Future Topics

for

Projection Imaging – Dose Reporting, XA 3D Volume Objects

DICOM WG-02

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Presentation outline

- ## Dose Reporting
  - „Why Dose Reporting?“
  - User Scenarios (as of today)
  - Solution outline
  - Next steps

- ## XA 3D Volume Object
  - Issues to be solved
  - Solution outline
  - Scope of Work
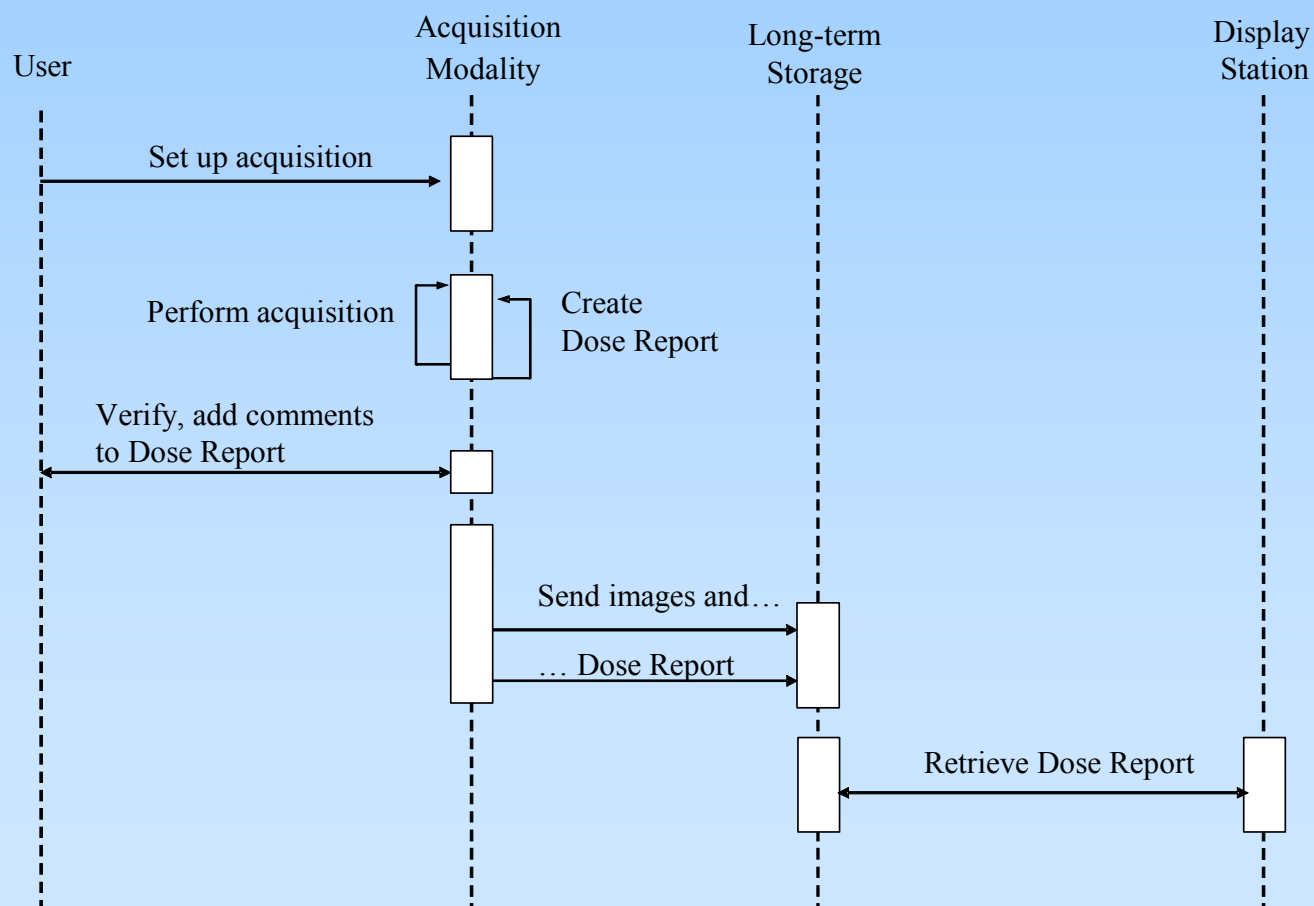 - Invitation

Why Dose Reporting ?

