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DICOM Conformance Statement

CharruaPACS

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1. Introduction

1.1 Intended Audience

It is assumed that any readers of this document are familiar with the DICOM standard.

1.2 Overview

CharruaPACS is a DICOM 3.0 compliant PACS (Picture Archiving and Communication System) application that has the following modules:

- A PACS Server which uses the PostgreSQL database engine.
- A WEB Server that enables HTTP Protocol access.
- A HL7 interface for receiving HL7 messages through LLP (Low Level Protocol).

1.3 Scope

This document is the **CharruaPACS** conformance to the DICOM 3.0 Standard. This statement is intended for evaluating the integration and connection of CharruaPACS with other DICOM compliant devices.

1.4 References

DICOM 3.0 Standard, Parts 1 through 14 (PS 3.1-PS3.14); **CharruaPACS** Operational Manual.

1.5 Definitions

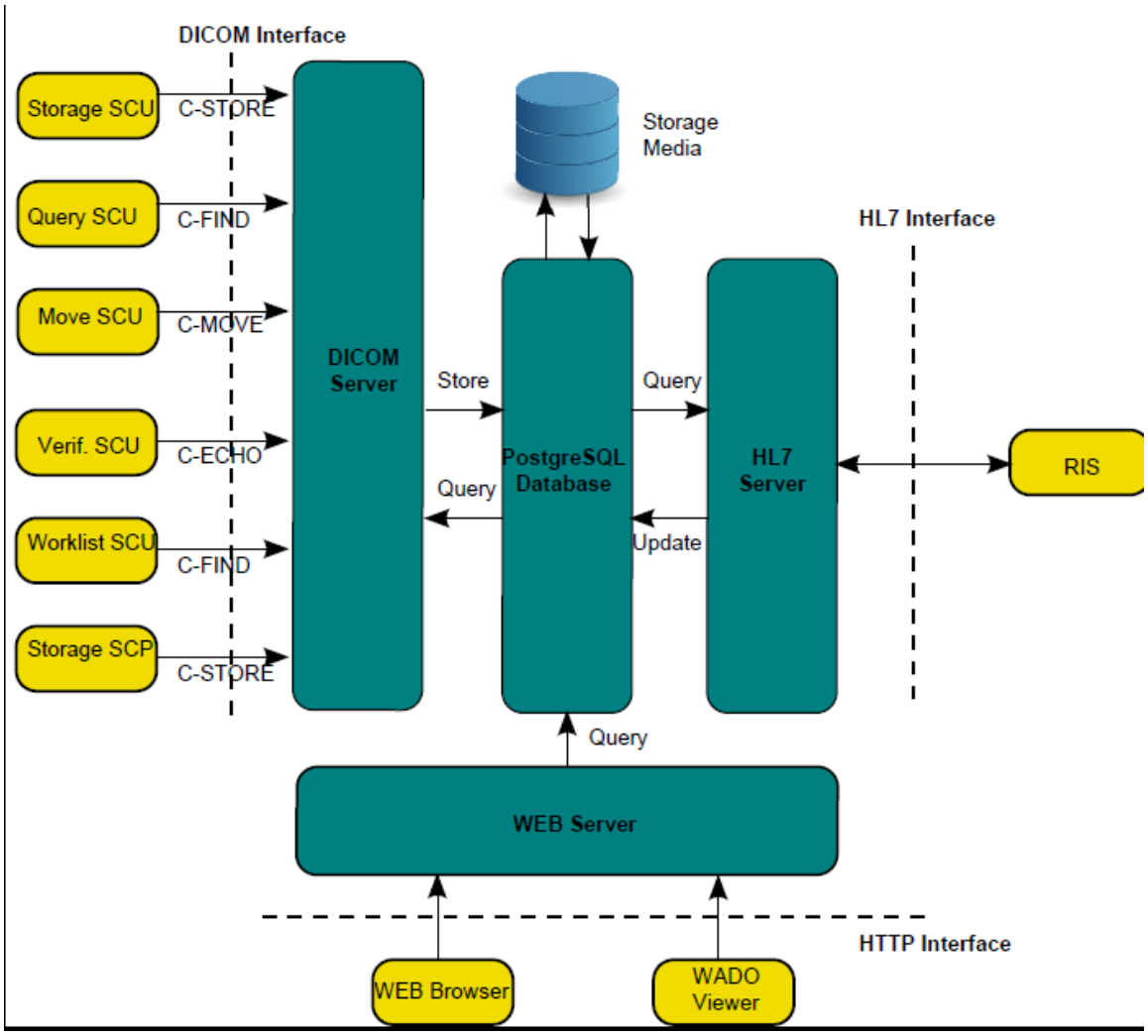
- AE: Application Entity
- AE-Title: name of an AE
- DICOM: Digital Imaging and Communications in Medicine
- IE: Information Entity
- IHE: Integrating the Healthcare Enterprise
- IOD: Information Object Definition
- MPPS: Modality Performed Procedure Step.
- PDU: Protocol Data Unit
- SCP: Service Class Provider
- SCU: Service Class User
- SOP: Service Object Pair
- TCP/IP: Transmission Control Protocol / Internet Protocol
- UID: Unique Identifier
- VM: Value Multiplicity
- VR: Value Representation

