

Resource Center for Emerging Technologies (RCET) Report University of Florida Gainesville, Florida

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RCET Team

Providing an infrastructure for quality assurance and data management in radiation therapy clinical trials

Physicists

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(Application Physicist: 0.05FTE)

Computer Scientists

Douglas Dillard MS

(Software Engineer: 1.0 FTE)

Anil Lingamalu MS (Last day: 04/30/05)

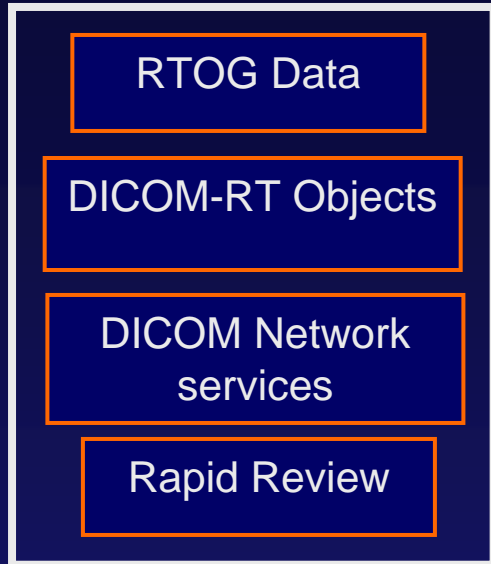
(Software Engineer: 1.0 FTE)

Guanghua Yan MS

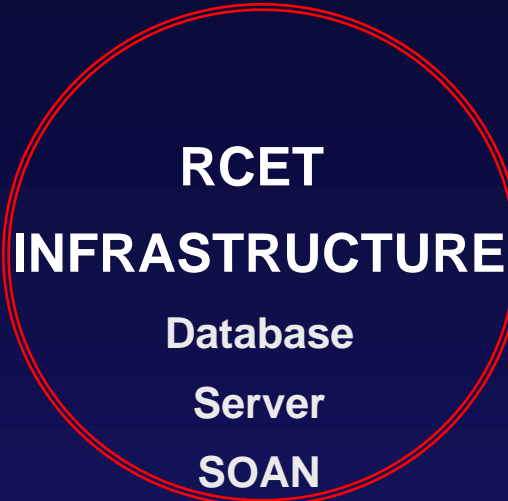
(Research Assistant: 0.33 FTE)

Sanjay Ranka PhD

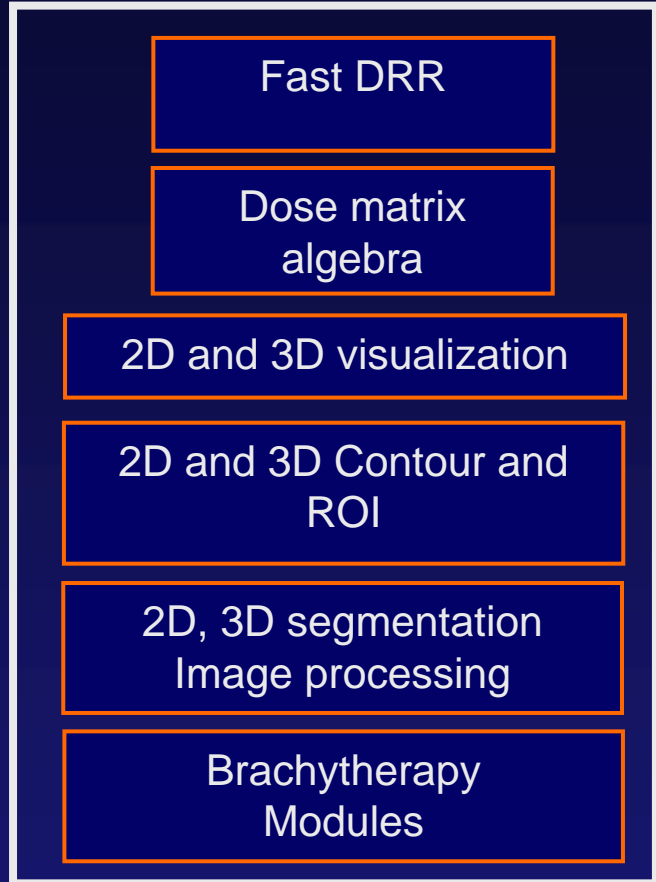
(Informatics Expert: Consultant)



