ATC AdvancedTechnologyConsortium
Providing support in quality assurance and data management for radiation therapy clinical trials

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

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RTOG Data

DICOM-RT Objects

DICOM Network services

Rapid Review

WebSys

RCET INFRASTRUCTURE

Database

Server

SOAN

RCET Modules

Fast DRR

Dose matrix algebra

2D and 3D visualization

2D and 3D Contour and ROI

2D, 3D segmentation Image processing

Brachytherapy Modules

NetSys

Image Feature based Data Mining

Context based Data Mining

Data Mining

Wavelet Transforms

Image Transmission and Storage

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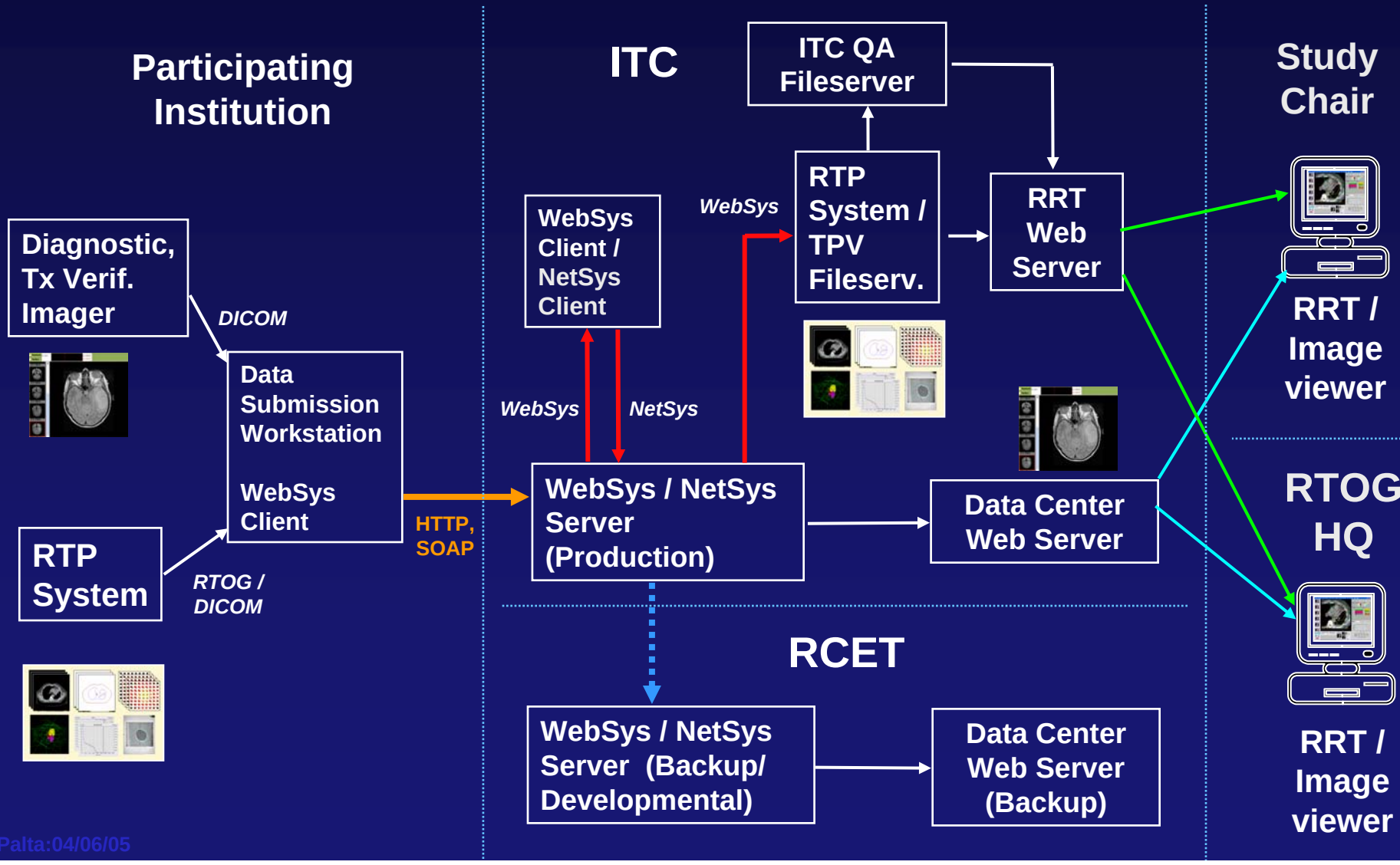
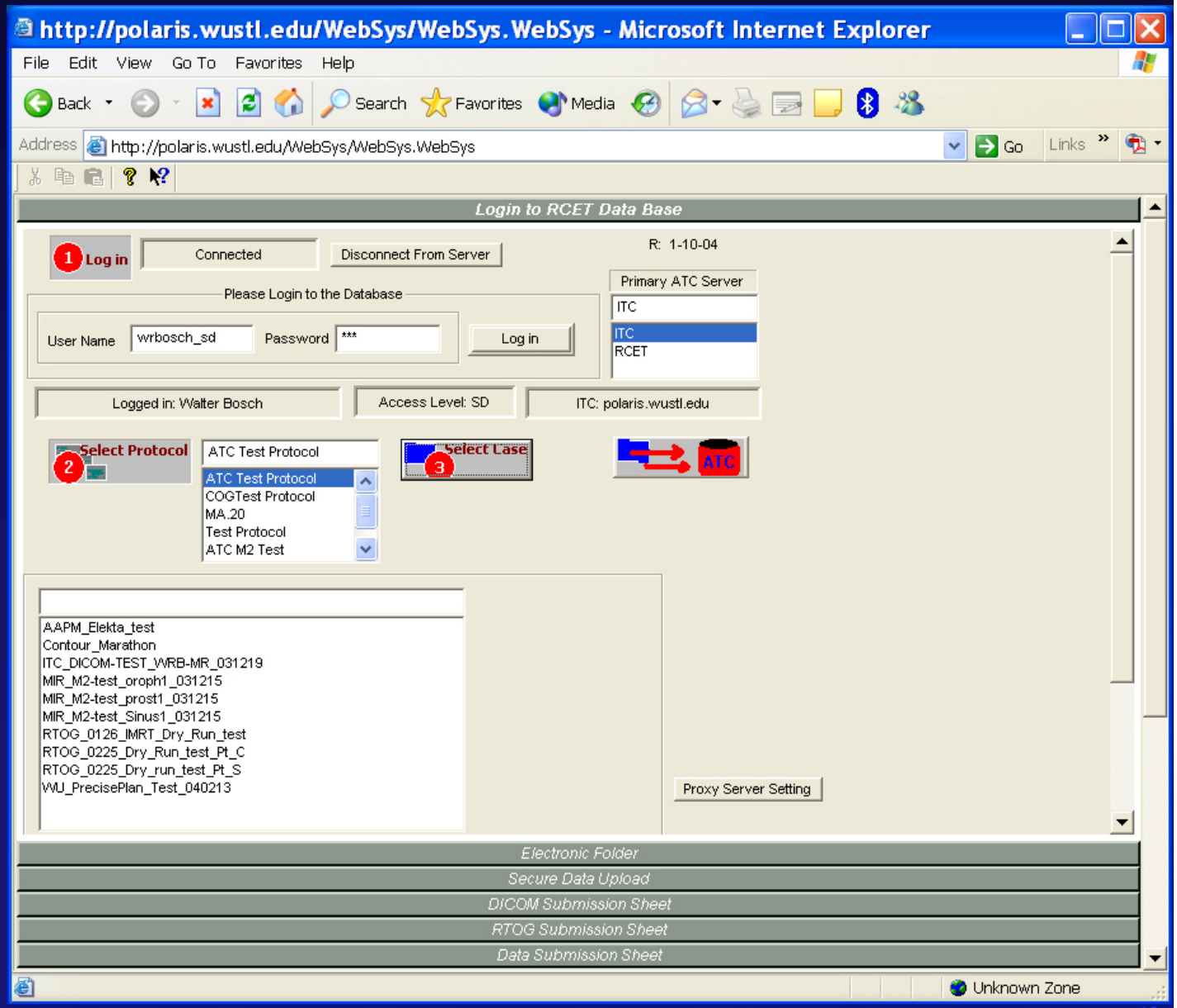
ATC Method 2 (WebSys Services)