- MPPS solution delivers Dose Data into an environment where further evaluation is not typically expected.

- Initiated from IEC

- Flexible and equipment-dependent structure for dose information needed (Projection X-Ray, CT, Mammography).

- Close relationship to images generated by irradiation shall be kept, but application of dose shall be recorded independently from image storage.

- Retrieval and "Data Mining" of dose information shall be possible in future. Support new applications related to dose evaluation and reporting.

- Transposing of dose information into other presentations (graphical, new algorithms) shall be possible.

- Establish a clear responsibility of and capability for X-Ray equipment to store dose-related information.
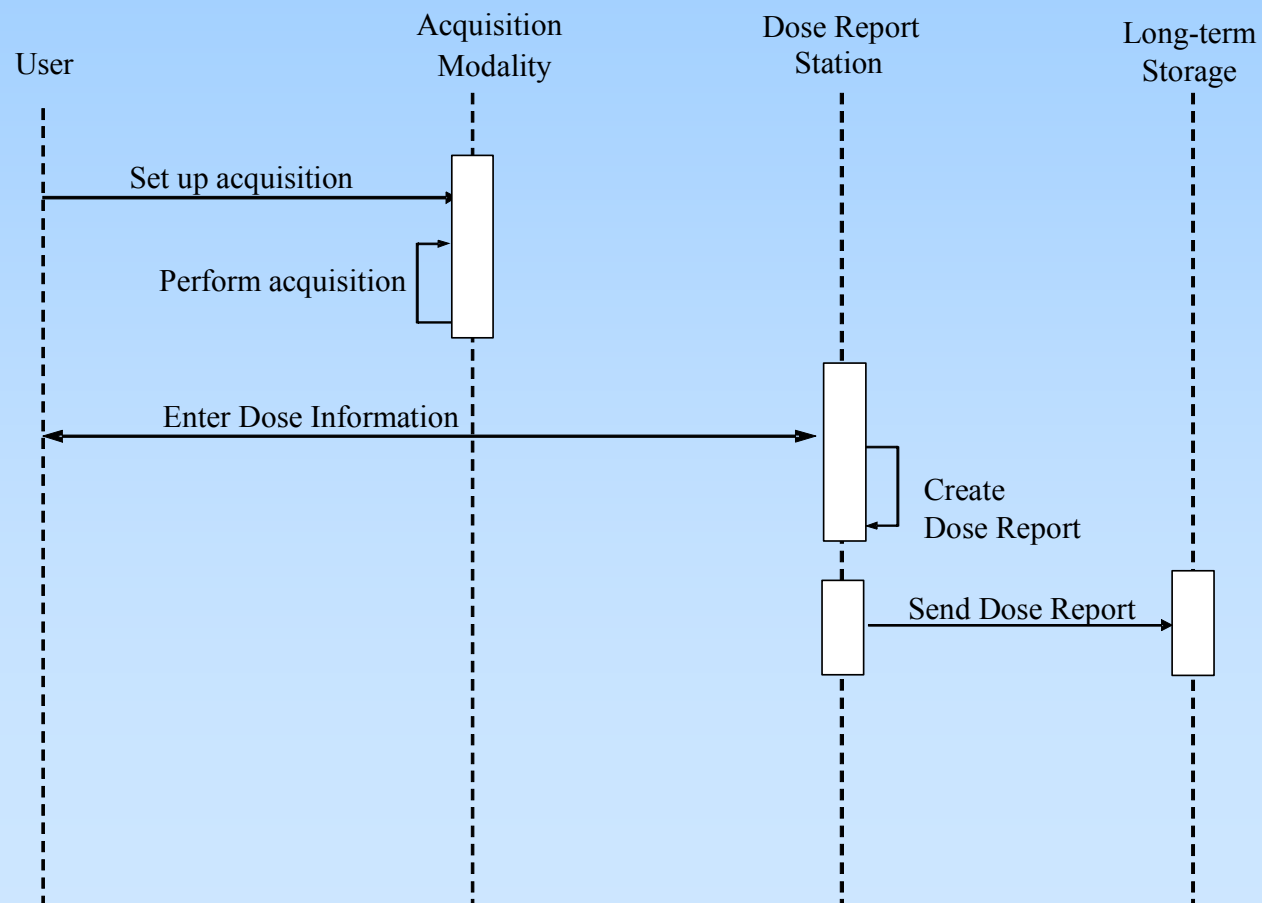
User scenarios (as of Supplement 94)

- The solution for Dose Reporting shall be scalable from simple Radiography to complex interventional X-Ray procedures.