2. Implementation Model

CharruaPACS supports multiple Application Entities. It provides storage, query/retrieve and management of DICOM images and reports. Many DICOM Storage SCUs may concurrently initiate or maintain associations with **CharruaPACS**.

It runs on any MS-Windows platforms as a Windows Service.

2.1 Application Data Flow Diagram



2.2 Functional Definition of Application Entities

CharruaPACS waits for other Storage, Query, Retrieve or Verification SCU applications to connect at a specific TCP/IP port number. CharruaPACS will accept associations with Presentation Context for the Storage, Query, Retrieve, Worklist, MPPS or Verification Service class.

2.3 Sequencing of Real-World Activities

N/A.

3. AE Specifications

CharruaPACS supports only one Application Entity or AE.

3.1 CharruaPACS AE Specification

CharruaPACS provides Standard Conformance to the following DICOM 3.0 SOP Classes as a SCP:

Service	SOP Class UID	Transfer Syntax
ECHO-VERIFICATION SCP	1.2.840.10008.1.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1
FIND SCP	1.2.840.10008.5.1.4.1.2.2.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1
MOVE SCP	1.2.840.10008.5.1.4.1.2.2.2	1.2.840.10008.1.2 1.2.840.10008.1.2.1
Modality WORKLIST SCP	1.2.840.10008.5.1.4.31	1.2.840.10008.1.2 1.2.840.10008.1.2.1
MPPS	1.2.840.10008.3.1.2.3.3	1.2.840.10008.1.2 1.2.840.10008.1.2.1
Non Image Storage		
AmbulatoryECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.3	1.2.840.10008.1.2 1.2.840.10008.1.2.1
BasicTextSR	1.2.840.10008.5.1.4.1.1.88.11	1.2.840.10008.1.2 1.2.840.10008.1.2.1
ChestCADSR	1.2.840.10008.5.1.4.1.1.88.65	1.2.840.10008.1.2 1.2.840.10008.1.2.1
ColorSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.2	1.2.840.10008.1.2 1.2.840.10008.1.2.1
ComprehensiveSR	1.2.840.10008.5.1.4.1.1.88.33	1.2.840.10008.1.2 1.2.840.10008.1.2.1
EncapsulatedPDFStorage	1.2.840.10008.5.1.4.1.1.104.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1
EnhancedSR	1.2.840.10008.5.1.4.1.1.88.22	1.2.840.10008.1.2 1.2.840.10008.1.2.1
GeneralECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.2	1.2.840.10008.1.2 1.2.840.10008.1.2.1
GrayscaleSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1
MammographyCADSR	1.2.840.10008.5.1.4.1.1.88.50	1.2.840.10008.1.2 1.2.840.10008.1.2.1
PseudoColorSoftcopyPresentationStateStorage	1.2.840.10008.5.1.4.1.1.11.3	1.2.840.10008.1.2 1.2.840.10008.1.2.1
TwelveLeadECGWaveformStorage	1.2.840.10008.5.1.4.1.1.9.1.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1
XRayRadiationDoseSR	1.2.840.10008.5.1.4.1.1.88.67	1.2.840.10008.1.2 1.2.840.10008.1.2.1