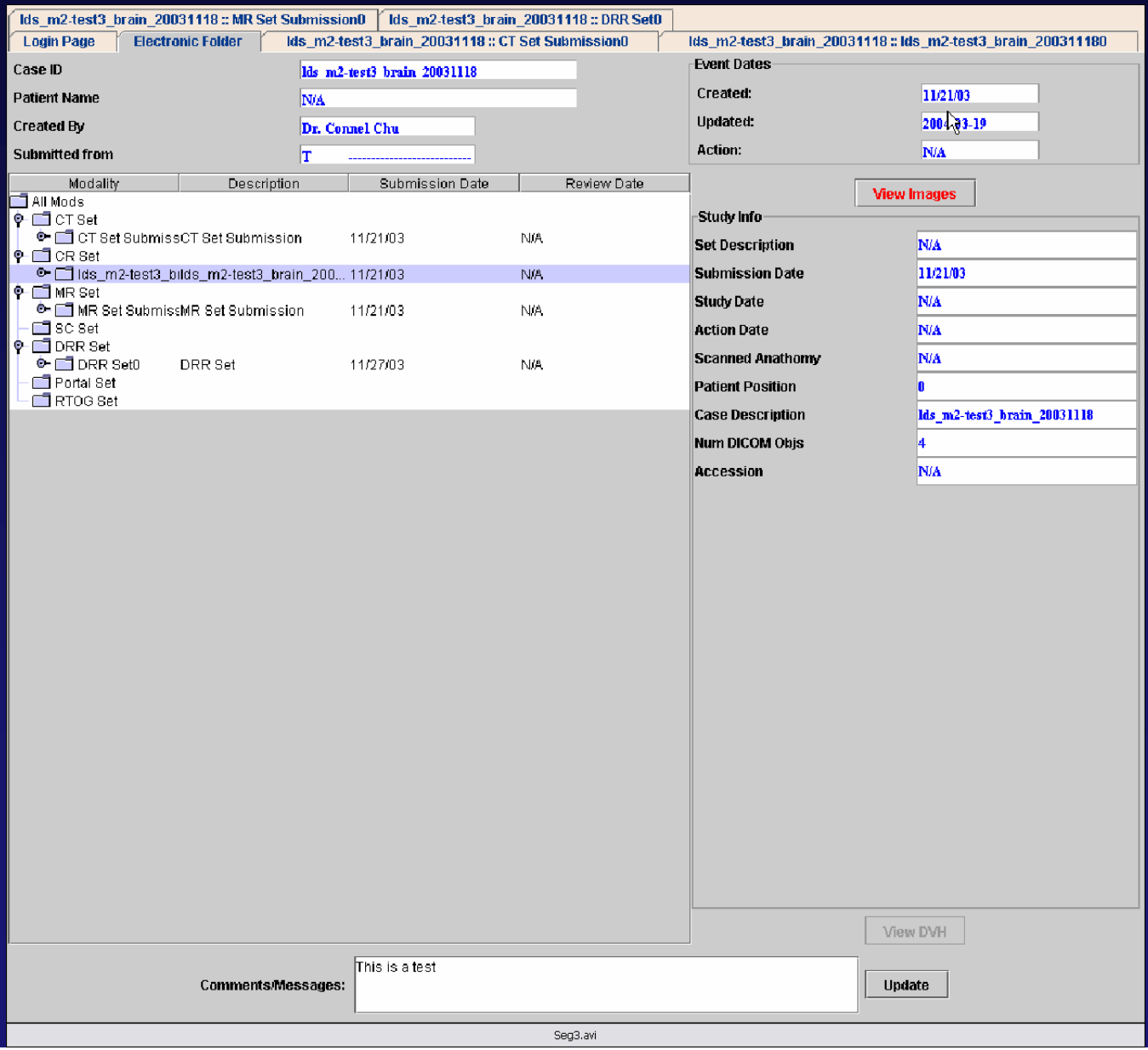


WebSys

- 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



Electronic Chart



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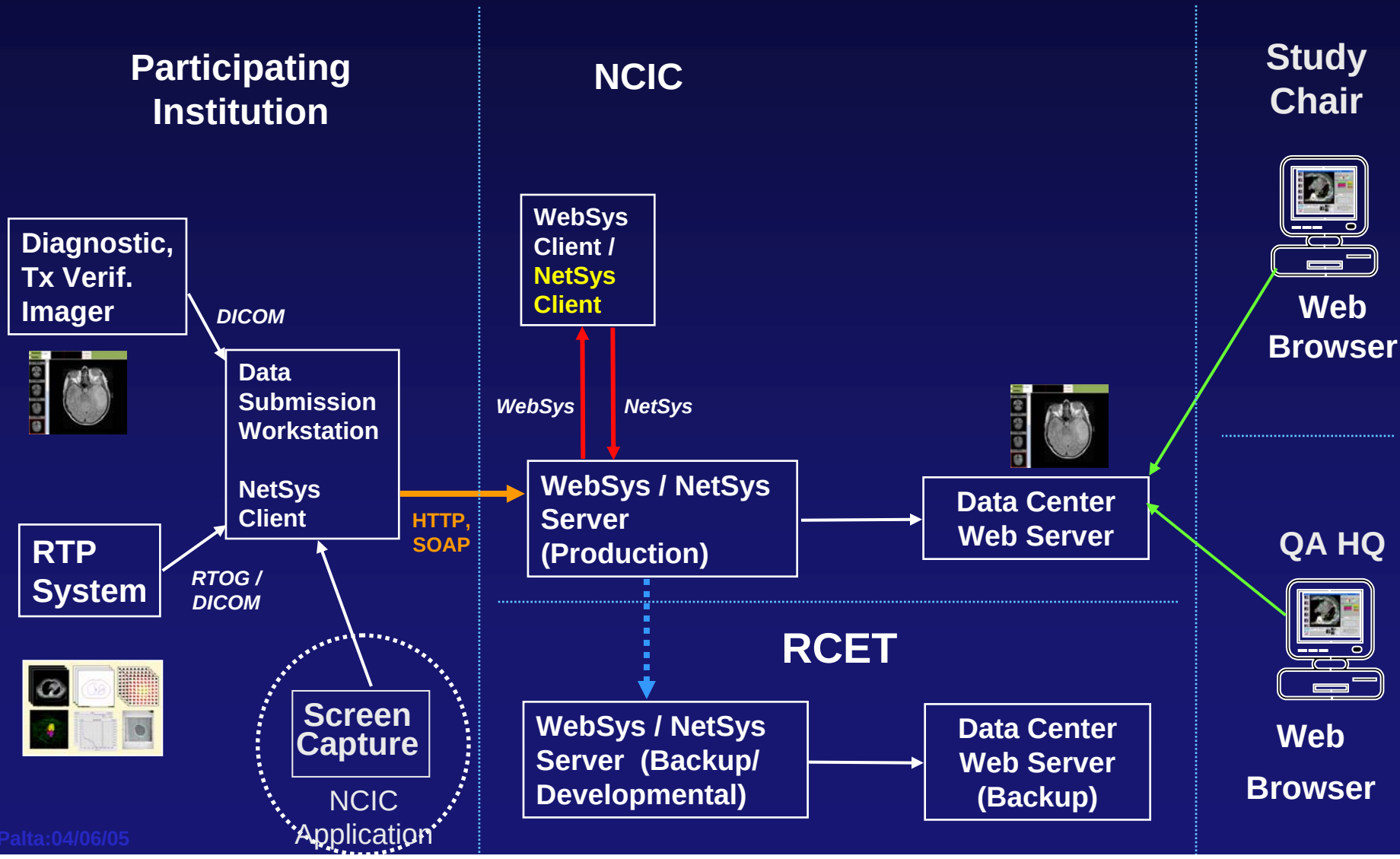
ATC Method 3 (NetSys Services)