- Dose Reports shall be interchangeable between different devices – Acquisition Systems, Display Stations, Dose Report Stations, Radiation Safety Station, PACS.

- The possibility to create secondary reports to summarize dose with extended scope (e.g. visit, certain time period) shall be provided.

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Scenario
"Basic Dose Reporting"

User	Acquisition Modality	Long-term Storage	Display Station

Set up acquisition

Perform acquisition → Create Dose Report

Verify, add comments to Dose Report

Send images and…

… Dose Report

Retrieve Dose Report

Scenario - "Dose Reporting for Non-Digital Imaging"

User   Acquisition Modality   Dose Report Station   Long-term Storage

Set up acquisition

Perform acquisition

Enter Dose Information

Create Dose Report

Send Dose Report

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Scenario
"Dose Reporting Post-Processing"

Acquisition Modality or Dose Report Station

Long-term Storage

Radiation Safety Station

Send Dose Report

Retrieve Dose Reports

Send Regulatory Dose Report

Store Cumulative Dose Report

Retrieve Referenced Images

Create Dose Map

Store Dose Map

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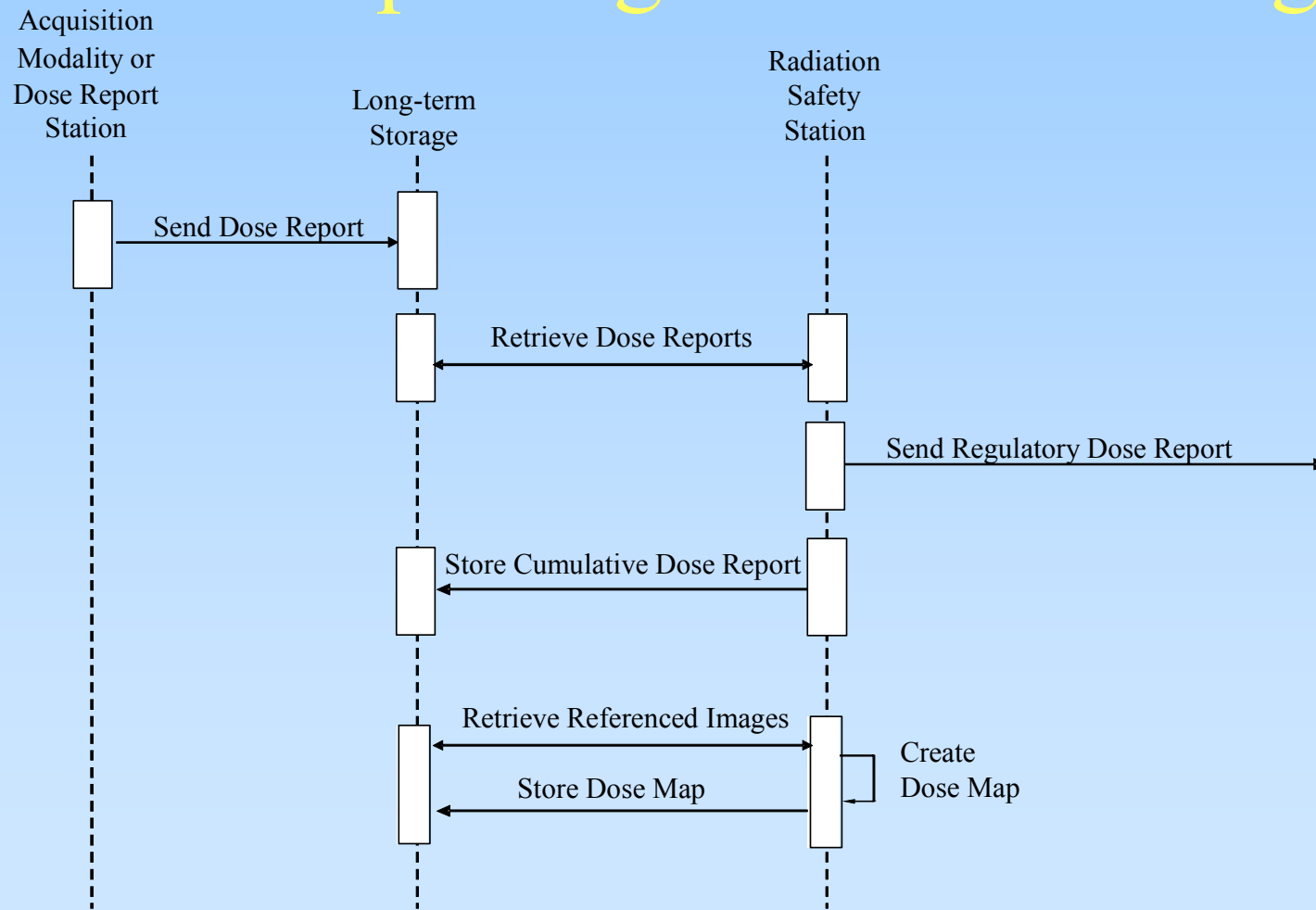
"Print a dose report"