Image Storage		
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.90 1.2.840.10008.1.2.4.91
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Idem
Digital Mammography X-ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Idem
Digital Mammography X-ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	Idem
Digital IntraOral X-ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.3	Idem
Digital IntraOral X-ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	Idem
Digital X-ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Idem
Digital X-ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	Idem
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Idem
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	Idem
XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	Idem
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Idem
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	Idem
Multi-frame Grayscale Word Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.3	Idem
Multi-frame Single Bit Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.1	Idem
Multi-frame True Color Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.4	Idem
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	Idem
Ophthalmic Photography 8 bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Idem
Ophthalmic Photography 16 bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.2	Idem
Positron Emission Tomography (PET) Image Storage	1.2.840.10008.5.1.4.1.1.128	Idem
Nuclear Medicine Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	Idem
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	Idem
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	Idem
VL Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.1	Idem
VL Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.77.2	Idem
X Ray Angiographic BiPlane Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.12.3	Idem
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Idem
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Idem
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Idem
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Idem
Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1.1	Idem
Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2.1	Idem
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Idem
VL Video Endoscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.1	Idem
VL Video Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	Idem
VL Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Idem
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Idem
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Idem

3.1.1 Association Establishment Policies

3.1.1.1 General

The maximum PDU size which can be transmitted by **CharruaPACS** is fixed at 16KB. The maximum PDU size which can be received by **CharruaPACS** is up to 16 Kbytes

3.1.1.2 Number of Associations

The number of simultaneous associations which can be accepted by **CharruaPACS** are limited only by the kernel parameters of underlying TCP/IP implementation and resource utilization of the computer where **CharruaPACS** is installed.

3.1.1.3 Asynchronous Nature

The **CharruaPACS** does not support asynchronous operations and will not perform asynchronous window negotiation.

3.1.1.4 Implementation Identifying Information

The **CharruaPACS** will provide an implementation class UID which is 1.2.826.0.1.3680043.2.1396.999

3.1.2 Association Initiation Policy

The **CharruaPACS** does not initiate any associations.

3.1.3 Association Acceptance Policy

CharruaPACS will accept any association regardless the called AE Title matches or not the CharruaPACS AE Title. Also it is not requested that the calling AE Title be known by **CharruaPACS**.

3.1.3.1 Real-World Activity – Verification Request

The real-world activity associated with the C-ECHO request is that an external node wishes to verify network or server operation.

The default behavior is to accept any Verification request regardless of the requesting AET.

Presentation Context Table – Verification.

Abstract Syntax		**Transfer Syntax**	**Role**	**Extended Negotiation**
Name	**UID**			
Verification	1.2.840.10008.1.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1	**SCP**	**None**

CharruaPACS provides standard conformance for DICOM SOP Verification class.

3.1.3.2 Real-World Activity – Store Object

CharruaPACS accepts associations from nodes that wish to store DICOM objects using the C-STORE command.

The Real-World activity associated with the C-STORE operation is the storage of the images on the disk of the system upon which **CharruaPACS** is running. Images are stored by writing the data set of the C-STORE command with the standard file header described in the DICOM 3.0 Part 10 document.

Presentation Context Table – Storage.

Abstract Syntax		**Transfer Syntax**	**Role**	**Extended Negotiation**
Name	**UID**			
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	See Transfer Syntax Selection Policies Below	**SCP**	**None**
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	See Transfer Syntax Selection Policies Below	**SCP**	**None**
DX Image Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.1	See Transfer Syntax Selection Policies Below	**SCP**	**None**
DX Image Storage (Raw)	1.2.840.10008.5.1.4.1.1.1.1.1	See Transfer Syntax Selection Policies Below	**SCP**	**None**
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	1.2.840.10008.1.2 1.2.840.10008.1.2.1	**SCP**	**None**
US Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6	1.2.840.10008.1.2 1.2.840.10008.1.2.1	**SCP**	**None**
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1	**SCP**	**None**
US Multi-Frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3	See Transfer Syntax Selection Policies Below	**SCP**	**None**
US Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	See Transfer Syntax Selection Policies Below	**SCP**	**None**
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	See Transfer Syntax Selection Policies Below	**SCP**	**None**
MG Storage (Presentation)	1.2.840.10008.5.1.4.1.1.1.2	See Transfer Syntax Selection Policies Below	**SCP**	**None**
MG Storage (Raw)	1.2.840.10008.5.1.4.1.1.1.2.1	See Transfer Syntax Selection Policies	**SCP**	**None**

