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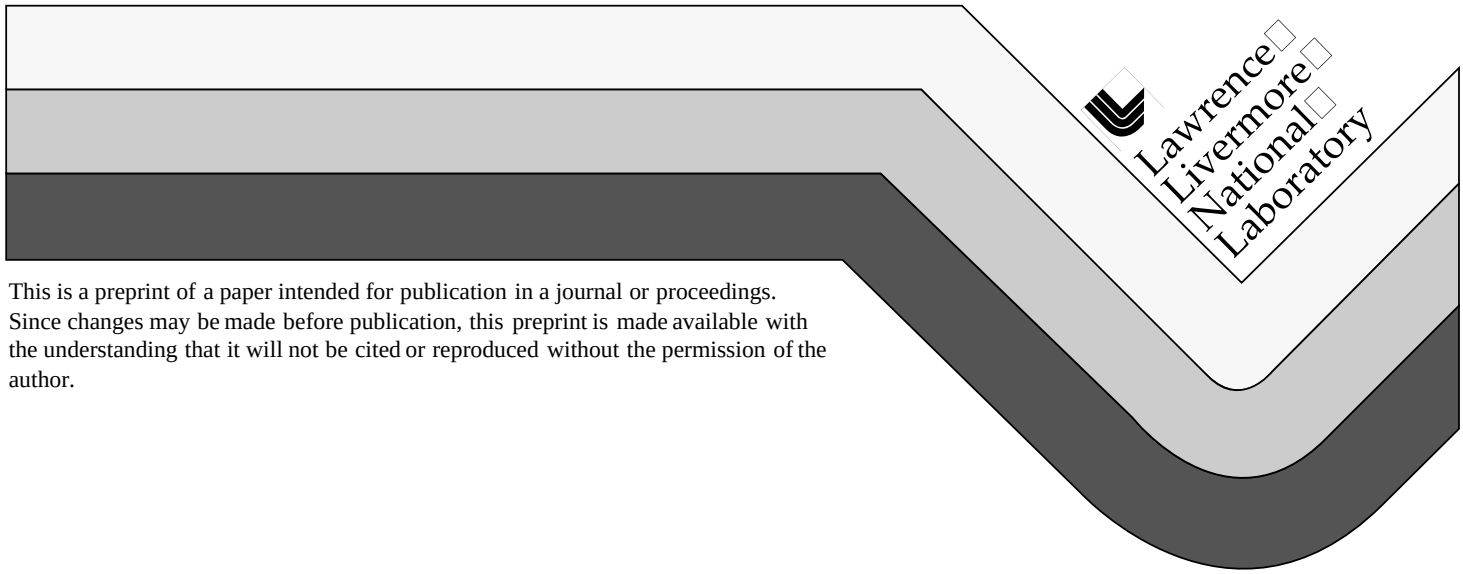

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Web-based Document and Content Management With Off-the-Shelf Software

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Oct '96. FileMaker/Tango/WebSTAR: One of the major programs at LLNL, the Earth and Environmental Sciences (EES) directorate, had a need for a non-proprietary, platform-independent, Web-based image database. We knew of no commercial product that met these criteria, so we decided to build our own. We were just beginning to use Tango, a database access CGI that worked in conjunction with our Macintosh WebSTAR Web-server software. Therefore, we chose to create an image database using FileMaker Pro and then provide Web access using Tango and WebSTAR. We had to make our thumbnails and screen shots by hand using an applicaton called PhotoMaster. We were placing originals into the archive manually. Fortunately, Tango automatically created the URL to the FTP link to original file. This gave us a proof-of-concept product that we could present to our client. They liked what they saw and funded us for $50,000 to finalize the project. $15,000 of this was used to purchase extra disk storage for our fileserver. It also paid for one month of labor for an Information Specialist from the TID Library to compile a list of controlled keywords by interviewing people throughout the EES directorate. One month of labor for HTML customization by TID's Internet Publishing Team was also covered by this funding. Although they liked the prototype, the customer's main concern at this point was that the FileMaker database was unacceptably slow.