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Patient Position:  HFS                                                    02-Mar-05 13:34:47


1     CARD           FIXED     Auto                             2s    60F/s  02-Mar-05 13:36:08

A   62kV    99mA     3.6ms   0.0CL small 0.9Cu 23cm      0.7µGym²  0.1mGy  28LAO   12CRA 127F


2     CARD           FIXED     Auto                             3s    60F/s  02-Mar-05 13:36:18

A   62kV    99mA     3.6ms   0.0CL small 0.9Cu 23cm      0.8µGym²  0.1mGy   0LAO    0CRA 157F



Patient Position:  HFS                                                    02-Mar-05 13:36:48



***Accumulated exposure data***                                          02-Mar-05 13:36:49

Phys: TBD                    Exposures: 2      Fluoro:   0.3min Total:      2.5µGym²  0.3mGy

A    Fluoro:    0.3min        1.0µGym²   0.1mGy            Total:      2.5µGym²  0.3mGy

B    Fluoro:    0.0min        0.0µGym²   0.0mGy            Total:      0.0µGym²  0.0mGy



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Example with irradiation events and accumulated values section

Solution outline – Projection X-Ray

- Structure to encode accumulated values as well as individual irradiation event data in one object is needed.
- Relationship to patient, study, procedure shall be provided.
- Possibility to create an additional dose report summary derived from "basic reports" shall be available
- Supplement 94 defines open solution to be extended for equipment dose reports not yet specified
- Existing DICOM services for workflow management and information retrieval shall be applicable to the solution.

Solution outline – X-Ray accumulated data

- Equipment identification and calibration information
- Scope of report and reference information
- Accumulated values, one set for each plane (X-Ray source)
  - Dose Area Product (grand total, total for fluoroscopy and acquisition modes)
  - Dose at "Reference Point (RP)" (grand total, total for fluoroscopy and acquisition modes).
  - Grand total of radiographic frames in report scope
  - Total time of fluoroscopy

Solution outline
X-Ray irradiation event data

- General Event information (method, plane, type)
- Link to acquired image(s), if any
- Dose at RP, Dose Area Product
- Acquisition parameters (e.g. kV, mA, filtration), some with "per frame" encoding option.
- Geometry information (e.g. C-arm/Table Angulations, Source to … Distances, Collimated Area, Patient Orientation/Position)
- Timing of X-Ray application
- Event Unique Identifier

Next Steps

- Proceed Supplement 94 "Diagnostic X-Ray Radiation Dose Reporting" to Final Text.

- Extent the Standard with CT and Mammography equipment by defining the related Dose Report Templates.

- Foster implementations to gain experience in features connected with Dose Reporting (e.g. Features of Radiation Safety Station)

- Apply results from practical experience to extent existing Standard according to further needs.

XA 3D Volume Object

- Problems to be solved

- Solution outline

- Scope of Work

- Invitation

XA 3D Volume Objects "Problems to be solved"

- Volume Objects encoding
  - Make 3D reconstruction from 2D projection imaging an integral part of XA procedure, no "extra CT modality".
  - Use new "enhanced" encoding schemes where applicable
  - Provide concept for 3D (color) overlay.

