

ActiveDICOM – Enhancing Static Medical Images with Interaction

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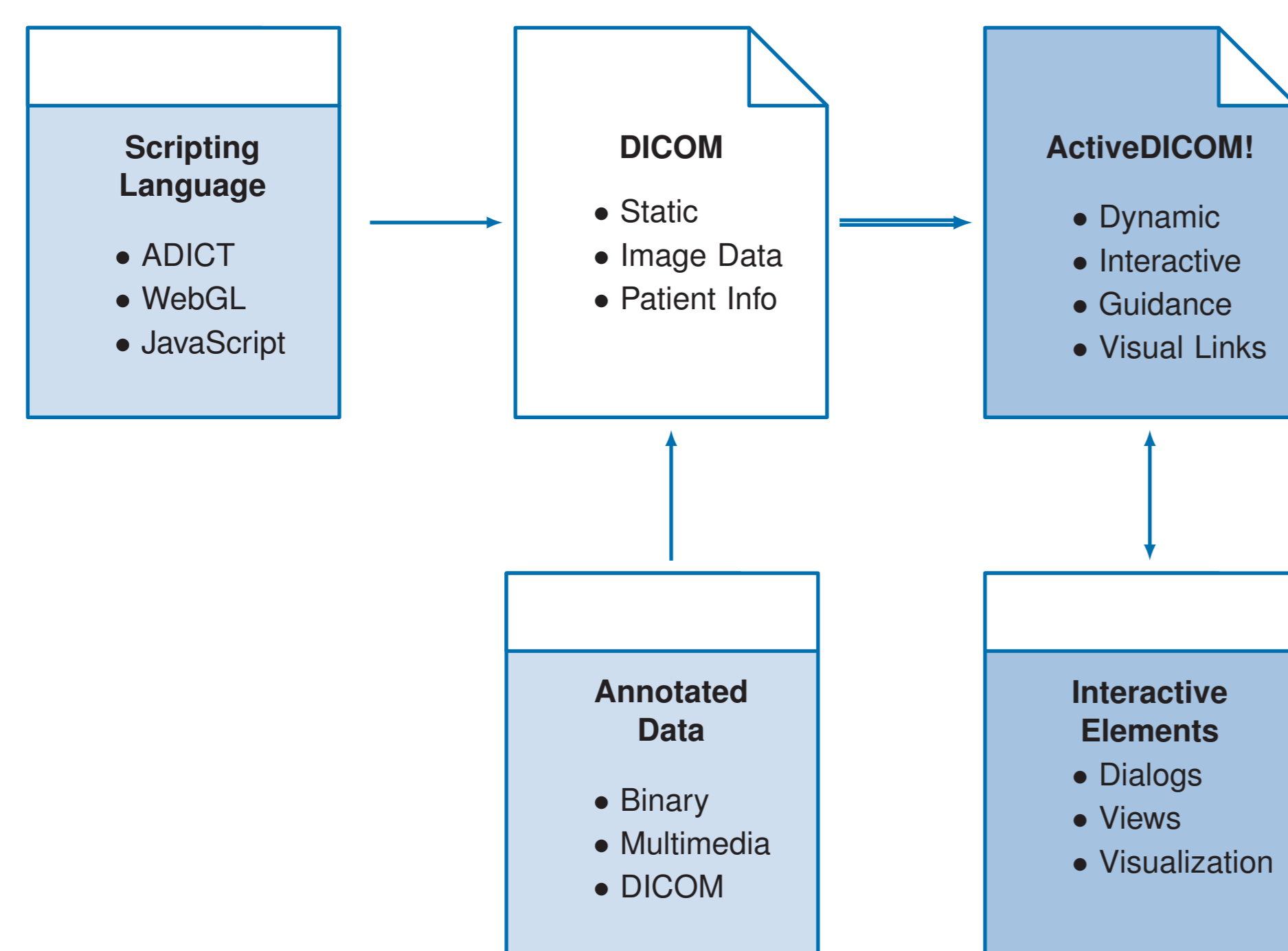
Introduction

Digital Imaging and Communications in Medicine (DICOM) is a well-established standard in medical imaging, consisting not only of image data, but sensitive data such as patient and examination information. Nowadays, although having a large variety of advanced rendering techniques available, DICOM images are still generated and sent to the Picture Archiving and Communication System (PACS). These images are then fetched by the medical doctor from a workstation and used for medical reporting. The user has no other possibilities than being able to change the windowing function for displaying the DICOM images. If a certain region is of special interest, either images of the whole data set are generated or have to be specifically requested. Both approaches consume a considerable amount of time. Secondly, the image generation on demand remains pending until done by the responsible assistant. Despite supporting a broad range of features and being widely applied, DICOM images remain static.

