail Results
  - Verify:
    - A_ASSOCIATE_RQ
    - A_ASSOCIATE_AC
    - C_ECHO_RQ
    - C_ECHO_RSP
      - 0000,0900 = Status Code, Value of 0000 = SUCCESS
    - A_RELEASE_RQ
    - A_RELEASE_RP





36

DVTk – Scenario 1, Emulate SCU: DICOM ECHO

- What do these results tell us?
  - A_ASSOCIATE_RQ
  - A_ASSOCIATE_AC
  - C_ECHO_RQ
  - C_ECHO_RSP
    - 0000,0900 = Status Code, Value of 0000 = SUCCESS
  - A_RELEASE_RQ
  - A_RELEASE_RP
- Why don't you see a (0000,0900) tag in the C_ECHO_RQ?

37

DVTk – Scenario 1, Emulate SCU: DICOM STORE

- Open "Storage SCU Emulator"
  - Configure/Verify SCP settings
  - Configure/Verify SCU settings
  - Ping SCP
  - File > Export DICOM Data > Select DICOM Files
  - Review Logging (tab)
  - Select: Display Validation Result
  - Select: Detail Results
  - Verify:
    - A_ASSOCIATE_RQ
    - A_ASSOCIATE_AC
    - C_STORE_RQ
    - C_STORE_RSP
      - 0000,0900 = Status Code, Value of 0000 = SUCCESS
    - A_RELEASE_RQ
    - A_RELEASE_RP





38

DVTk – Scenario 1, Emulate SCU: DICOM STORE

- What do these results tell us?
  - A_ASSOCIATE_RQ
  - A_ASSOCIATE_AC
  - C_STORE_RQ
  - C_STORE_RSP
    - 0000,0900 = Status Code, Value of 0000 = SUCCESS
  - A_RELEASE_RQ
  - A_RELEASE_RP

39

DVTk – Scenario 1, Emulate SCU: DICOM ECHO

- What would it mean if the DICOM ECHO was successful, but the DICOM STORE failed?
  - A_ASSOCIATE_RQ
  - A_ASSOCIATE_AC
  - C_ECHO_RQ
  - C_ECHO_RSP
    - 0000,0900 = Status Code, Value of 0000 = SUCCESS
  - A_RELEASE_RQ
  - A_RELEASE_RP

  - A_ASSOCIATE_RQ
  - A_ASSOCIATE_AC
  - C_STORE_RQ
  - C_STORE_RSP
    - 0000,0900 = Status Code, other than 0000 = Problem
  - A_RELEASE_RQ
  - A_RELEASE_RP

40

Scenario 2, Emulate SCP

- What settings do I use on my laptop?
  - Can I make up settings?
    - IP
    - SNM
    - AE Title
    - Port #
  - Can I get static IP settings from IT to verify there is no conflict?
  - What would be the best solution?
  - Why is this the best solution?
  - How do I accomplish this if those settings are already in use by other systems?

41

Scenario 2, Emulate SCP



42

Scenario 2, Emulate SCP



43

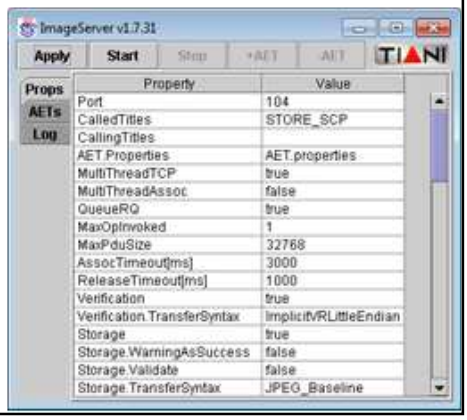
JDICOM – Scenario 2, Emulate SCP

1. Set static IP in OS
2. Run JDicom program “ImageServerGUI”
3. In the “Props” tab, fill in:
   - Port = DICOM port # of the SCP (your laptop)
   - Called Title = AE Title of the STORE SCP (your laptop)
   - Calling Title = AE Title of STORE SCU (the modality, leave blank for promiscuous mode)
   - Set Verbose to:
     - 1 for no PDU logging
     - 2 for DIMSE logging in PDU’s
     - 3 for detailed DIMSE logging in PDU’s
   - Fileset.Path must be set to a valid directory where you want received images to be stored. (ex. Create a directory called “images” in the JDICOM folder, the path will then read: c:/program files/jdicom/images