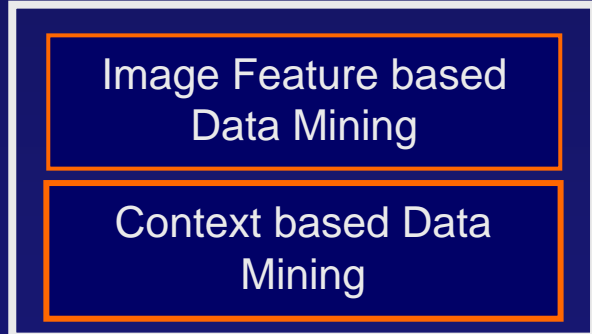
WebSys



RCET Modules



NetSys

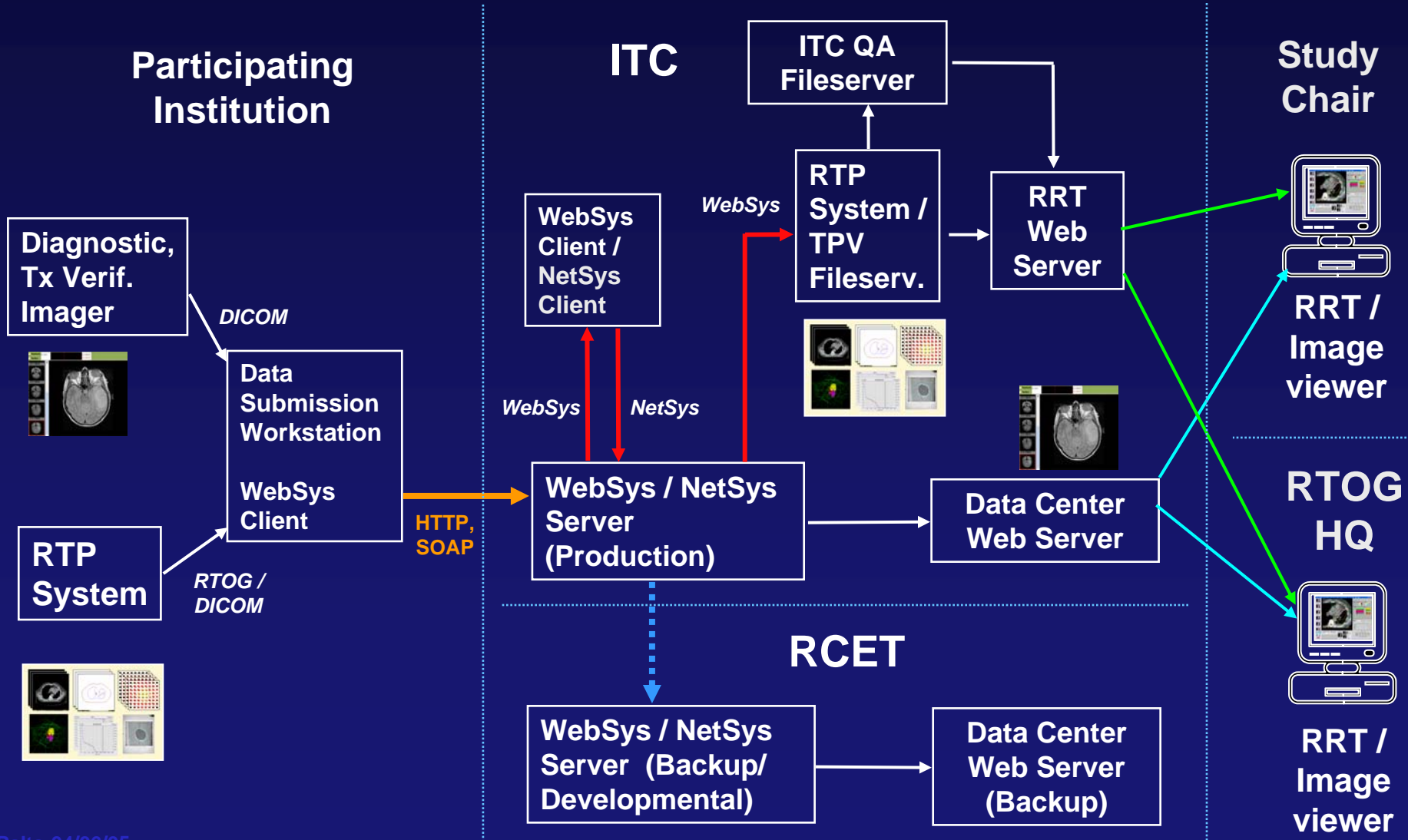


Data Mining



Image Transmission and Storage

ATC Method 2 (WebSys Services)