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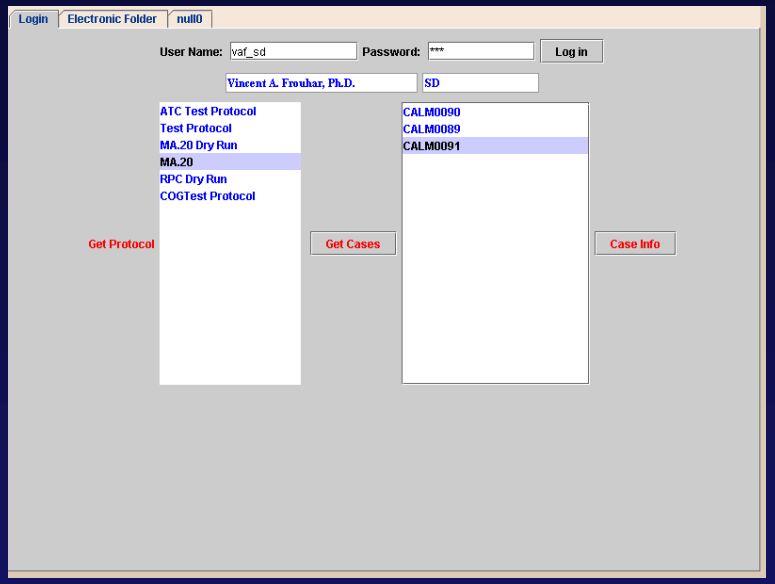
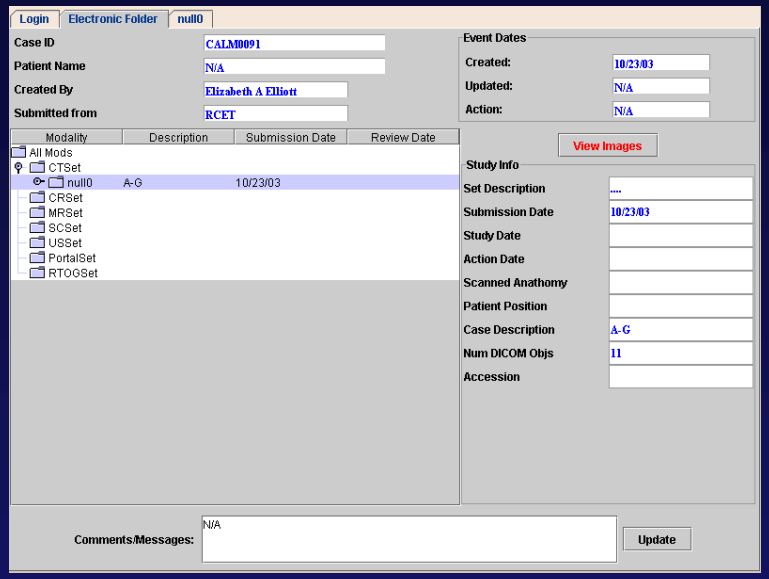
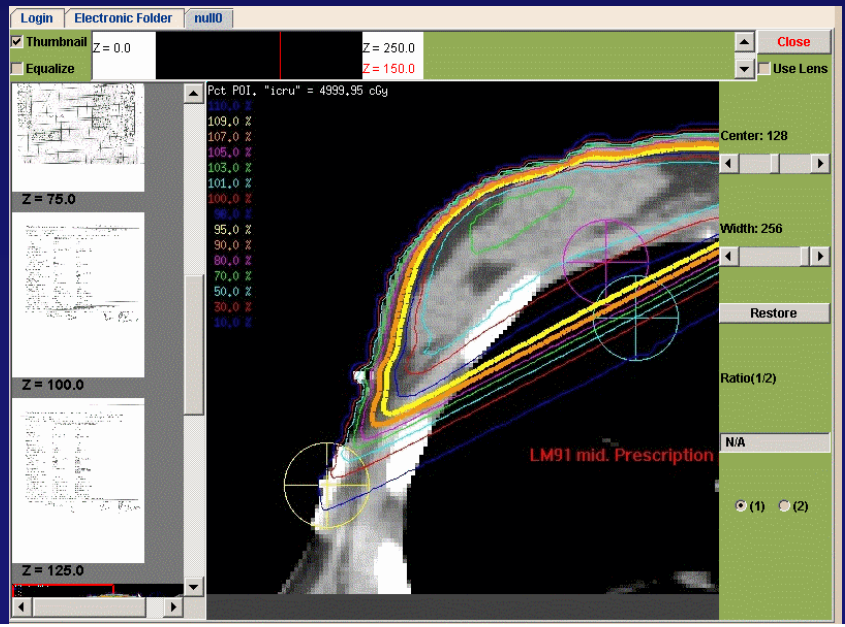




Rapid Review



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.

