#  restFul3D

## SUBMITTED on Behalf of Working Group 27

(Web Services for DICOM )

*Steve Nichols, GE Healthcare*

## Introduction/Scope

This work item proposes to establish DICOMwebTM transactions for volumetric rendering and clarifies behavior for rendering a Volumetric Presentation State instance resource. The intent is to allow a lightweight client (such as a zero-footprint viewer) to request volumetric rendering of a series of images from an endpoint (such as a 3D post processing server), and having that endpoint respond with a new volumetric image in the form of a DICOMweb media type.

This proposal also has the support of several DICOM workgroups[[1]](#footnote-1) that have contributed to the use case development. It also has the support of the OHIF (Open Health Imaging Foundation).

## Limitations of Current Standard

The current standard for rendering requests is limited to 2D requests for displaying existing images. When a zero-footprint or lightweight 2D DICOM display is complemented with volumetric rendering, it is delivered by a separate server, utilizing private interfaces.

DICOMweb includes transactions intended to render a series as common 2D media types, but not as a 3D volume. DICOMweb also specifies behavior for rendering a Presentation State instance resource, however specific behavior for rendering Volumetric Presentation State instances is not specified.

Standardizing access to volumetric rendering will facilitate interoperability between origin servers capable of volumetric rendering and lightweight applications requiring access to volumetric rendering for presentation, reporting or headless processing.

## Description of Proposal

This proposal is intended to harmonize and extend the existing 2D rendering functionality by addressing volumetric data requests that create new images in accordance with the principles already established for Volumetric Presentation States.

This work item proposes an extension of the rendering functionality within DICOMweb to render and present 3D or 4D volumetric data. These transactions will allow a user agent to retrieve a rendered volume of DICOM slice data in non-DICOM media types from an origin server capable of rendering display algorithms, such as multi-planar reconstruction, surface rendering and volume rendering.

This work item will include specification of a subset of parameters that would be provided in a GET request to a rendering server, instructing the server as to how to render the series as a volume. Parameters will be based on existing attributes established in the MPR and Volume Rendering presentation state modules.

Considerations include:

* Due to the multitude of controls established for the Volumetric Presentation state, WG-27 will need to consider default behaviors versus those that are managed through parameter.
* Patient de-identification. Since faces can be reconstructed from head and neck CT and MR scans, implications of the anonymize parameter[[2]](#footnote-2) should be considered, as de-facing[[3]](#footnote-3) may not be feasible or clinically practical.
* Use case input from WG-17 considers current 3D model workflow involving Adobe 3D pdf format. Should this work item include elements of Adobe 3D, licensing will need to be considered.
* Use case input from WG-21 includes the concept of standardizing color lookup tables for volume rendering display. WG-27 will need to consider the application of parameters based on the Render Display Module in real-time, on-the-rly volume rendering. It is noted that color, tissue opacity and lighting may vary slightly between volumetric rendering origin servers.

Note: The intent of this work item is not to replace Supplements 156 (Planar MPR Volumetric Presentation State) and 190 (Volume Rendering Volumetric Presentation States), rather, it is intended to provide a complimentary, alternative option for real-time rendering of a series as a volume, and clarifying behaviors in for rendering an existing Volumetric Presentation state via DICOMweb.

## Parts of Standard Affected

This work item will affect Part 18 of the DICOM standard.

## Resources & Time Line

About 8 people are active in Working Group 27. Steve Nichols has volunteered to write this supplement; Bill Wallace (AGFA) and Jonathan Whitby (Vital / Canon) will contribute to the supplement.

Work will take approximately 36 months based on the assumptions below.

Note: assumptions include a Trial Use Implementation, as recomended by David Clunie.

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| **Item** | **Months (est.)** | **Note** |
| WG-27 draft | 12 |  |
| WG-06 review | 12 |  |
| Public Comment | 2 |  |
| Trial use | 9 | depending on adopters and timing w.r.t. Connectathon |
| Letter ballot & final text | 5 |  |

Members of WG-27 anticipate that 4 hours of Working Group Six meeting time will be required on each of nine occasions upon readiness of the first draft through final text of the supplement.

1. WG-01/WG-12 (US), WG-02 (Angio), WG-16 (MRI), WG-17 (3D), WG-21 (CT) and WG-27 [↑](#footnote-ref-1)
2. <http://dicom.nema.org/medical/dicom/current/output/html/part18.html#sect_9.4.1.2.1> [↑](#footnote-ref-2)
3. <https://www.ajronline.org/doi/full/10.2214/AJR.18.20452> [↑](#footnote-ref-3)