Dec ’96. Butler SQL/Tango: In an attempt to improve access speed, I converted the FileMaker Pro database to Butler SQL, the only SQL database available for the Macintosh. This provided access speeds that were an order of magnitude faster—1.4 seconds versus 14. The next hurdle was what to do with viewgraphs. Viewgraphs seemed to be an insoluble problem— the customer wanted access to individual slides, but with our existing technology, only the whole presentation could be downloaded and we had no way to automate the creation of thumbnail imagoes. Also, we were limited to searching on the metadata associated with the viewgraph. We knew that viewgraphs were going to make up a substantial part of any image database, so we had to find a way to surmount this problem.

In this same time period, another major client, the Director's Office, approached us with a need for a Web-based image database. We used the work we had produced for the E&ES prototype to demonstrate our capabilities. Once again, the customer was pleased and were funded for another $50,000.

Nov ’97.Imation Media Manager (based on Butler etc.) Customer demands for new features such as a shopping cart capability, automatic placement of the original in an archive *and* creation of a link for download, were becoming overwhelming. At this time we came across a commercial image database product called Media Manager by the Imation Corporation. This product appealed to us because it used the same tools we were already using: Butler SQL, Tango, and WebSTAR. This meant that we knew we could easily customize it. What was even more appealing was that Imation said that for a fee (a substantial one) they could customize the

application to handle individual slides from PowerPoint. We promptly purchased the product, but even with Imation's help, we could not get the Macintosh version of MediaManager to work. We were forced to use NT version which worked with one very important exception—the download feature did not work. Our system configuration stored the original file of each image on a Sun fileserver which we were accessing from our NT Web server via NFS. Imation could not get the download function to work in this environment.

Meanwhile, independent of our image database project, TID's photo lab had converted an ACTI graphics art camera from conventional film to digital. They were now able to scan images maps at 10000 X 8000 lines of resolution. This resulted in files that were in the range of 100-250 Mb. It was clear that if these were to be added to the database and accessed over the Web, image compression was needed. We began looking at the image compression tools on the market and chose MrSID (Multi-resolution seamless image database), a technology developed at LANL and later spun off as the foundation of a new company—Lizardtech. We found this the most appealing compression technology because of its zooming capabilities and its near lossless compression. I set up a meeting with representatives from Imation and Lizardtech to present the idea of incorporating MrSID compression into Media Manager's screen shots. The people from Lizardtech were wildly enthusiastic, but the ones from Imation weren't interested.

June '98: Our image database project came to the attention of the Nuclear Weapons Information Project (NWIP) at LLNL. They were in the process of implementing a document management system using a product called Intradoc

made by Intranet Solutions, Inc. The Intradoc system performs several functions when a file is submitted. First. It launches the application in which the file was created. It then creates a Postsript version of the file. The postscript file is then sent to Adobe Acrobat Distiller. The PDF version of the file and the original are then sent to the Intradoc vault. Next, the built-in Verity search engine does a full-text indexing of the file. Finally, an HTTP link to the PDF is created.

But Intradoc had a shortcoming—it did provide the database user with a graphic representation of the files returned by their search. However, the fact that it provided full-text indexing of PowerPoint presentations, a capability that, given our difficulties with presentations, was very attractive. We decided that we could take advantage of the best features offered by both systems by providing a common Web portal (see fig1). At this time, I wrote a CRADA proposal that sought to add thumbnail representation to Intradoc similar to that of Media Manager. We weren't sure how we would create the thumbnails but knew we wanted to incorporate an off-the-shelf solution. The CRADA proposal was approved and funded for $105,000. Shortly thereafter I suggested to Intranet Solutions that they incorporate MrSID image compression into Intradoc. They were very receptive to this idea and began to learn more about MrSID.