WebSys

- Secure upload of images and treatment planning data
- Supports DICOM and RTOG Data Exchange format
- Images and data are anonymized and encrypted prior to upload

http://polaris.wustl.edu/WebSys/WebSys.WebSys - Microsoft Internet Explorer

File Edit View Go To Favorites Help

Back Forward Stop Home Search Favorites Media

Address http://polaris.wustl.edu/WebSys/WebSys.WebSys

Go Links

Login to RCET Data Base

1 Log in Connected Disconnect From Server R: 1-10-04

Please Login to the Database

User Name wrbosch_sd Password *** Log in

Primary ATC Server

ITC
ITC
RCET

Logged in: Walter Bosch Access Level: SD ITC: polaris.wustl.edu

2 Select Protocol ATC Test Protocol
ATC Test Protocol
COGTest Protocol
MA.20
Test Protocol
ATC M2 Test

3 Select Case

A.APM_Elekta_test
Contour_Marathon
ITC_DICOM-TEST_WRB-MR_031219
MIR_M2-test_oroph1_031215
MIR_M2-test_prost1_031215
MIR_M2-test_Sinus1_031215
RTOG_0126_IMRT_Dry_Run_test
RTOG_0225_Dry_Run_test_Pt_C
RTOG_0225_Dry_run_test_Pt_S
WU_PrecisePlan_Test_040213

Proxy Server Setting

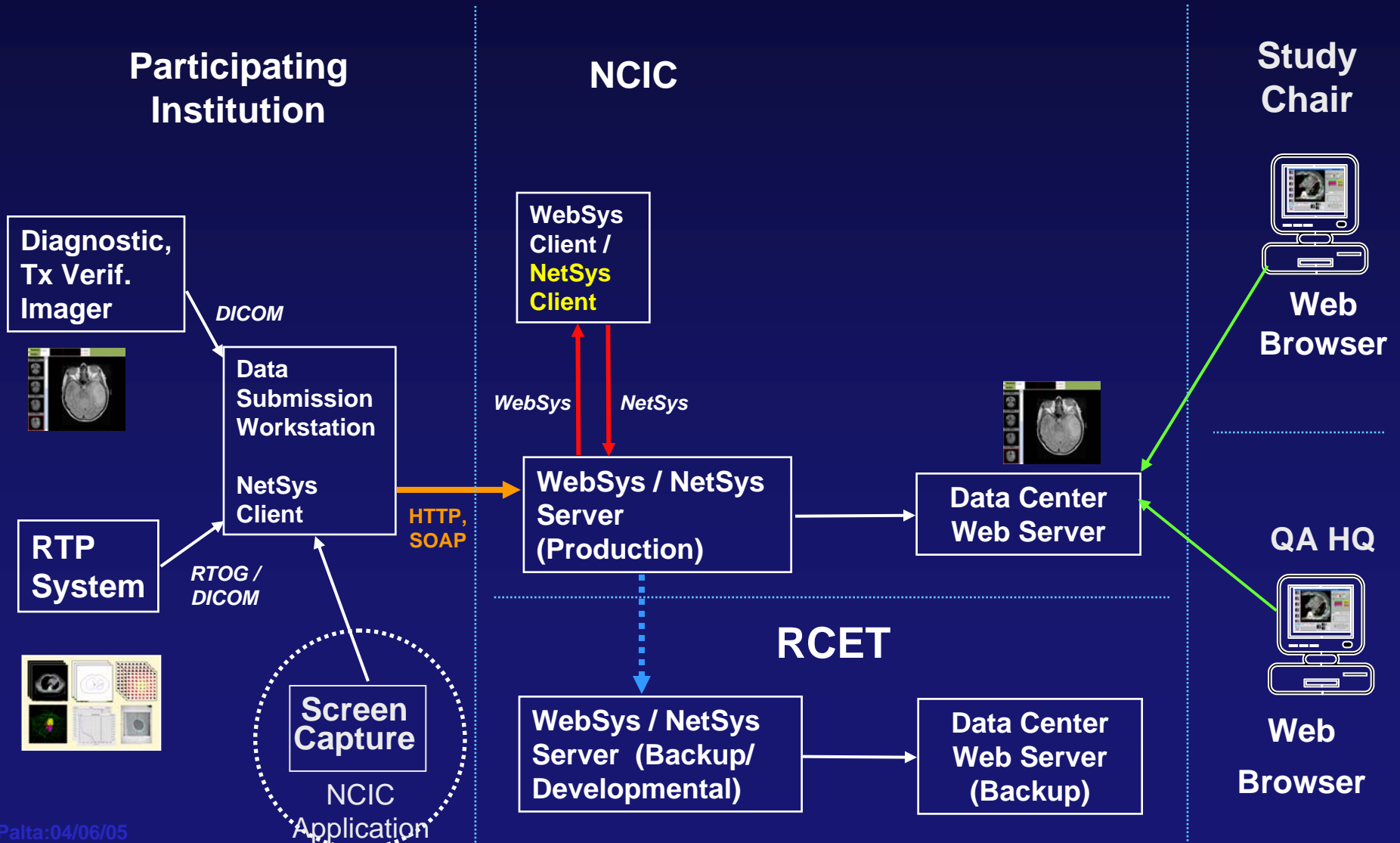
Electronic Folder
Secure Data Upload
DICOM Submission Sheet
RTOG Submission Sheet
Data Submission Sheet

