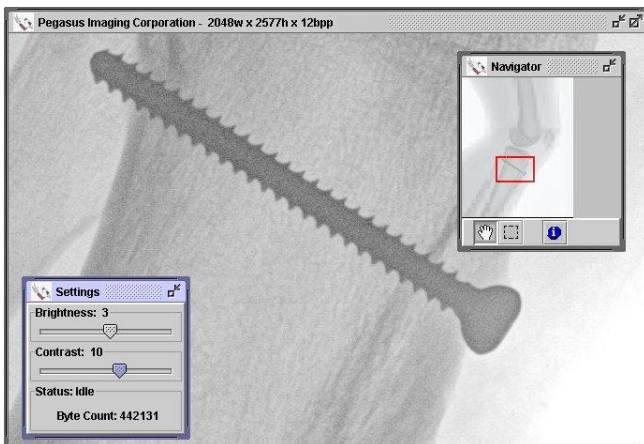


Pegasus PICTools JPEG2000 – Support for JPIP

Standards-based JPEG 2000 Transmission Software Toolkit

Introduction

The Pegasus Imaging PICTools JPEG2000 software development kit (SDK) provides sophisticated imaging technology enabling engineers to design and build a JPIP implementation wholly in accordance with the JPEG 2000, Part 9 standard. The JPIP standard is designed to speed optimize network viewing of user selectable resolutions and areas of interest on JPEG 2000 images. The Pegasus PICTools JPEG2000 SDK provides a complete JPIP API for client and server side deployments. It also provides JPIP / JPEG 2000 compliant compression, request and receive, and decompression of JPEG 2000 images. The Pegasus Imaging JPIP implementation benefits from many years of experience working with streamed multi-resolution image formats. In fact, Pegasus has successfully offered a similar solution, Image Delivery Protocol (IDP), since 2002.



The tiny rectangle selects the region of a very large image that the user wishes to examine closely, which is quickly displayed at full resolution in the large main window.

The Need for JPIP

The JPIP standard was defined specifically to address the difficulty with viewing very large images transmitted across networks. It provides a specification for the image user to identify and accelerate viewing access to entire low-resolution versions of large images along with user-defined areas of interest in those images. This selective viewing on demand dramatically improves the user perception of download speeds, particularly for very large images or slower network connections. (If desired, for example, the entire high-resolution image can be downloaded as a

background action while the selected area of interest is already being viewed.)

The current trend in medical imaging and digital photography is for larger image sets with resolutions exceeding 2,000 by 2,000 pixels, and this trend is expected to continue. As X-ray and MRI sensors improve, higher resolutions can lead to better diagnostic opportunities. Using JPIP, a network of remote diagnostic users will more quickly navigate through large image sets by fully transmitting only the regions of interest in each image. Instead of waiting for transmission of a complete image containing millions of bytes, the data from the source image comprising only a low-resolution version of the image, perhaps 1/20th the size, can be requested and retrieved for initial viewing.

As the table below illustrates, a low-resolution “placeholder” for the full image, or a small area of interest, can be transmitted over a typical DSL line in a fraction of a second, whereas the user would have to wait 27 seconds if the entire, full-resolution image had to be transmitted prior to display.

	Low Resolution Proxy Image	High Resolution Full Image
Image Resolution	512 x 620	2048 x 2577
Image Size (lossless 3:1 compression)	159 Kbytes	2,577 Kbytes
Decompressed memory size	476 Kbytes	7,731 Kbytes
DSL transmission time at 768 Kbits/sec	0.21 seconds	27 seconds

Table 1 - JPIP Image Speed Comparison

Viewing an entire set of these very large images can easily saturate existing 100-BaseT networks. Multiple viewing stations operating on a network place even greater demands on bandwidth. Using JPIP, many diagnostic workstations can be placed on the same local network without saturating the network and slowing down the diagnostic process. The ability to quickly share complex medical images over wide area networks enables many new and exciting healthcare treatment options.

JPIP Architecture

A typical JPIP implementation involves two main components: a server that stores the full image sets and delivers partial or full images as they are requested, and a client that requests those images and displays them to the end user. The JPIP client provides additional interface controls that allow a user to select images available on the server, scroll within an image, select a region within an image to download and view in more detail, and perform other operations. The network used for transmission of the requests and images can use the Internet (HTTP), other standard protocols, or a proprietary transport protocol.