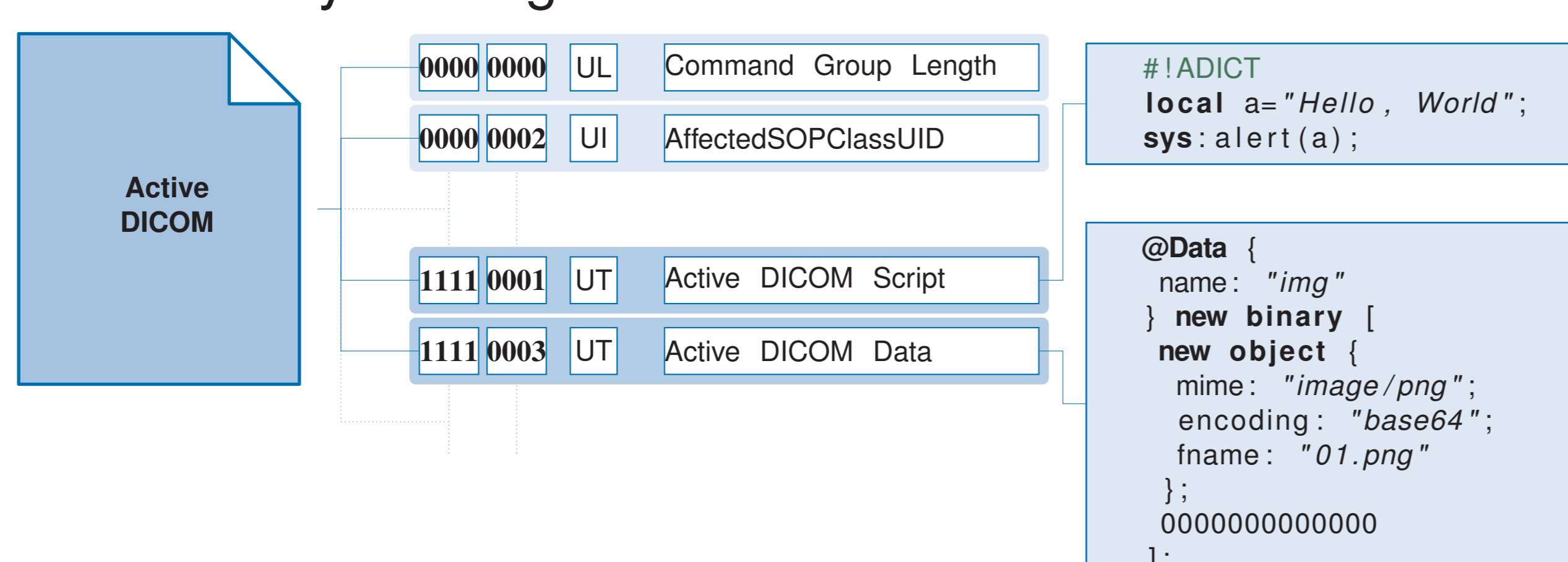
We propose a visualization mapping language, Active DICOM Script (ADICT), which enhances conventional DICOM with interactive elements by combining heterogeneous data, interaction and visualization. Such DICOM images are then called Active Digital Imaging and Communications in Medicine (ActiveDICOM).

ActiveDICOM

Active DICOM Script merges static DICOMs, interactive elements and multimedia into an ActiveDICOM.