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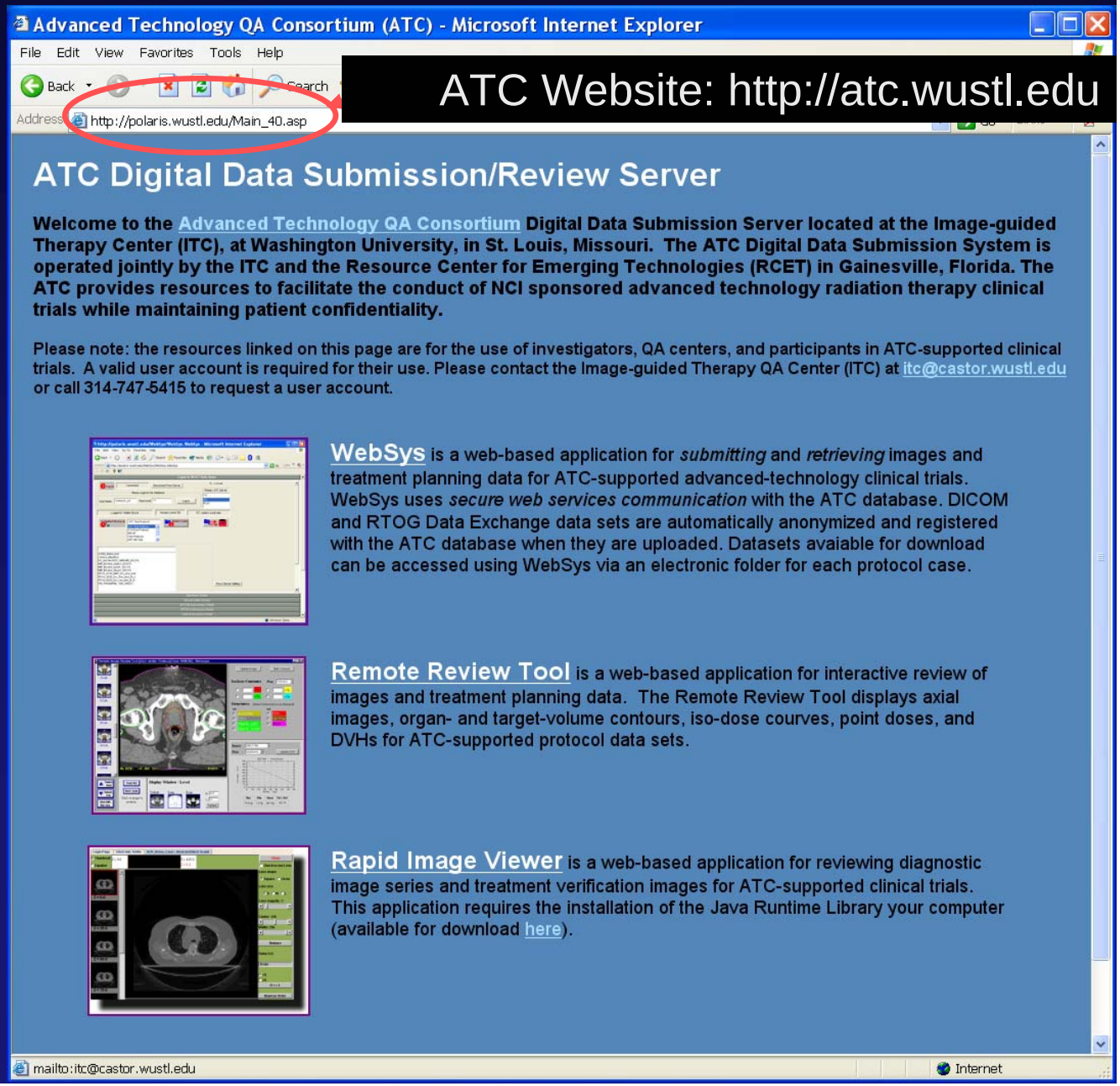
ATC Digital Data Submission Server