Unknown Zone

Electronic Chart

Ids_m2-test3_brain_20031118 :: MR Set Submission0		Ids_m2-test3_brain_20031118 :: DRR Set0																																																	
Login Page		Electronic Folder																																																	
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Case ID	<input type="text" value="Ids_m2-test3_brain_20031118"/>	Event Dates																																																	
Patient Name	<input type="text" value="N/A"/>	Created:	<input type="text" value="11/21/03"/>																																																
Created By	<input type="text" value="Dr. Connel Chu"/>	Updated:	<input type="text" value="2004-03-19"/>																																																
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<table border="1"> <thead> <tr> <th>Modality</th> <th>Description</th> <th>Submission Date</th> <th>Review Date</th> </tr> </thead> <tbody> <tr> <td>CT Set</td> <td></td> <td></td> <td></td> </tr> <tr> <td>CT Set Submiss</td> <td>CT Set Submission</td> <td>11/21/03</td> <td>N/A</td> </tr> <tr> <td>CR Set</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Ids_m2-test3_bil</td> <td>Ids_m2-test3_brain_200...</td> <td>11/21/03</td> <td>N/A</td> </tr> <tr> <td>MR Set</td> <td></td> <td></td> <td></td> </tr> <tr> <td>MR Set Submiss</td> <td>MR Set Submission</td> <td>11/21/03</td> <td>N/A</td> </tr> <tr> <td>SC Set</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DRR Set</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DRR Set0</td> <td>DRR Set</td> <td>11/27/03</td> <td>N/A</td> </tr> <tr> <td>Portal Set</td> <td></td> <td></td> <td></td> </tr> <tr> <td>RTOG Set</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Modality	Description	Submission Date	Review Date	CT Set				CT Set Submiss	CT Set Submission	11/21/03	N/A	CR Set				Ids_m2-test3_bil	Ids_m2-test3_brain_200...	11/21/03	N/A	MR Set				MR Set Submiss	MR Set Submission	11/21/03	N/A	SC Set				DRR Set				DRR Set0	DRR Set	11/27/03	N/A	Portal Set				RTOG Set				<input type="button" value="View Images"/>	
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<input type="text" value="This is a test"/>		<input type="button" value="Update"/>																																																	

ATC Method 3 (NetSys Services)



Login | Electronic Folder | null0

User Name: vaf_sd Password: *** Login

Vincent A. Frouhar, Ph.D. SD

- ATC Test Protocol
- Test Protocol
- MA.20 Dry Run
- MA.20
- RPC Dry Run
- COGTest Protocol

Get Protocol

- CALM0090
- CALM0089
- CALM0091

Get Cases

Case Info

Login | Electronic Folder | null0

Case ID: CALM0091

Patient Name: N/A

Created By: Elizabeth A Elliott

Submitted from: RCET

Event Dates

Created: 10/23/03

Updated: N/A

Action: N/A

View Images

Modality	Description	Submission Date	Review Date
<input type="checkbox"/> All Mods			
<input type="checkbox"/> CTSet			
<input checked="" type="checkbox"/> null0	A-G	10/23/03	
<input type="checkbox"/> CRSet			
<input type="checkbox"/> MRSet			
<input type="checkbox"/> SCSet			
<input type="checkbox"/> USSet			
<input type="checkbox"/> PortalSet			
<input type="checkbox"/> RTOGSet			