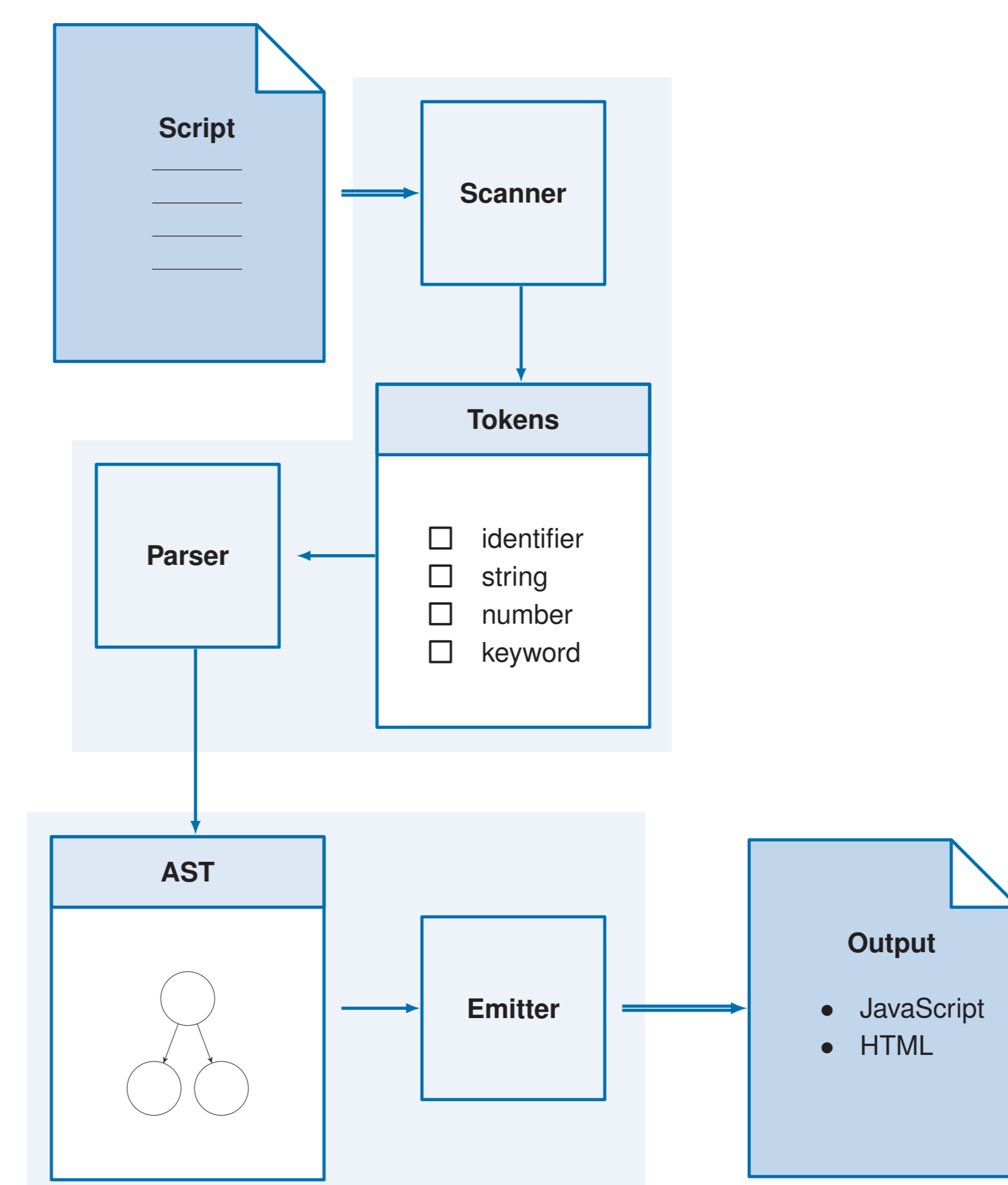
This domain specific language features a powerful syntax, extensibility, abstraction and easy code generation. In order to maintain compatibility to viewers not capable of interpreting the ActiveDICOM extensions, they are added through the use of the DICOM data dictionary and tags.



The above figure shows how the scripting language is integrated into a DICOM. On the right side of the figure two basic script examples are shown.

