



Insight™ Web Streaming Functions



The adaptive web streaming technology of Insight reduces overall bandwidth requirements as compared to traditional web-based systems.



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Insight™ System Architecture

The Insight™ image and data management system allows enterprise-wide access to all patient data and diagnostic functions. This is achieved via the system's unique adaptive streaming technology.

The Insight™ system is client/server-based: any application on the server generates screen images. When a new screen image is available, the image is compressed and transmitted to the user located at the client machine (see Figure 1).

The streaming technology ensures that the user observes no difference between running Insight™ remotely on the server and running an application on the local client. To the user, the computer network transmitting the images may simply be considered as a long monitor cable. In addition, the streaming technology contains built-in encryption layers so that security protections are always active.

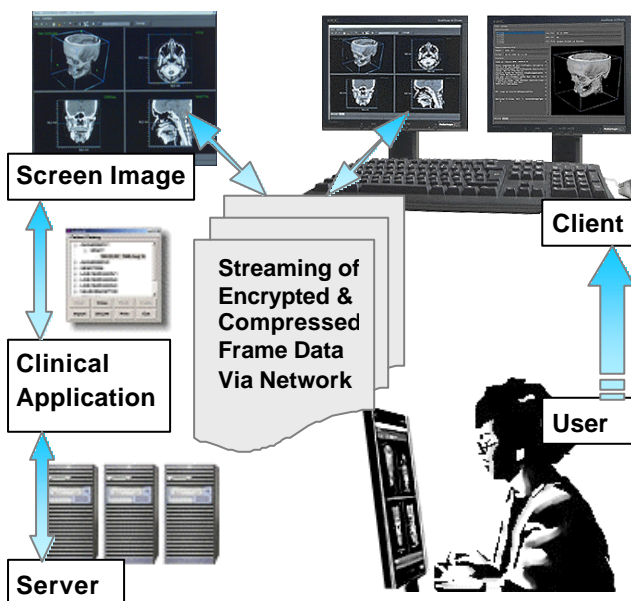


Figure 1. The client-server architecture of the Insight™ system ensures that patient data and images are not transferred from the server to any clients. Only the final screen images are streamed to the client station in response to user interactions.

Adaptive Streaming Technology

The Insight™ adaptive streaming technology is a complex set of methods that ensures the system requires less overall network bandwidth than a traditional web-based system (given similar usage patterns and similar network topology).

Consider a clinician using a 2 mega-pixel monitor examining the reconstructed volume for a 400 MB CT scan. For a typical session using adaptive streaming, the average network load is 75 kb/s, for an overall data transmission from the server to the client of 1 MB. With a traditional web-based system, overall data transmission from server to client would be 400 MB.

In generating a reconstruction on the server, Insight™ adaptive streaming operates such that screen updates involve only those pixels that have changed state. The updated pixels are compressed and sent to the client. During interaction with the data (motion, zooming, window-level, etc), the compression level is high (based upon the available bandwidth that is continually being monitored and measured), and the data are also sub-sampled prior to processing (reconstruction in this case) and compression. When interaction is complete, full-resolution data is used, along with no losses due to compression, to ensure perfect fidelity in the resulting screen image.

Figure 2 shows the average network load for the example session, both for Insight™ and for a conventional web-based client-server system.

As another example, consider a pair of CR chest images being viewed on a 3 mega-pixel monitor. For a typical session, the Insight™ system uses

1| It is assumed that only 60% of screen pixels are required to be updated during interactions with the data. The frame-rate is assumed to be 12 fps, and the overall session is two minutes in length, with the system assumed quiescent fifty percent of the time (requiring no pixel updates).



an average of approximately 150 Kb/s of bandwidth, for a total data transmission of 2 MB.

A web-based system without adaptive streaming transmits 5 MB in total.

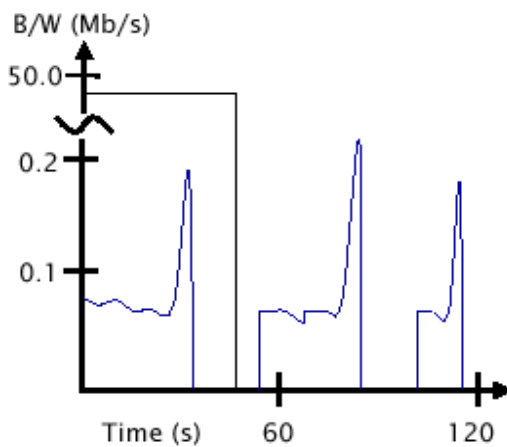


Figure 2. Network bandwidth consumption for a typical session using the Insight™ system (in blue) versus for a traditional web-based client-server system (in red).

Transmission Methods

As the examples in the previous section show, the advantages of the Insight™ adaptive streaming technology vary depending upon a number of complex factors. In fact, streaming is automatically not used in certain situations where overall bandwidth consumed would be less if data were transmitted directly to a client device.

For example, reports or textual RIS data are often better handled via an XML-based method. Similarly, 2D image data may be transmitted on-demand to high-resolution multi-screen diagnostic workstations, rather than the final screen images being streamed. For wireless PDAs, as shown in Figure 3, streaming is used in most situations.

The decision regarding what type of transmission method to use, and how to use it, is done automatically by the Insight™ system in order to ensure optimal system performance and to minimize network bandwidth requirements.

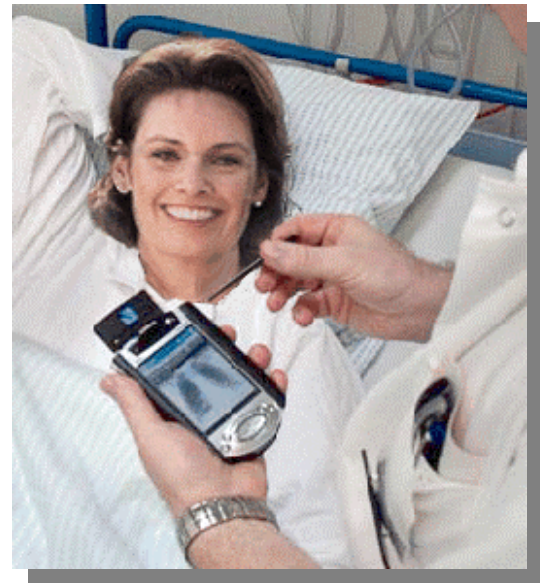


Figure 3. The Insight™ system being used to access radiology data on a wireless PDA at the bedside. Streaming technology allows such a light client to function as a powerful diagnostic tool.



Conclusion

Contrary to traditional medical IT systems – where patient data are forwarded for viewing on local workstations – the architecture of the Insight™ system uses powerful servers to stream final screen images to client devices.

This patent-pending adaptive streaming technology allows access to images, patient data, and diagnostic functions on low-bandwidth computer networks. Remote access to the servers, for example over common DSL connections, gives clinicians the same features and performance as are available within the hospital.

The network bandwidth and topology requirements for the Insight™ system are no greater or more stringent than for traditional web-based client-server systems, given equivalent usage patterns and numbers of users.

The Insight™ image and data management system provides unique possibilities for new ways of working with patient image and other data.

About MDX Corp.

MDX Corp. is an innovative Canadian company specializing in systems for managing and distributing patient images and data in healthcare organizations.

The company's offerings include the breakthrough system for Image and Data Management, Insight™, is available worldwide along with the Galileo™ advanced medical image analysis software systems.

The Insight™ technology, which is patent-pending and unique to the medical IT market, produces measurable financial benefits and improves workflows and patient care.

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