PET/CT Image Fusion Headed for PACS

by Jerold W. Wallis, MD

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Introduction

With the growth of PET-CT, there is increasing demand for display of fused PET and CT images on PACS displays. Up until now, this ability has been available on dedicated PET interpretation workstations, but it is rarely (if ever) present on general radiology PACS displays. IHE has now created an Image Fusion Profile to help make this a more commonly available feature on viewing systems.

IHE ("Integrating the Healthcare Enterprise") works with vendors, users and domain experts to create detailed guidelines as to how to use existing standards (eg, DICOM) in order to get different systems to interact smoothly to meet specific user needs. In this case, the result is the Image Fusion Profile. Vendors who choose to support the profile have the opportunity to do extensive testing with other vendors in a controlled environment, to help ensure that the developed software will work well when it is released as a clinical product. Users can then ask for the profile by name when purchasing systems.

What is the goal of the Image Fusion Profile?

This profile addresses the ability to convey registered data from one system to another for further processing, storage and display, and also the ability to present repeatable fused displays consisting of a grayscale underlying image and a colored overlay image.

The Fusion profile has been designed for general radiology and other medical use, regardless of type of modality. At the same time, it is recognized that PET-CT will be the major use of the profile in the near-term, and it has been designed to meet the needs of PET-CT viewing on general radiology PACS viewing systems.

How will things work under the profile?

Systems that comply with the Image Fusion Profile have the ability to deal with some special DICOM objects (see text box)

Special DICOM objects used in the Image Fusion Profile

"*Registration object* "– defines how two image sets are aligned (this is optional for already-registered PET-CT data from a hybrid scanner).

"*Blending Presentation State*" – defines how the fused data should be displayed, and includes pointers to the images, window level settings, color tables, and registration object (if present).

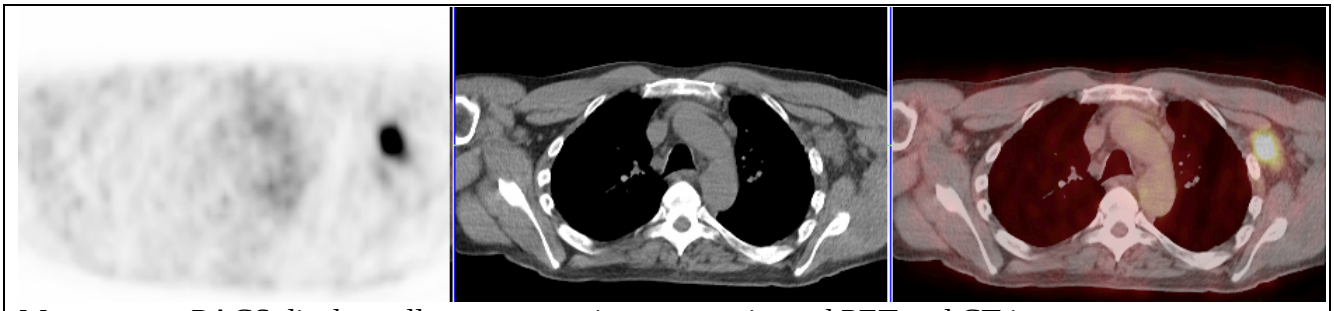
The profile would work as follows for PET-CT data:

- At your workstation, your software saves a Blending Presentation State, and possibly a Registration Object.
- When you send data to your PACS, both the image data and these two special DICOM objects would be sent for storage.
- When you view your images on the PACS Display, you would select just the Blending Presentation State. The fused images would then automatically appear, with the data resampled as needed to account for the differences in image sizes and slice spacing.

Once the fused data appeared on your viewing screen, you would have the ability to navigate

through the fused volume, change window settings (using controls appropriate for PET or CT data), and adjust the transparency (weighting) of the two image sets. Based on our experience with PET-CT data, two additional requirements were included in the profile: the ability to view tomographic images in multiple image planes (transaxial, sagittal, and coronal images), and the ability to view the two image sets separately side-by-side in a registered fashion (rather than just as a color fused display).

Display systems that comply with the profile will likely allow the user to manually pick registered PET and CT images for display, even if the data come from an older system that does not supply a Blending Presentation State. While the ability to do quantitation on PET images to display Standardized Uptake Values (SUV) would be of interest to some users, this ability is not required by the profile. Display of SUV and other PET-specific features will likely find a place in a future IHE PET profile instead.



Most current PACS displays allow users to view non-registered PET and CT images at separate times. Displays complying with the IHE Fusion Profile would allow users to view registered images, both in side-by-side format.(left and middle images) and in fused format (right image).

The next step

This profile is now published for "trial implementation," which means that vendors can look it over and decide to implement test versions of their software. They will then be able to verify that their software works with other vendors data at a large multi-vendor testing session (connect-a-thon) to occur at RSNA headquarters in Chicago next January. Choosing to comply with and test the profile will allow vendors to be confident that their Image Fusion solution will work well and meet users needs when it reaches the marketplace.

Vendors interested in the profile should contact the IHE (http://www.ihe.net) about the participant workshops scheduled for this summer. A much more detailed document describing the profile is available on the IHE web site. Portions of the profile are applicable to acquisition systems, processing workstations, image storage devices, and images displays, so inquiries from all are welcome.

In the meantime, users should start asking vendors *"Do you offer systems that comply with the Image Fusion Profile?"* – the fastest way to get vendors to supply the features of the profile is to get many people to ask for it.

About the Author

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