44

JDICOM – Scenario 2, Emulate SCP

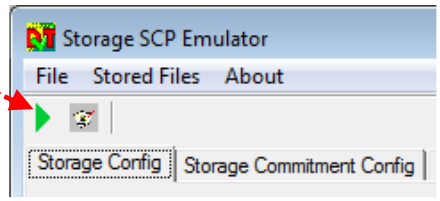
4. Check to ensure transfer syntaxes are the same as device trying to communicate with.
5. Click: Apply
6. Click: Start
7. Click Log Tab
   - Log should now read: "Waiting for invocations from clients..." near the bottom of the log



45

DVTk – Scenario 2, Emulate SCP

- Set static IP in OS
- Open "Storage SCP Emulator"
  - Configure/Verify settings in "Storage Config" (tab)
  - Click: Run Emulator
  - From modality:
    - Perform DICOM Echo (if possible)
    - Perform DICOM STORE functions
  - Review Logging (tab)
  - Verify:
    - ASSOCIATE_RQ
    - ASSOCIATE_AC
    - STORE_RQ
    - STORE_RSP
      - 0000,0900 = Status Code, Value of 0000 = SUCCESS
    - RELEASE_RQ
    - RELEASE_RP



46

Emulator Overview

- Program your laptop to act as a DICOM device
- Laptop actively participates in DICOM communication
- Cut the problem in half
- Obtain record of what is actually happening
- Can send logs to PACS Admin's, Vendors, or tech support personnel
- Can utilize more advanced techniques than we have time to cover:
  - Changing SOP classes
  - Using compression
  - Changing Transfer Syntaxes
  - Multiple vs Single association settings
  - Etc…
- It is as easy as it sounds

47

Questions?

48

RADIOLOGICAL SERVICE TRAINING INSTITUTE

Thank You For Your Time

Todd Boyland, CEO, RSTI Training



For more information on RSTI and how our training programs can help to keep your organization moving in the right direction contact us at 440.349.4700 or find us on-line at rsti-training.com