- Volume content
  - Define relation between volume reference system and C-arm isocenter.
  - Preserve geometrical data and other specifics of the 2D acquisition context

- Volume application
  - Align with future "3D Presentation State", Segmentation IOD (Supplement 111), multi-dimensional image registration.
  - Provide concept for 4D viewing – 3D multi-volume sets.
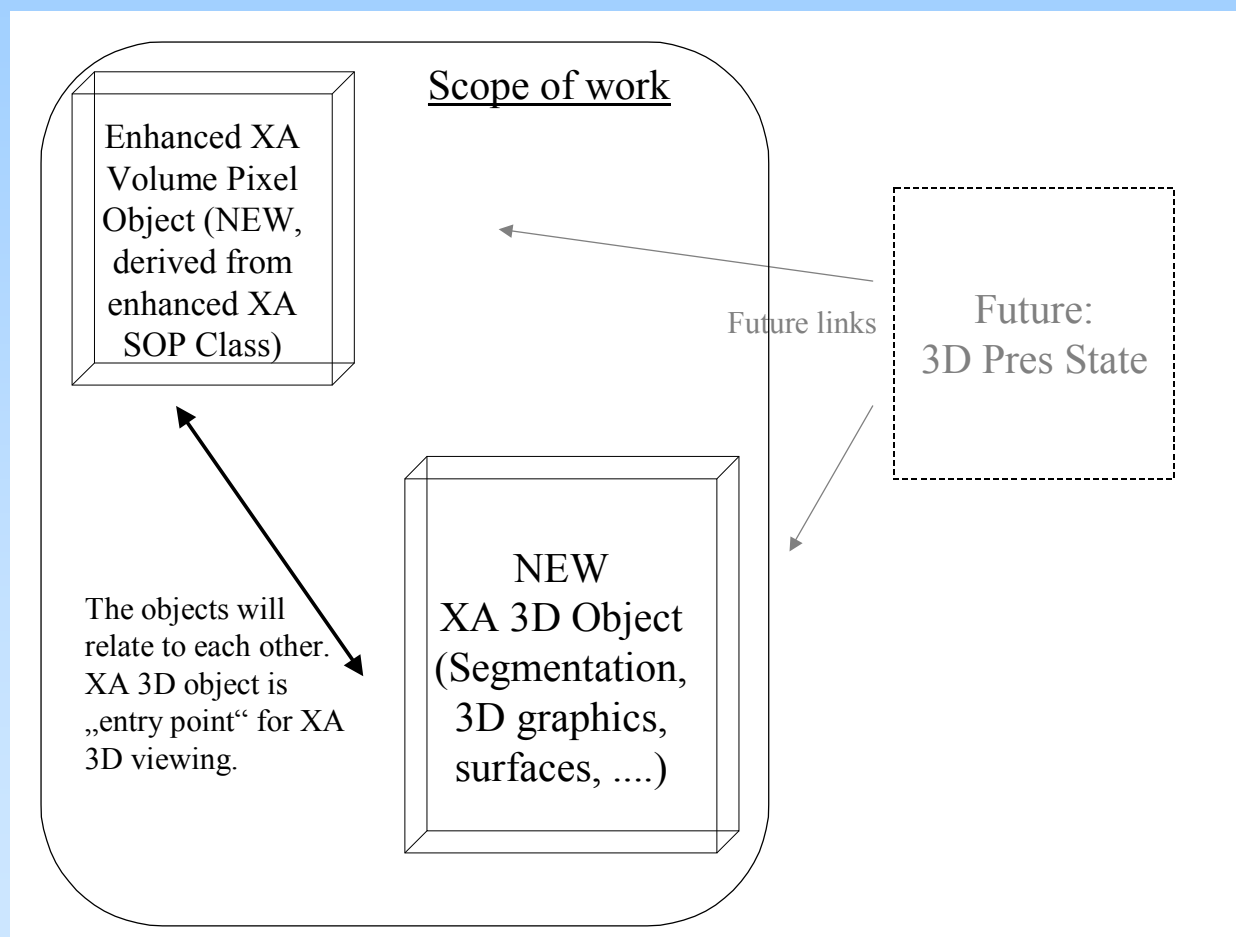
From 2D rotational angiograms…