Study Info

Set Description: ****

Submission Date: 10/23/03

Study Date:

Action Date:

Scanned Anatomy:

Patient Position:

Case Description: A-G

Num DICOM Objs: 11

Accession:

Comments/Messages: N/A Update

Rapid Review

Login | Electronic Folder | null0

Thumbnail Z = 0.0 Z = 250.0 Z = 150.0

Equalize Use Lens

Pct P01, "Icru" = 4999.95 cGy

Center: 128

Width: 256

Restore

Ratio(1/2)

N/A

(1) (2)

LM91 mid. Prescription

Z = 75.0

Z = 100.0

Z = 125.0

RCET Activities

ATC directed:

- Testing and “bug” fixes of **ATC Method 2** (In progress)
- Clinical data collection for MA-20 at NCIC utilizing **ATC Method 3**
- Enhancements to the data archive, retrieval, and review capabilities

Other complimentary areas:

- Integrating the Healthcare Enterprise in Radiation Oncology (IHE-RO)
 - An ASTRO initiative
 - Seamless connectivity in Radiation Therapy
- Pilot program for clinical QA and outcome studies @ UF
 - Provide an infrastructure for remote peer-review
 - Web-based services (WebSys enabled rapid review)
 - Interface with outcome and facility management databases
 - Web-based access to a complete patient dataset

RCET Activities

RCET research and development:

- Development of data mining algorithm (image feature and context based)
- Advanced algorithms for imaging data transmission and storage (Wavelet transforms)
- New modules for NetSys
 - Fast DRR
 - Dose matrix algebra
 - 2D and 3D visualization
 - 2D and 3D contours and ROI
 - Image segmentation and image processing
 - LDR Intracavitary Brachytherapy

ATC Method 2 (Current Status)

For Elekta (Precise Plan), CMS (Focus and XIO), MDS Nordion, Philips (Pinnacle), and Varian (Eclipse), ATC Method 2 can accomplish the following:

- Data (DICOM and RTOG) submission using a secure networking mechanism, which is conformant with HIPPA requirements.
- All data submitted through ATC Method 2 is auto-registered with a central database.
- Electronic folder reports all accepted modalities with a summary for the dataset.
- Submitted data are immediately available for retrieval using electronic folder.
- For diagnostic DICOM datasets, images are available immediately for rapid-review via the Rapid-Review applet.

ATC Digital Data Submission Server

Provides links to

- WebSys – secure upload/download
- RRT – image segmentation and dosimetry review
- Rapid Image Viewer – diagnostic image display

Advanced Technology QA Consortium (ATC) - Microsoft Internet Explorer

Address http://polaris.wustl.edu/Main_40.asp

ATC Website: <http://atc.wustl.edu>

ATC Digital Data Submission/Review Server

Welcome to the [Advanced Technology QA Consortium Digital Data Submission Server](#) located at the Image-guided Therapy Center (ITC), at Washington University, in St. Louis, Missouri. The ATC Digital Data Submission System is operated jointly by the ITC and the Resource Center for Emerging Technologies (RCET) in Gainesville, Florida. The ATC provides resources to facilitate the conduct of NCI sponsored advanced technology radiation therapy clinical trials while maintaining patient confidentiality.

Please note: the resources linked on this page are for the use of investigators, QA centers, and participants in ATC-supported clinical trials. A valid user account is required for their use. Please contact the Image-guided Therapy QA Center (ITC) at itc@castor.wustl.edu or call 314-747-5415 to request a user account.

WebSys is a web-based application for *submitting* and *retrieving* images and treatment planning data for ATC-supported advanced-technology clinical trials. WebSys uses *secure web services communication* with the ATC database. DICOM and RTOG Data Exchange data sets are automatically anonymized and registered with the ATC database when they are uploaded. Datasets available for download can be accessed using WebSys via an electronic folder for each protocol case.

Remote Review Tool is a web-based application for interactive review of images and treatment planning data. The Remote Review Tool displays axial images, organ- and target-volume contours, iso-dose curves, point doses, and DVHs for ATC-supported protocol data sets.

