WHITE PAPER

Enterprise Imaging

Image Area
Integration capabilities

AGFA HealthCare

1. Why are integrations needed in a modern PACS system?

When building a "next generation" PACS system it is important to be able to provide an intelligent system that is capable of simplifying workflows. This can drastically reduce the number of interactions required of the user, thereby reducing costs. One building block in achieving this goal is to provide a sufficient amount of functionality in the PACS solution, so that the radiologist does not have to move to a different workstation to complete a complex reading task. Offering a lot of functionality natively in the PACS solution requires additional work to add all the necessary processes and workflows; this can be cost and resource intensive, which is why the Enterprise Imaging platform has extended integration functionality.
Other vendors have already introduced specialized products to the field that have proven useful to the customer; integrating those products into the PACS system is more cost efficient than 'reinventing the wheel'. But with a standard integration, the application still opens in a separate window and therefore has a completely different look and feel. This creates another barrier to using those integrations, as the radiologist needs extra training for that use case. Instead, seamless integrations are preferred, because they allow the user to learn a single look-and-feel and adapt it to all applications in the PACS system. This is a cost effective approach that will create more productive workflows.

2. What are the integration capabilities?

The platform combines a classical approach, e.g. launching the third-party application in a separate window, with a new seamless integration approach, in which the user does not see or feel any difference between the third-party application and Enterprise Imaging platform. To achieve this, it defines three levels of integration, depending on the capabilities of the third-party vendor.

Level 1:
Within a level 1 integration, the third-party application is embedded into the Image Area, and the look-and-feel is adapted as much as possible. The main characteristics of this integration level are:

- In-depth embedded application;
- Complete GUI driven by the Enterprise Imaging client;
- Not noticeable to the end-user that it is a third-party application.

The Image Area provides a full abstraction between frontend and backend, making it possible to connect the third-party at different points in the application. As a result, it is possible to further refine the integration process to a relatively in-depth renderer level integration or to an application level integration.

With the combination of the Hanging Protocols and Integrations, the Image Area is able to combine different renderer types from the solution with those from a third-party application. As shown in the following example, the user will not be able to tell which functionality comes from which vendor, allowing complex workflows and integrations.

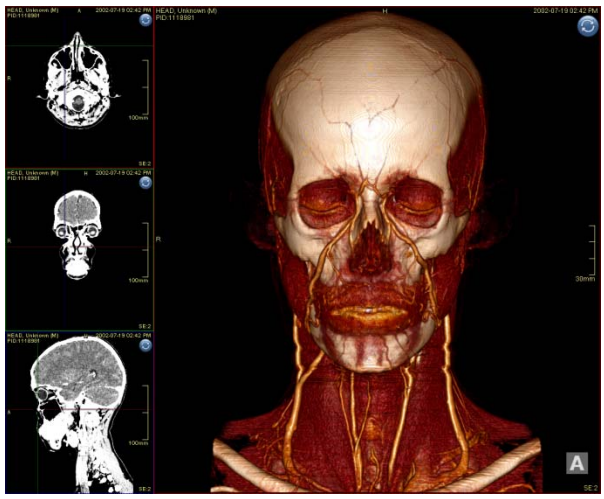

Figure 1 – Example of a renderer level 1 integration

In this example, the DVR (direct volume rendering) viewport is provided by a third-party renderer, while all MPR (multiplanar reconstruction) views are provided by the system. Functionality that is available on a DVR viewport in Enterprise Imaging is also available on the third-party viewport, as it only provides the rendered content.