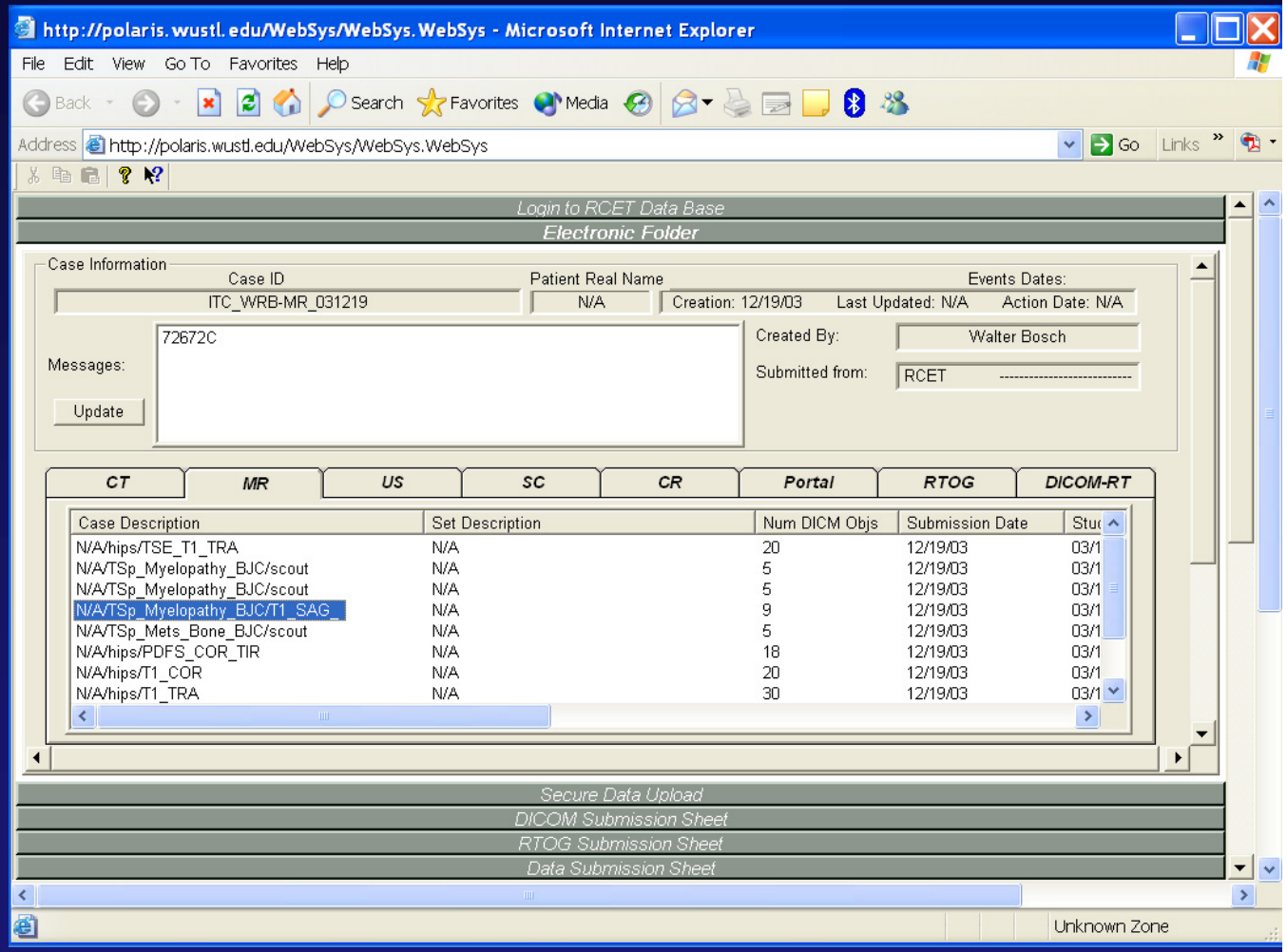
Provides links to

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

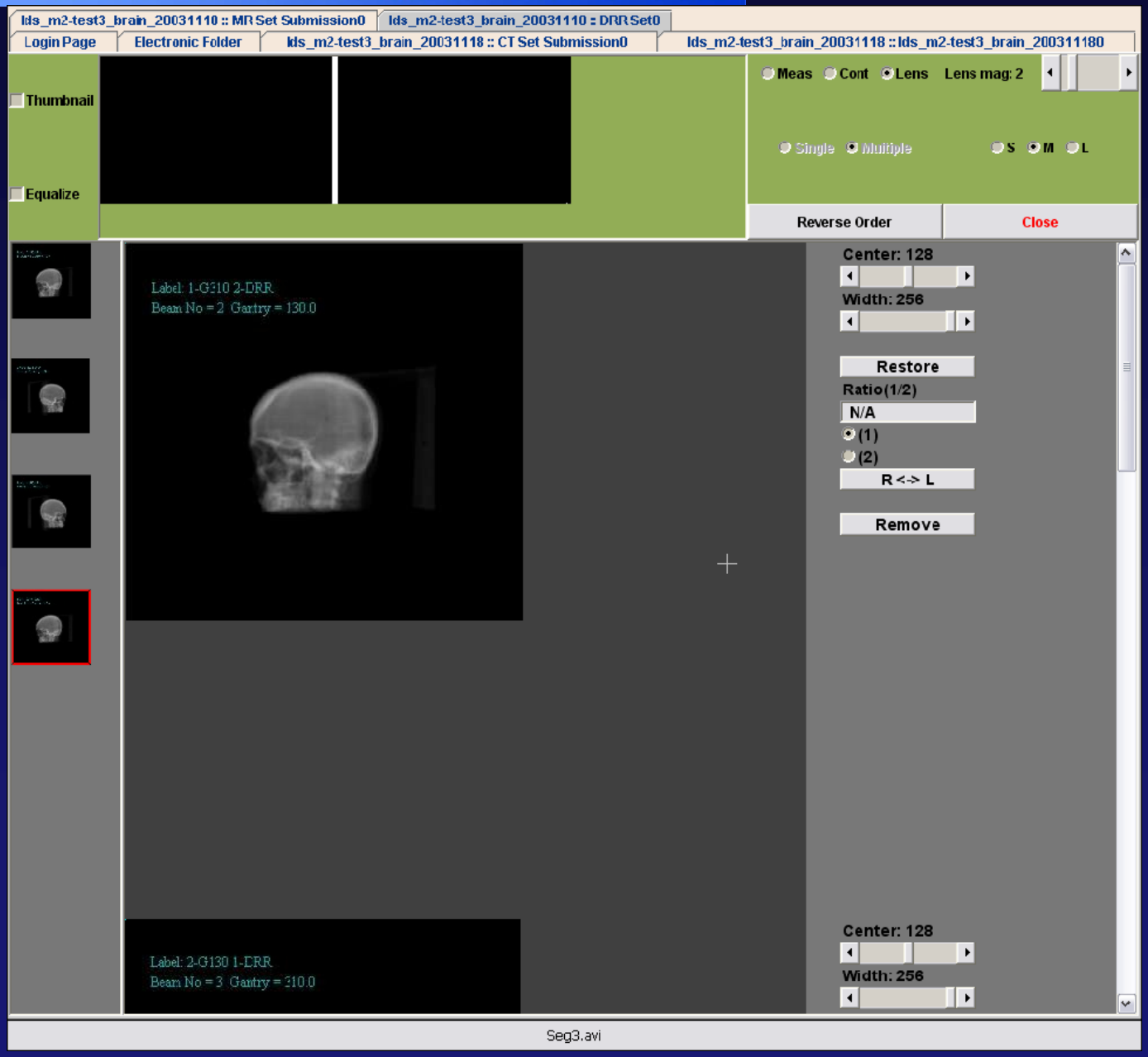


WebSys

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



RT Image Review



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NetSys

Integrating the Healthcare Enterprise In Radiation Oncology

IHE-RO

An initiative spearheaded by ASTRO

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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 …

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IHERO Planning Committee (Cooper, La Plain; Co-Chair)

Develop Clinical Use Cases