Rapid Image Viewer is a web-based application for reviewing diagnostic image series and treatment verification images for ATC-supported clinical trials. This application requires the installation of the Java Runtime Library your computer (available for download [here](#)).

mailto:itc@castor.wustl.edu

Internet

WebSys

- Secure download of data
- Access restrictions: own data (user), entire protocol (study director)

http://polaris.wustl.edu/WebSys/WebSys.WebSys - Microsoft Internet Explorer

Address: http://polaris.wustl.edu/WebSys/WebSys.WebSys

Login to RCET Data Base
Electronic Folder

Case Information

Case ID: ITC_WRB-MR_031219 Patient Real Name: N/A Creation: 12/19/03 Last Updated: N/A Action Date: N/A

Messages: 72672C Created By: Walter Bosch Submitted from: RCET

Case Description	Set Description	Num DICM Objs	Submission Date	Stur
N/A/hips/TSE_T1_TRA	N/A	20	12/19/03	03/1
N/A/TSp_Myelopathy_BJC/scout	N/A	5	12/19/03	03/1
N/A/TSp_Myelopathy_BJC/scout	N/A	5	12/19/03	03/1
N/A/TSp_Myelopathy_BJC/T1_SAG	N/A	9	12/19/03	03/1
N/A/TSp_Mets_Bone_BJC/scout	N/A	5	12/19/03	03/1
N/A/hips/PDFS_COR_TIR	N/A	18	12/19/03	03/1
N/A/hips/T1_COR	N/A	20	12/19/03	03/1
N/A/hips/T1_TRA	N/A	30	12/19/03	03/1

Secure Data Upload
 DICOM Submission Sheet
 RTOG Submission Sheet
 Data Submission Sheet

RT Image Review

Ids_m2-test3_brain_20031110 :: MR Set Submission0 Ids_m2-test3_brain_20031110 - DRR Set0

Login Page Electronic Folder Ids_m2-test3_brain_20031118 :: CT Set Submission0 Ids_m2-test3_brain_200311180

Thumbnail Equalize

Meas Cont Lens Lens mag: 2

Single Multiple S M L

Reverse Order Close

Center: 128
Width: 256

Restore


Ratio(1/2)
N/A

(1)
 (2)