49

```
172.21.1.50(1061)-172.21.1.122(104) Type 1 PDU : Length = 230 : Direction = OUT
25-Jan-07 19:28:28.263 to 19:28:28.263
Association Request
  Acceptor:  RSTI_PACS
  Initiator: DSM_MG_SCU
DICOM UID: 1.2.840.10008.3.1.1.1
Outer Type 20
  Presentation Context 1
    Type 30 : 1.2.840.10008.5.1.4.1.1.1.2
    Type 40 : 1.2.840.10008.1.2
    Type 40 : 1.2.840.10008.1.2.1
  Outer Type 50
    Max PDU : 31744
    Type 52 : 2.16.840.1.113816.40.19991231
    Type 55 : 1.0.3
172.21.1.122(104)-172.21.1.50(1061) Type 2 PDU : Length = 187 : Direction = IN
25-Jan-07 19:28:28.556 to 19:28:28.749
Association Acceptance
  Acceptor:  RSTI_PACS
  Initiator: DSM_MG_SCU
DICOM UID: 1.2.840.10008.3.1.1.1
Outer Type 21
  Presentation Context 1
    Result/Reason = 00
    Type 40 : 1.2.840.10008.1.2.1
  Outer Type 50
    Max PDU : 32768
    Type 52 : 1.2.826.0.1.3680043.2.60.0.1
    Type 55 : softlink_jdt103
DataSet logged to file C:\Logs\Sniff\20070125_142643\0000_172.21.1.50(1061)-
172.21.1.122(104)\0_OUT.dcm at 1/25/2007 2:28:30 PM
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 140 : Direction = OUT
25-Jan-07 19:28:30.428 to 19:28:30.428
  PDV Length=136  PCID = 1  Type = COMMAND  Last Fragment
(0000,0000) UL 0004: 0000007A
(0000,0002) UI 001C: 1.2.840.10008.5.1.4.1.1.1.2
(0000,0100) US 0002: 0001
(0000,0110) US 0002: 0001
(0000,0700) US 0002: 0000
(0000,0800) US 0002: 0102
(0000,1000) UI 0026: 2.16.840.1.113816.50.4.20031203.151421
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 2492 : Direction = OUT
25-Jan-07 19:28:30.434 to 19:28:30.436
  PDV Length=2488  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.439 to 19:28:30.490
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.490 to 19:28:30.540
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.540 to 19:28:30.606
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.606 to 19:28:30.660
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
```

```
25-Jan-07 19:28:30.660 to 19:28:30.721
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.721 to 19:28:30.786
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.786 to 19:28:30.845
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.845 to 19:28:30.905
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.905 to 19:28:30.962
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:30.963 to 19:28:31.019
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:31.022 to 19:28:31.077
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:31.077 to 19:28:31.137
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:31.138 to 19:28:31.193
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:31.193 to 19:28:31.250
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:31.250 to 19:28:31.308
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 32742 : Direction = OUT
25-Jan-07 19:28:31.308 to 19:28:31.365
  PDV Length=32738  PCID = 1  Type = DATA  Continues...
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 518 : Direction = OUT
25-Jan-07 19:28:31.366 to 19:28:31.372
  PDV Length=514  PCID = 1  Type = DATA  Continues...
DataSet logged to file C:\Logs\Sniff\20070125_142643\0000_172.21.1.50(1061)-
172.21.1.122(104)\1_OUT.dcm at 1/25/2007 2:28:32 PM
172.21.1.50(1061)-172.21.1.122(104) Type 4 PDU : Length = 6 : Direction = OUT
25-Jan-07 19:28:31.495 to 19:28:31.495
Illegal empty PDV
  PDV Length=2  PCID = 1  Type = DATA  Last Fragment
(0008,0008) CS 0010: ORIGINAL\PRIMARY
(0008,0016) UI 001C: 1.2.840.10008.5.1.4.1.1.1.2
(0008,0018) UI 0026: 2.16.840.1.113816.50.4.20031203.151421
(0008,0020) DA 0008: 20031203
(0008,0023) DA 0008: 20031203
(0008,0030) TM 0006: 151223