Connectathons and Public Demonstration

IHERO Technical Committee (Curran, Swerdloff; Co-Chair)

Provides Oversight

supervises

Establishes Integration Profiles and identifies standards

IHERO Task Force

Tripuraneni, Palta; Co-Chair

ASTRO Initiative

IHERO Domain-related Technical Working Group

Global Development:
Radiation Oncology Planning and Delivery Systems, IT Infrastructure, etc.

contribute

Users

Global Interoperability

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

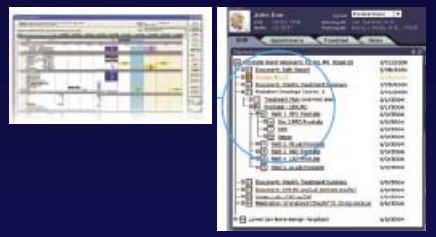
IHERO Deliverables

- 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

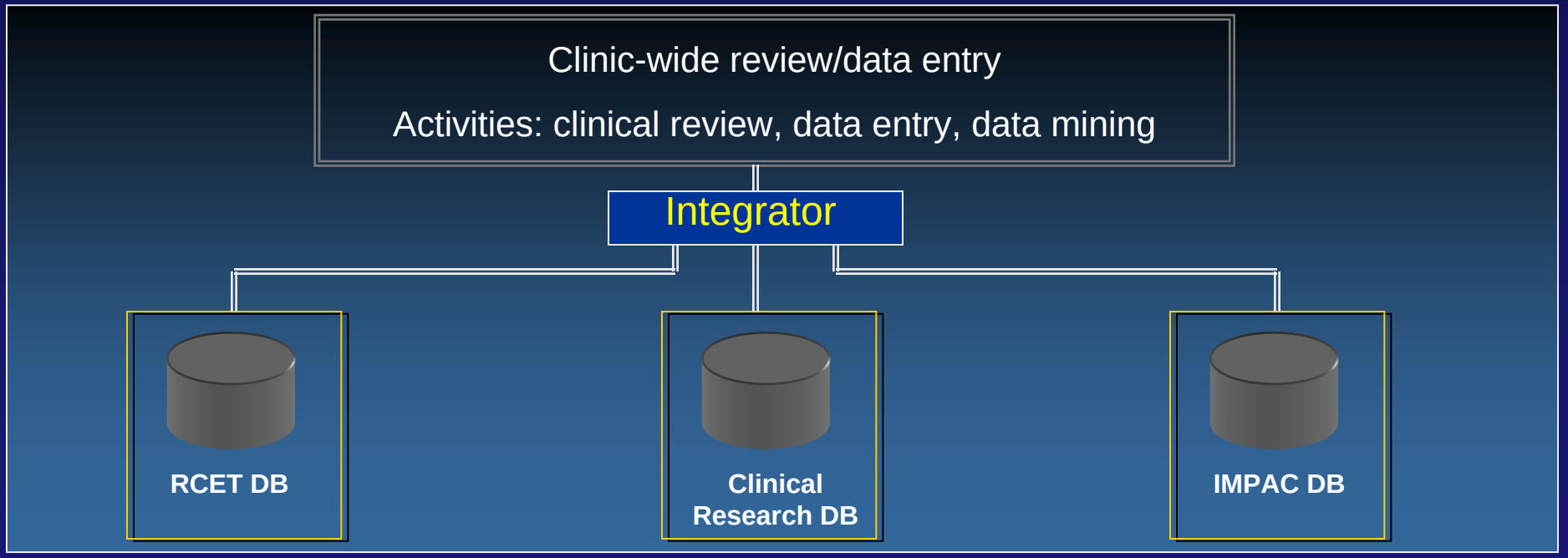
RCET System (Treatment Planning Data)