R <-> L

Remove

Label: 1-G310 2-DRR
Beam No = 2 Gantry = 130.0



Label: 2-G130 1-DRR
Beam No = 3 Gantry = 110.0

Seg3.avi

Operations Configuration Preferences GUI Layout Options

Analyzer Off Set View <idle> Case ID: Proton_Case 3

Case ID: Proton_Case 3 Coord: (0, 0,-36) mm

Case ID: Proton_Case 3 Coord: (0, 0,-34) mm

Case ID: Proton_Case 3 Coord: (0, 0,-31) mm

Case ID: Proton_Case 3 Coord: (0, 0,-29) mm

Case ID: Proton_Case 3 Coord: (0, 0,-26) mm

Case ID: Proton_Case 3 Coord: (0, 0,-24) mm

Z=-46 mm Z=-44 mm Z=-41 mm Z=-39 mm Z=-36 mm Z=-34 mm Z=-31 mm

Contrast Ctrl

First Step

16 1



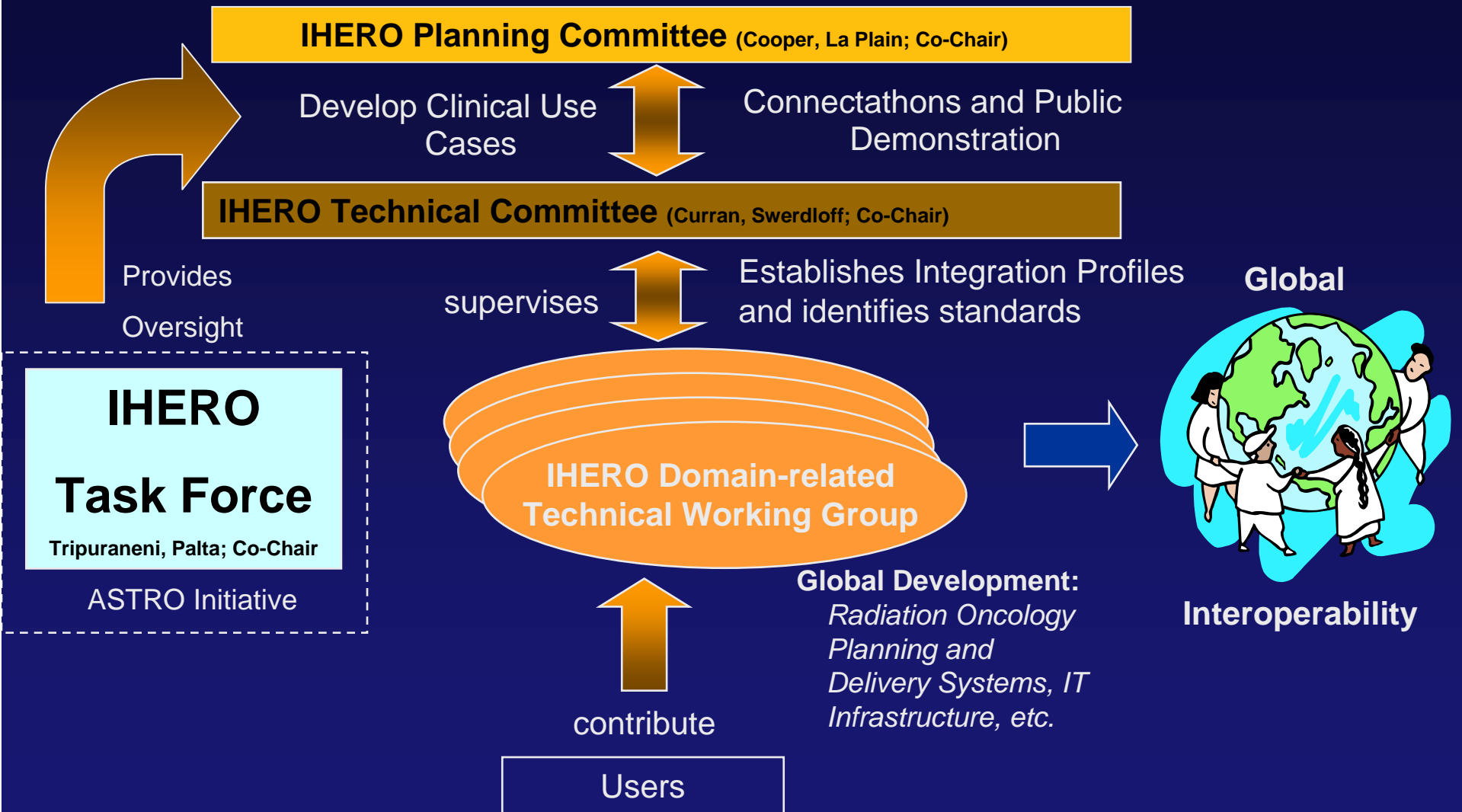
Integrating the Healthcare Enterprise In Radiation Oncology

IHE-RO

An initiative spearheaded by ASTRO

IHERO Participants

- Societies Representing Healthcare Segments
 - RSNA, HIMSS, **ASTRO**, **AAPM**, **ACR**, **ESTRO**,
- Users
 - Radiation Oncologists, Medical Physicists, Radiation Therapists, Administrators, ...
- **NCI, ATC**
- Treatment Planning System Vendors
- Facility Management Systems Vendors
- Therapy Delivery Systems Vendors
- Standards Development Organizations (SDOs)
 - NEMA, DICOM, HL7, ISO ...



IHERO Organizational Structure

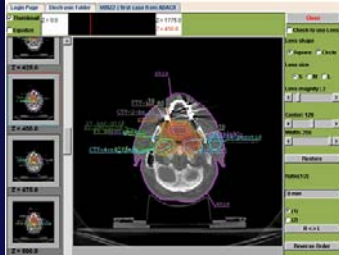
IHERO Process

- Users identify desired functionalities that require coordination and communication among multiple systems
 - E.g., radiotherapy workflow, single registration, cross-device sharing of data
 - Find and document standards-based transactions among systems to achieve desired functionality
 - Apply necessary constraints to eliminate useless wiggle room
- Provide process and tools to encourage vendors to implement
 - **software test tools (for example, tools such as MESA)**
 - Connectathon interoperability testing event
- Provide tools and education to help users acquire and integrate systems using these solutions
 - Connectathon results and public demonstrations
 - Integration statements

IHERO Deliverables

- **Integration Profiles**
 - Describe clinical need and use cases
 - provide a more precise definition of how standards are implemented
- **Technical Framework**
 - Provides implementation specification for each transaction by specific reference to Standards
- **Connectathon**
 - Vendors implement these profiles and test their systems with software tools and at a face-to-face Connectathon, where they test interoperability with other vendors' systems.
- **Public Demonstrations**
 - Vendors publish IHE Integration Statements to document the integration profiles supported by their products