(0008,0033) TM 0006: 151401
(0008,0050) SH 0000:
(0008,0060) CS 0002: MG
(0008,0068) CS 0010: FOR PRESENTATION
(0008,0070) LO 0018: Lorad, A Hologic Company
(0008,0080) LO 0004: RSTI
(0008,0081) ST 000E: 30745 Solon Rd
```

```
(0008,0090) PN 0000:
(0008,1010) SH 0008: DSM2000
(0008,1030) LO 0018: Digital Spot Compression
(0008,1070) PN 0004: rrr
(0008,1090) LO 0004: DSM
(0008,2218) SQ 0032:
>(0008,0100) SH 0008: T-04000
>(0008,0102) SH 0004: SNM3
>(0008,0104) LO 0006: Breast
-------------
(0010,0010) PN 0008: qa test
(0010,0020) LO 0008: 7654321
(0010,0030) DA 0000:
(0010,0040) CS 0000:
(0018,0015) CS 0006: BREAST
(0018,0060) DS 0002: 28
(0018,1050) DS 0006: 0.166
(0018,1150) IS 0004: 100
(0018,1152) IS 0002: 7
(0018,1164) DS 000C: 0.024\0.024
(0018,11A0) DS 0004: 45.5
(0018,1508) CS 000C: MAMMOGRAPHIC
(0018,1510) DS 0004: -15
(0018,7004) CS 000C: SCINTILLATOR
(0020,000D) UI 0026: 2.16.840.1.113816.50.2.20031203.151223
(0020,000E) UI 0026: 2.16.840.1.113816.50.3.20031203.151223
(0020,0010) SH 0000:
(0020,0011) IS 0000:
(0020,0013) IS 0000:
(0020,0020) CS 0004: L\A
(0020,0062) CS 0002: B
(0020,4000) LT 000A: first test
(0028,0002) US 0002: 0001
(0028,0004) CS 000C: MONOCHROME1
(0028,0010) US 0002: 0200
(0028,0011) US 0002: 0200
(0028,0034) IS 0004: 1\1
(0028,0100) US 0002: 0010
(0028,0101) US 0002: 000E
(0028,0102) US 0002: 000D
(0028,0103) US 0002: 0000
(0028,0301) CS 0002: NO
(0028,1040) CS 0004: LIN
(0028,1041) SS 0002: 0001
(0028,1050) DS 000A: 5223\5223
(0028,1051) DS 000A: 5301\5301
(0028,1052) DS 0002: 0
(0028,1053) DS 0002: 1
(0028,1054) LO 0002: US
(0028,2110) CS 0002: 00
(0040,0318) CS 0006: BREAST
(0040,0555) SQ 0000:
(0054,0220) SQ 003A:
>(0008,0100) SH 0008: R-10242
>(0008,0102) SH 0004: SNM3
>(0008,0104) LO 000E: cranio-caudal
-------------
```

```
(0054,0222) SQ 003C:
>(0008,0100) SH 0008: R-102D7
>(0008,0102) SH 0004: SNM3
>(0008,0104) LO 0010: Spot Compression
-------------
(0060,3000) SQ 044A:
>(0060,3002) US 0002: 0100
>(0060,3004) US 0002: 0000
>(0060,3006) US 0002: 3FFF
>(0060,3008) US 0002: 0040
>(0060,3010) LO 000A: Luminance
>(0060,3020) UL 0400: 00587AB0 00587AB4 00587AB8 00587ABC 00587AC0 ...
-------------
(0071,0010) LO 0026: LORAD - A Hologic Company, Group 0071
(0071,1000) US 0002: 0000
(0071,1001) US 0002: 0017
(0071,1002) US 0002: 0000
(0071,1003) US 0008: 00CC 0008 0101 0009
(0071,1004) US 0008: 00B2 00CA 0101 0009
(0071,1005) FL 000C: -10.82618 19.10811 -31.60832
(0071,1008) US 0002: 0000
(0071,1009) SH 0002: ?
(0071,100A) US 0002: 0000
(0071,100B) ST 0028: c:\DSMDB\7654321\12-03-2003\151241_L.img
(2050,0020) CS 0008: IDENTITY
(7FE0,0010) OW 80000: 0418 0403 0427 043F 043A 0436 0449 045A 0469 0472 ...
DataSet logged to file C:\Logs\Sniff\20070125_142643\0000_172.21.1.50(1061)-
172.21.1.122(104)\2_IN.dcm at 1/25/2007 2:28:33 PM
172.21.1.122(104)-172.21.1.50(1061) Type 4 PDU : Length = 172 : Direction = IN
25-Jan-07 19:28:32.861 to 19:28:33.055
  PDV Length=168  PCID = 1  Type = COMMAND  Last Fragment
(0000,0000) UL 0004: 0000009A
(0000,0002) UI 001C: 1.2.840.10008.5.1.4.1.1.1.2
(0000,0100) US 0002: 8001
(0000,0120) US 0002: 0001
(0000,0800) US 0002: 0101
(0000,0900) US 0002: B000
(0000,0902) LO 0018: set InstanceNumber to 0
(0000,1000) UI 0026: 2.16.840.1.113816.50.4.20031203.151421
172.21.1.50(1061)-172.21.1.122(104) Type 5 PDU : Length = 4 : Direction = OUT
25-Jan-07 19:28:37.625 to 19:28:37.625
Association Close Request
FIN Seen (172.21.1.50(1061)-172.21.1.122(104))
This TCP direction closed prematurely
 > 20 seconds and not running : State was TCP.TCPState+States[]
This TCP direction closed prematurely
```