Clinical Research System (Site specific coding sheets)



IMPAC

(Treatment Data)



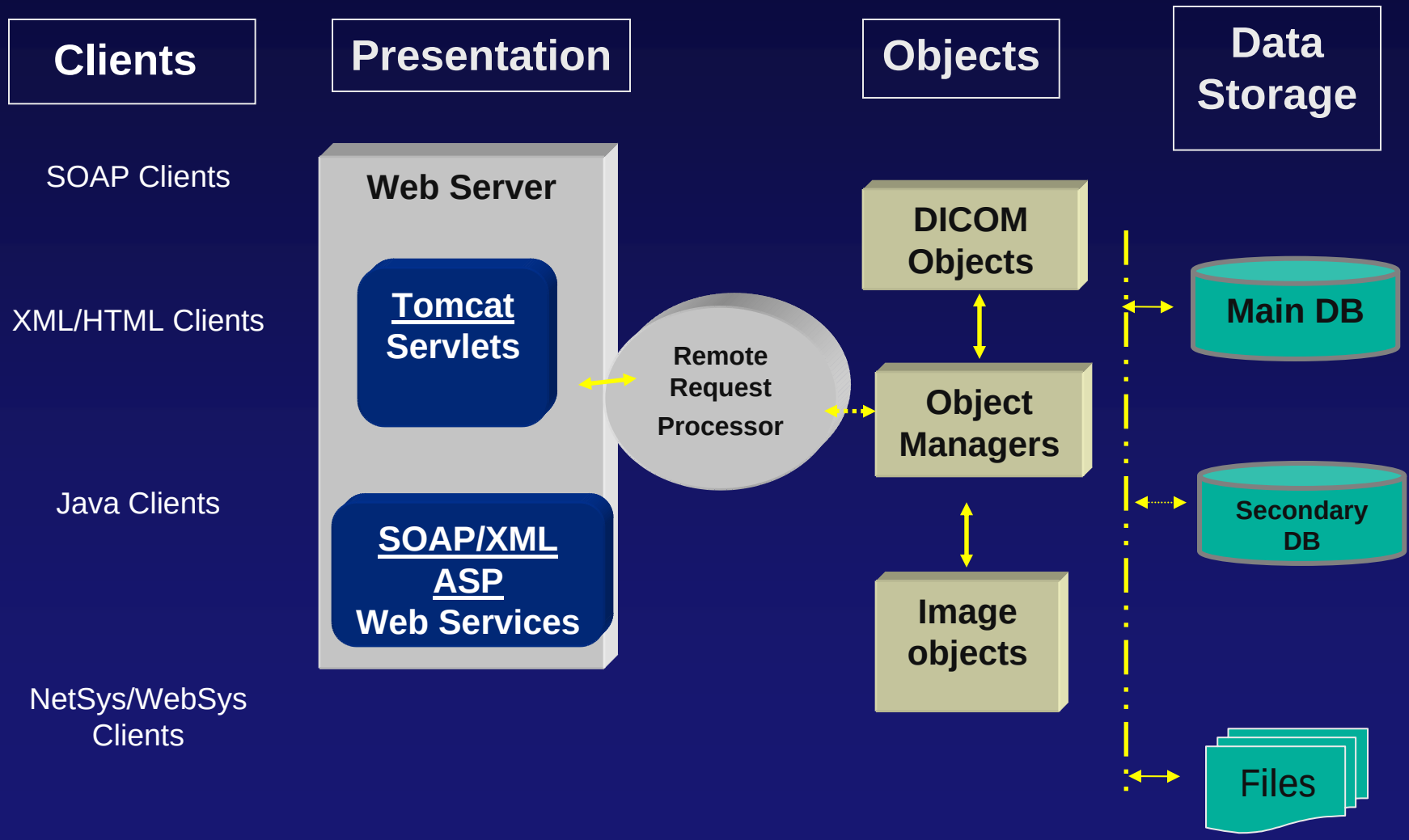
Summary of RCET Activities

- 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