		Below		
Multi-frame True Color Secondary Capture Image	1.2.840.10008.5.1.4.1.1.7.4	See Transfer Syntax Selection Policies Below	**SCP**	**None**
Multi-frame Grayscale Byte Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7.2	See Transfer Syntax Selection Policies Below	**SCP**	**None**
NM Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.5	See Transfer Syntax Selection Policies Below	**SCP**	**None**
NM Image Storage	1.2.840.10008.5.1.4.1.1.20	See Transfer Syntax Selection Policies Below	**SCP**	**None**
XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1	See Transfer Syntax Selection Policies Below	**SCP**	**None**
RF Image Storage	1.2.840.10008.5.1.4.1.1.12.2	See Transfer Syntax Selection Policies Below	**SCP**	**None**
Standard PET Image	1.2.840.10008.5.1.4.1.1.128	See Transfer Syntax Selection Policies Below	**SCP**	**None**

CharruaPACS supports several Transfer Syntaxes, the accepted transfer syntax is chosen according to the following order of precedence:

1. JPEG2000 Lossless (1.2.840.10008.1.2.4.90).
2. JPEG Default Lossless Non-hierarchical, first-order prediction (Process 14 selection value 1) (1.2.840.10008.1.2.4.70).
3. Little Endian Explicit (1.2.840.10008.1.2.1).
4. Implicit Little Endian (1.2.840.10008.1.2).

CharruaPACS returns the following status codes in response to a C-STORE request:

Status Code	Status	Description
0000H	Success	Object successfully stored.
A700H	Refused	Out of resources, unable to create local file
A701H	Refused	Can't convert Transfer Syntax
A702H	Refused	Unable to register object in database
A703H	Refused	Unable to save object to a local file

3.1.3.3 Real-World Activity – Query/Retrieve Request

CharruaPACS accepts associations from applications that wish to perform query (C-FIND) and retrieve (C-MOVE) operations on objects that have been previously stored in the PostgreSQL database.

Presentation Context Table – Query/Retrieve

Abstract Syntax		Transfer Syntax	Role	Extended Negotiation
Name	**UID**			
Study Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	1.2.840.10008.1.2 1.2.840.10008.1.2.1	**SCP**	**None**
Study Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	1.2.840.10008.1.2 1.2.840.10008.1.2.1	**SCP**	**None**

SOP Specific Conformance – Query/Retrieve

Study Root Query/Retrieve Attributes			
Level	**Description**	**Tag**	**Type**
Study	Study Date	(0008,0020)	R
Study	Study Time	(0008,0030)	R
Study	Accession Number	(0008,0050)	R
Study	Patient's Name	(0010,0010)	R
Study	Patient ID	(0010,0020)	R
Study	Study ID	(0020,0010)	R
Study	Study Instance UID	(0020,000D)	U
Study	Modalities in Study	(0008,0061)	O
Study	Referring Physician's Name	(0008,0090)	O
Study	Study Description	(0008,1030)	O
Study	Patient's Birth Date	(0010,0030)	O
Study	Patient's Sex	(0010,1040)	O
Series	Modality	(0008,0060)	R
Series	Series Number	(0020,0011)	R
Series	Series Instance UID	(0020,000E)	U
Series	Institution Name	(0008,0080)	O
Series	Series Description	(0008,103E)	
Series	Body Part Examined	(0018,0015)	O
Instance	Instance Number	(0020,0013)	R
Instance	SOP Instance UID	(0008,0018)	U