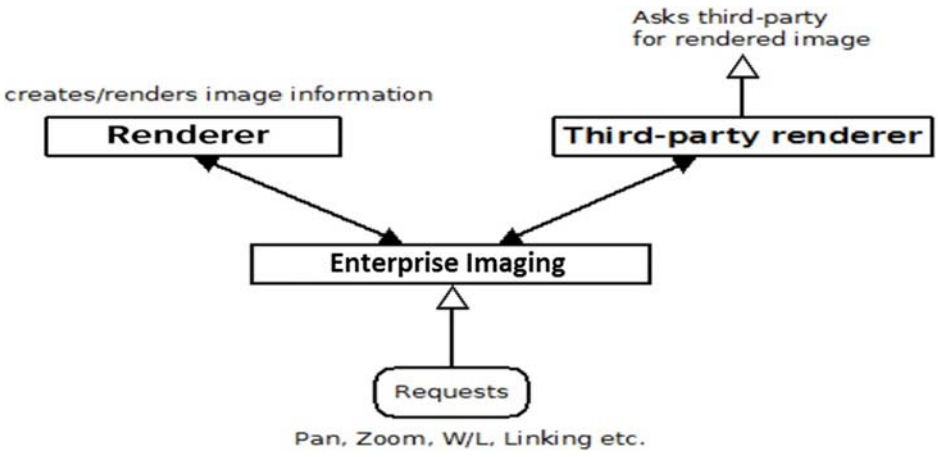

Figure 2 – Simplified view of architecture showing that the third-party renderer has access to all Enterprise Imaging platform functions

In this particular case, viewports can be linked (see Hanging Protocols white paper), enabling selections to be made on the DVR (third-party), which will then update the MPR (in-house renderer). However, in some cases the third-party application might not be able to provide all the features that are normally available within the Image Area. This will be noticeable to the user because the Image Area will either inform him or leave out the functionality for that particular renderer.

On the other hand, it is possible to provide additional interactions that are only allowed on the third-party by supplying content in the context menu, toolbar or clinical sidebar. Though a renderer level integration is very powerful, it is necessary that the third-party vendor be able to support the required level of granularity.

With this type of integration it is possible to offer complex workflows with third-parties that would otherwise be computer resource intensive. The product will maintain its overall look-and-feel, but can offer additional functionality of benefit to the user, as the interactions will remain identical. This reduces training time and improves ease of use.

Another way to integrate a third-party is to connect the entire third-party application to the Image Area. An example can be seen on the following screen:

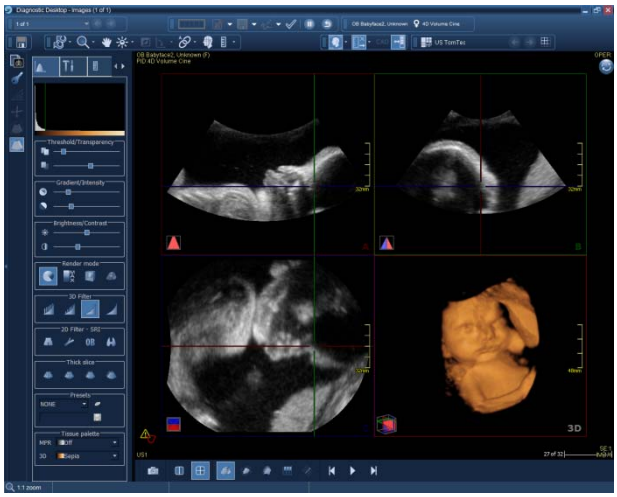

Figure 3 – Example of an application level 1 integration

With an application level integration, it is possible to take the content of the entire third-party application and integrate it into the Image Area. This provides access to additional workflows in the system, as they are present in the third-party application. If the user has knowledge of the original application, he will immediately feel comfortable with the integrated version. If the user has never used the third-party application, it will nonetheless be simpler for him, as the third-party will comply as much as possible with the Enterprise Imaging client look-and-feel. User Interface (UI) elements and the

interaction of the third-party application will be mapped towards the system UI elements, creating a seamless integration.

With a multiple screen solution, it is still possible to view an application level integration side by side using viewports. Some features will only be available on the third-party viewport or on Enterprise Imaging, but the user will receive feedback on which action(s) can be performed on which viewport. Additionally, it is possible to add extra user controls that may be required for the third-party. In the example screen above, the third-party application is using the complete viewport of the Image Area; it has added a toolbar at the bottom and an additional control in the clinical sidebar.

These types of integrations are less complex than the renderer level integration, but they do not offer the same granularity. They do, however, offer new workflows, which the UI would not otherwise be able to provide. The user will also need to make less effort to interact with the third-party application, which will adopt as much of the look-and-feel as possible.

In the case of a level 1 integration, Enterprise Imaging takes full control of the lifecycle of the third-party application. This includes not only installing and updating the process of the third-party application, but also starting and stopping the process. Furthermore, it is possible to both show and hide certain parts of the application from the user.

Interactions with the third-party application can be optimized so that workflows are easier and faster to use.