Implementation

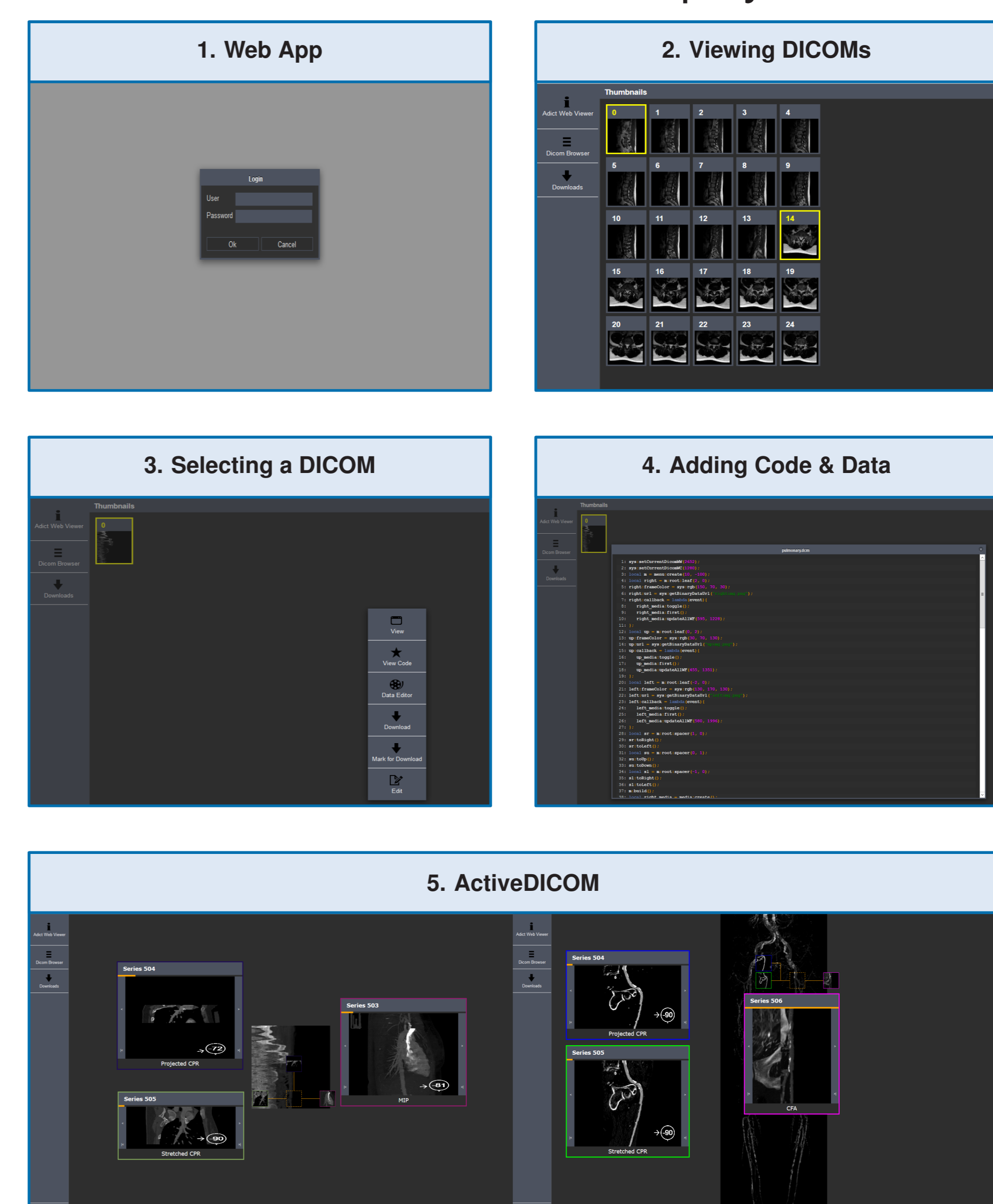
The realization of ActiveDICOM consists of two major parts. The first part of our implementation is the Active DICOM Script compiler. It translates the proposed mapping language into various target output formats. It uses a multi-tiered architecture.



The second part is a web-based DICOM viewer. This application provides common image manipulations such as zooming, panning and online window function alteration. Every part of the software was implemented in Java. The web application further utilizes JavaScript, WebGL and various Java-based web technologies.

Results

The following pipeline demonstrates the developed tools. It shows how an ActiveDICOM is created and displayed.



The fifth image shows embedded DICOMs within an ActiveDICOM. The depicted dialogues allow cycling through the embedded image collections and modification of the window function.