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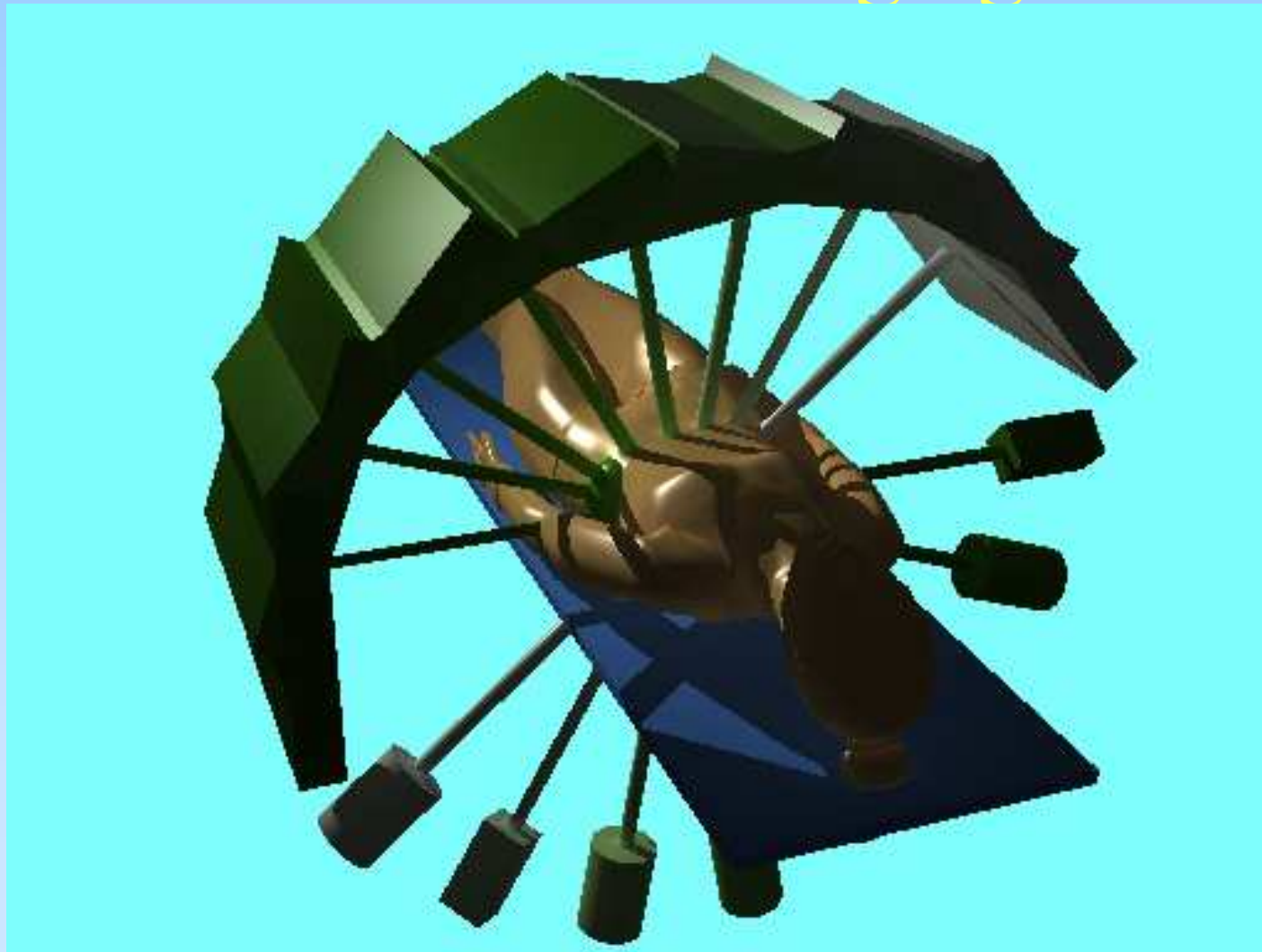
.. to XA 3D volumes
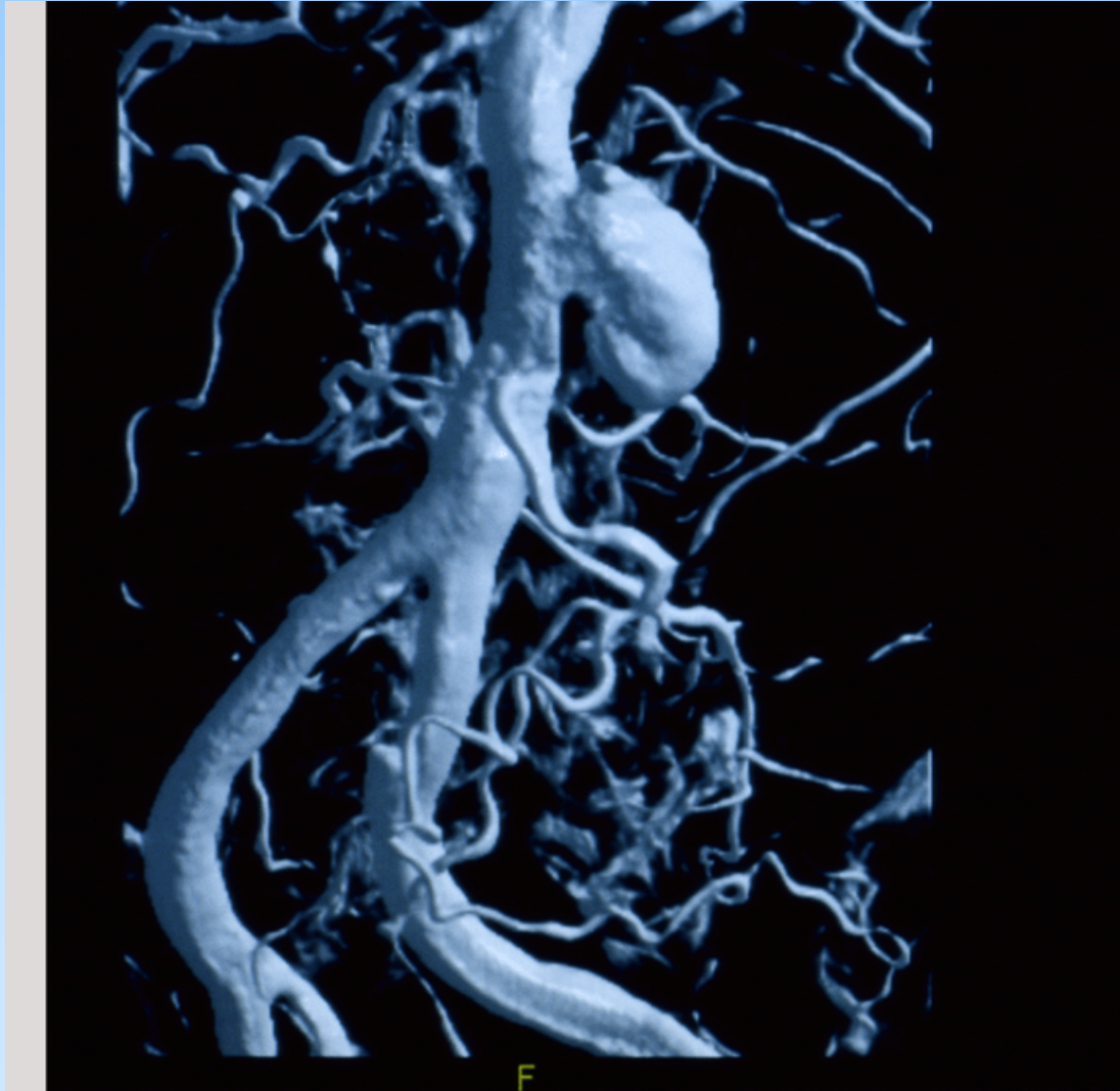
XA 3D – Solution outline

- Think of …

  - one Storage Class to store Pixel data volume ("XA volume")

  - another Storage Class to store specific XA 3D results (e.g. segmentations, marks, meshes, surfaces 3D annotations/measurements…)

- … that can be combined with a future 3D Presentation State solution

XA 3D – Scope of work

Scope of work

Enhanced XA Volume Pixel Object (NEW, derived from enhanced XA SOP Class)

Future links

Future: 3D Pres State

The objects will relate to each other. XA 3D object is „entry point" for XA 3D viewing.

NEW XA 3D Object (Segmentation, 3D graphics, surfaces, ...)

Invitation to WG-02

- In case you are interested in "XA 3D" work-item, please contact WG-02 chairman or visit our next meetings.

Contact WG-02 chairman

Rainer.Thieme@siemens.com

Next meetings:
- October 27th and 28th, 2005 in Washington
- December 12th to 14th, 2005 at DIN (Berlin)