Infrastructure for Clinical QA and Outcome Studies @UF



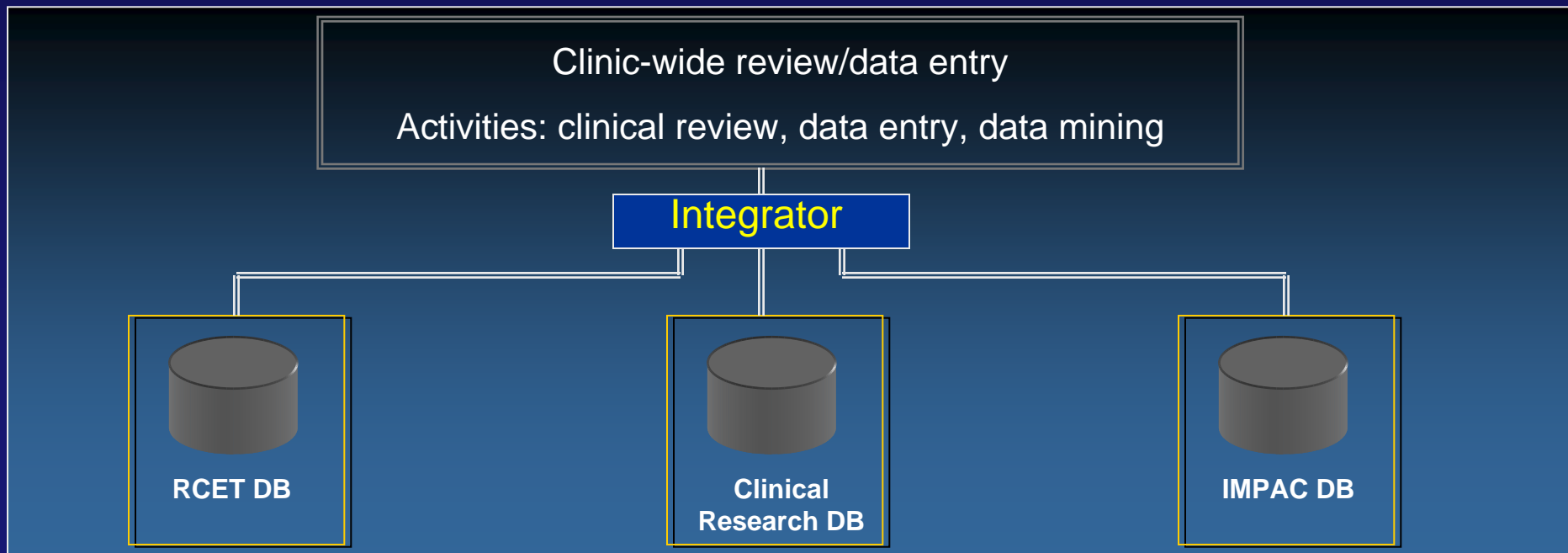
RCET System (Treatment Planning Data)



Clinical Research System
(Site specific coding sheets)



IMPAC
(Treatment Data)



Summary of RCET Activities

- The RCET team is continuing its effort in making ATC Method 2 for data archive and retrieval more robust through “bug” fixes and extending its capability to handle different flavors of DICOM-RT objects
- RCET Data Server has been replicated at NCIC to accrue MA20 clinical trial data using ATC Method 3. The RCET staff has transferred all day-to-day responsibilities of managing the Data Server to the NCIC IT staff.
- The RCET team is continuing its effort to add new modules to the NetSys and WebSys

Summary of RCET Activities

- The ITC and RCET team members are continuing to play an important role in the development of IHE-RO initiative and DICOM committee.
 - This endeavor is likely to accelerate the implementation of common DICOM and DICOM-RT standards.
- The Rapid-Review Applets have been redesigned to facilitate peer-review of DICOM images and RT-Structures.
 - This enhancement will facilitate remote peer-review, which is one of the key requirements for real time review of clinical data.

Summary of RCET Activities

- The research and development of data mining tools and data compression for storage and transmission using Wavelet Transforms is on-going. A prototype of these developments will be demonstrated at the next ATC meeting
 - A research abstract has been submitted to the 2005 BIROW meeting and two abstracts are submitted to the 2005 AAPM meeting. The manuscripts to peer-review journal will follow.
- An integration of RCET infrastructure, IMPAC database, and UF Outcome database is under way at UF for outcome studies.
 - A research abstract is submitted to the ASTRO 2005 and a manuscript in the Red Journal is planned

RCET System Architecture