The Magic of Pegasus' JPIP

The Pegasus PICTools JPEG2000 toolkit provides the JPIP tools needed to view large JPEG 2000 images over networks using an integrated end-to-end client-server application. Integrating high-speed JPEG 2000 viewing on a local area network allows the design and deployment of an effective department-level diagnostic imaging solution. An enterprise-level solution can be created by clustering multiple Web servers across a wide-area network. The standard HTTP protocol allows the development of JPEG 2000 viewing solutions using Web servers and Web browser clients.

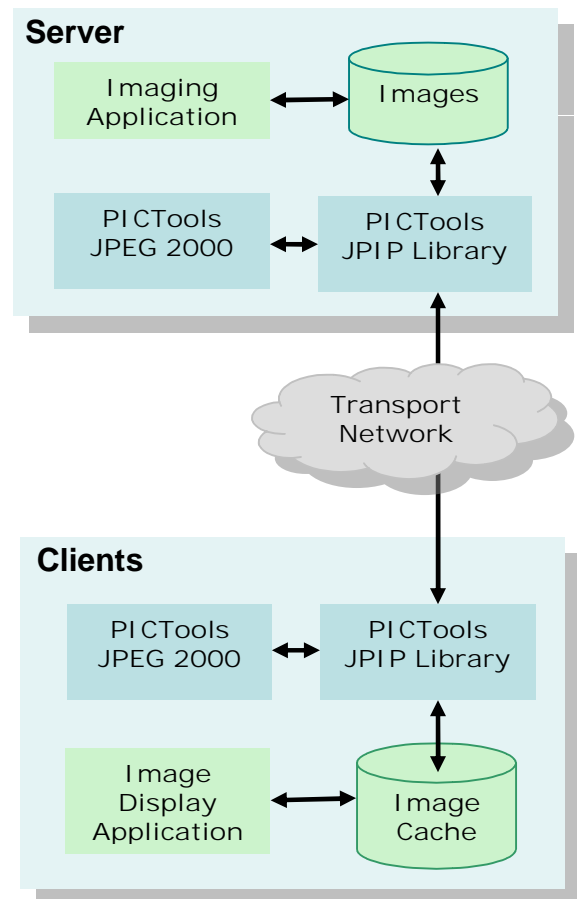
Using JPIP for Medical Imaging

The Pegasus PICTools JPEG2000 SDK solution can be used to build applications that enhance medical diagnosis by extending existing imaging practices. PICTools JPEG2000 helps to address several important demands of medical imaging:

- Allows user perception of much faster viewing of high-resolution medical images (2,000 x 2,000 pixels or more, and growing)
- Enables fast browsing through large image data sets (100+ images per set and increasing)
- Avoids saturation of data networks by progressive transmission of images
- Reduces space wasted from duplication of data by centralizing image storage
- Provides user perception of faster image viewing over wide area networks connected via DSL, cable modem, and even dial-up modems
- Enables high-resolution image data sets for remote 3D image creation

The PICTools JPEG2000 toolkit can be used to create highly efficient diagnostic image viewing workstations. Clinicians and doctors can quickly browse

low-resolution data sets, browse through difference resolution layers, and quickly scroll across images to view regions of interest. Hospitals and clinics can create clusters of inexpensive diagnostic workstations and locate them wherever they are needed to facilitate diagnosis. Radiologists on-call can view images remotely from home without returning to the clinic, even over dial-up modem lines.



About Pegasus

Founded in 1991 and headquartered in Tampa, Florida, Pegasus Imaging Corporation delivers digital imaging software development components, image compression and image editing technologies. The company exceeds speed and quality requirements for document imaging, forms processing, medical imaging, color/photo imaging, video applications and more. Technology is delivered as Microsoft .NET controls, COM controls, VCLs, DLLs and applications. Multiple platforms are supported, including Windows, Linux, Solaris, and IBM AIX. For more information, visit www.pegasusimaging.com, e-mail sales@jpg.com or call (813) 875-7575.