For a level 1 integration, documentation will be embedded so that the radiologist does not have to search in additional folders. Furthermore, the third-party application is packaged within the platform, which will automatically provide updates of the latest versions of the third-party vendor's application (if available). Licensing is embedded, which allows the license system to handle various third-party application license models, if necessary, and also to deactivate functionality by means of license availability. This model is not enforced, however, making it possible for the third-party application to provide its own license, which can then be combined with the one from the Enterprise Imaging solution, if necessary.

The tight integration also offers a logging mechanism, by integrating the log from the third-party vendor application into the platform log, enabling improved support.

The Image Area is capable, as well, of attaching third-parties' applications in a deeper granularity, by taking not only the entirety of an application, but specific parts and

attaching them to either the frontend or the backend. A simple example would be the integration of an algorithm that is capable of sophisticated calculations, the results of which are then visualized in the solution framework. With this type of integration, the workflow and visualization of the results are done by the Image Area, and therefore behave as any other, similar object in the framework.

Close collaboration with the VRVIS (Institute for Virtual Reality and Visualization in Vienna, Austria) has resulted in the ability of the Image Area to support semi-automatic spine labeling and vessel tracking with a single mouse click.

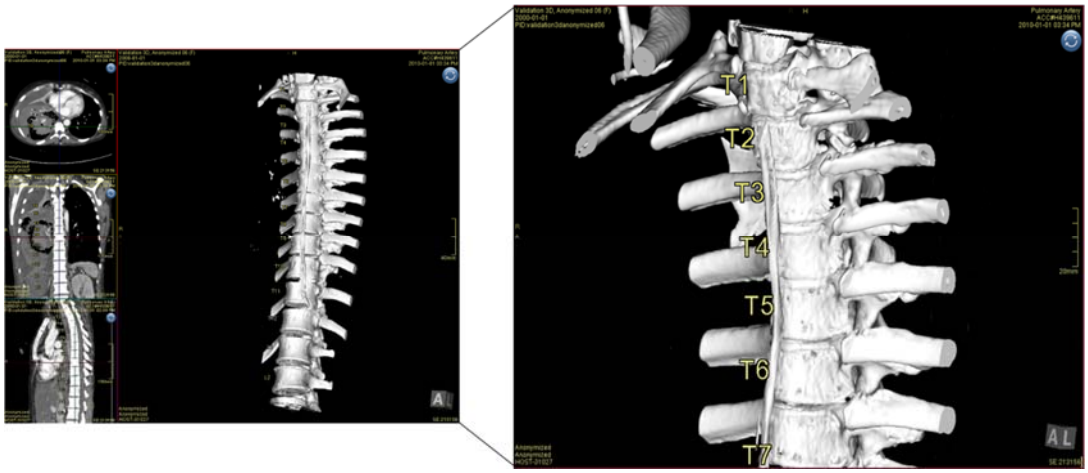

Figure 4 – Result display of semi-automatic spine labeling integration

As is displayed on the images, the visualization is done by the Image Area. The only connection that needs to be identified in such an integration is the data that must be exchanged to provide a correct calculation. This requires the establishment of close collaboration with the third-party vendor/institute.

Figure 5 – Result display of vessel tracking integration

Level 2:

A level 2 integration is not embedded within the Enterprise Imaging desktop, but is optimized so that it complies with the look-and-feel of the platform and starts up via a separate window. However, it is still integrated within the Image Area workflow to minimize the number of user mouse clicks required to activate the third-party product. This provides simpler access to the third-party application, making it easier to navigate between the Enterprise Imaging interface and the third-party vendor.

Depending on the capabilities of the third-party product, it is possible to integrate measurements into the *List Text Area* or to do a predefined image/study detection to automatically provide the correct data to the integrated application.

Level 3:

A level 3 integration differs from a level 2 integration in that it is integrated only by means of a desktop level integration. Therefore, functionality can be triggered by a button in the Image Area, which will then provide the image data to the application. Neither the Enterprise Imaging application nor the third-party application will change the workflow or the look-and-feel. This kind of integration will be available not only for the Image Area, but also for other components within the solution.

Agfa HealthCare, a member of the Agfa-Gevaert Group, is a leading global provider of diagnostic imaging and healthcare IT solutions. The company has nearly a century of healthcare experience and has been a pioneer on the healthcare IT market since the early 1990's. Today Agfa HealthCare designs, develops and delivers state-of-the-art systems for capturing, managing and processing diagnostic images and clinical/administrative information for hospitals and healthcare facilities, as well as contrast media solutions to enable effective medical imaging results.

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