CharruaPACS returns the following status codes in response to a C-FIND request:

Status Code	Status	Description
0000H	Success	Object successfully stored.
FE00H	Cancel	Sub-operations terminated due to Cancel Indication
C000H	Refused	Query Level not known

CharruaPACS returns the following status codes in response to a C-MOVE request:

Status Code	Status	Description

0000H	Success	Object successfully stored.
FE00H	Cancel	Sub-operations terminated due to Cancel Indication
C000H	Refused	Query Level not known
A801H	Refused	Move destination unknown

3.1.3.4 Real-World Activity – Modality Worklist Management

CharruaPACS will accept and respond to SCU Modality Worklist Information Model C-FIND requests:

Presentation Context Table – Modality Worklist.

Abstract Syntax		**Transfer Syntax**	**Role**	**Extended Negotiation**
Name	**UID**			
Modality Worklist	1.2.840.10008.1.4.31	1.2.840.10008.1.2 1.2.840.10008.1.2.1	**SCP**	**None**

Matching Key Types

SV - Single Valued Match
WC - Wild Card Match
SQ - Sequence Match
DR - Date Range Match

Keys used by CharruaPACS for the Modality Worklist - FIND requests

Module	**Attribute Name**	**Tag**	**Match**
Scheduled Procedure Step	Specific Character Set	(0008,0005)	
	Scheduled Procedure Step Sequence	(0040,0100)	SQ
	> Scheduled Station AE Title	(0040,0001)	SV
	> Scheduled Procedure Step Start Date	(0040,0002)	DR
	> Scheduled Procedure Step Start Time	(0040,0003)	DR
	> Modality	(0008,0060)	SV
	> Scheduled Performing Physician	(0040,0006)	
	> Scheduled Procedure Step Description	(0040,0007)	
	> Scheduled Action Item Code Sequence	(0040,0008)	
	>> Code Value	(0008,0100)	
	>> Coding Scheme Designator	(0008,0102)	
	>> Coding Scheme Version	(0008,0103)	
	>> Code Meaning	(0008,0104)	

	> Scheduled Procedure Step ID	(0008,0009)	
	> Scheduled Station Name	(0040,0010)	SV
	> Scheduled Procedure Step Location	(0040,0011)	
	> Scheduled procedure Step Status	(0040,0020)	SV
Requested Procedure	Requested Procedure Description	(0032,1060)	
	Study Instance UID	(0020,000D)	SV
	Requested Procedure ID	(0040,1001)	
Imaging Service Request	Accession Number	(0008,0050)	SV
	Requesting Physician	(0032,1032)	
	Referring Physician Name	(0008,0090)	

3.1.3.5 Real-World Activity – Modality Performed Procedure Step

CharruaPACS will accept and respond to SCU Modality Performed Procedure Step requests:

Presentation Context Table – MPPS.

Abstract Syntax		**Transfer Syntax**	**Role**	**Extended Negotiation**
Name	**UID**			
MPPS	1.2.840.10008.3.1.2.3.3	1.2.840.10008.1.2	**SCP**	**None**
		1.2.840.10008.1.2.1		

When N-CREATE/N-SET events are received, the status is updated in the corresponding entry in the Worklist database, based on the Accession Number.

4. Communication Profiles

4.1 TCP/IP Stack

CharruaPACS provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.1.1 TCP/IP API

CharruaPACS uses the TCP/IP stack from the Windows system upon which it executes. It uses a subroutine library that is based on a Berkeley socket interface.

4.1.2 Physical Media Support

CharruaPACS exists as a software application on a Windows operating system. As such, it places no restrictions on the physical network. CharruaPACS uses TCP/IP over Ethernet.

5. Extensions/Specializations/Privatizations

Not Applicable

6. Configuration

The following items related to DICOM are configurable for **CharruaPACS** AE:

- Local AE Title
- Local Server Ports

Please note that one or more remote query locations can be configured.

7. Document Change History

Document Version	Date	Changed performed by	Change description
1.0	09/16/2013	Rafael Sanguinetti	Creation and approval.
2.0	06/25/2014	Rafael Sanguinetti	Modification and approval.