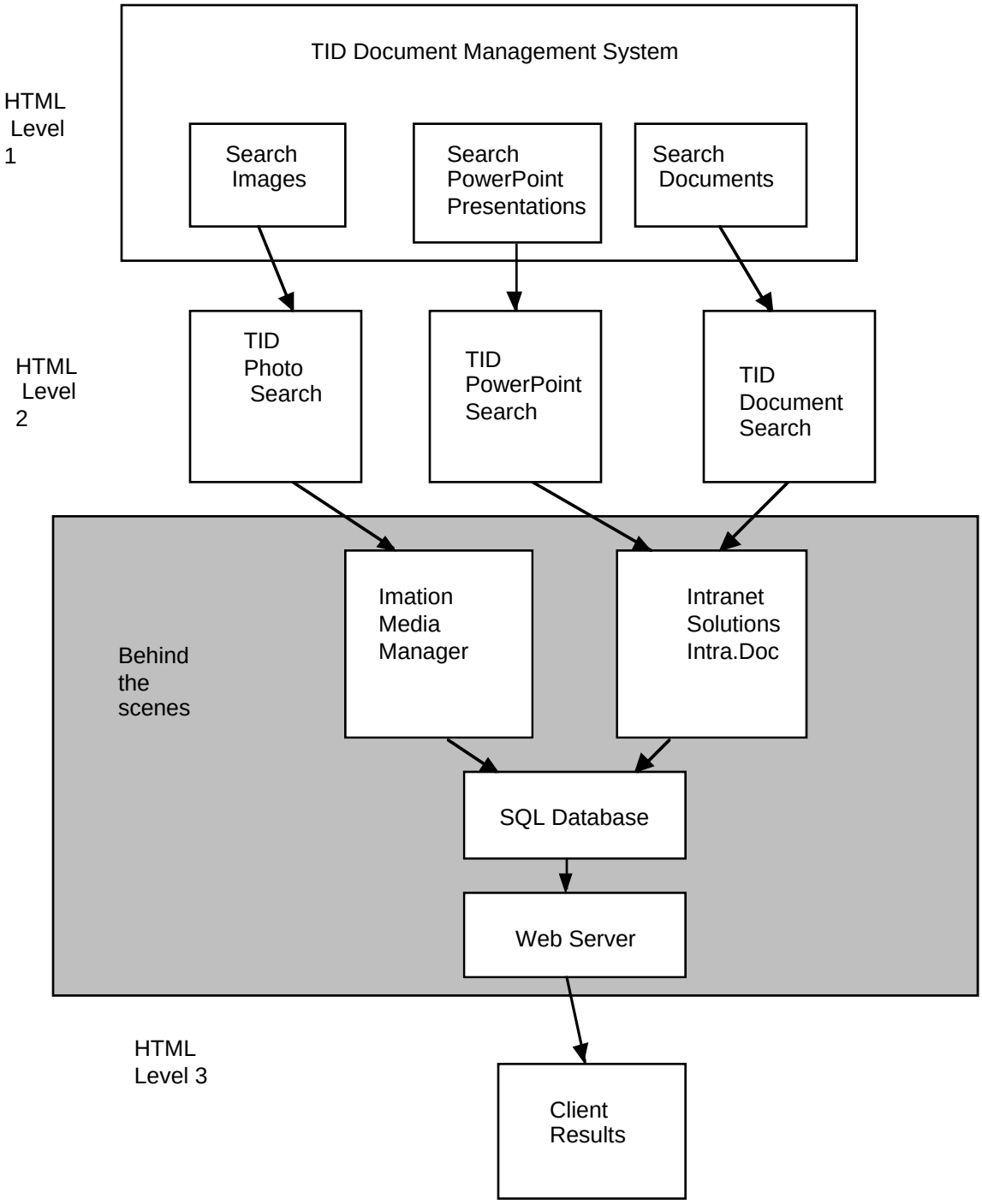

Figure 1: Conceptual view of Media Manager and Intradoc as a Web portal

In November of 1998, after spending a year unsuccessfully trying to get it to work in our environment, we abandoned Media Manager. The problem was that we

could not get Media Manager to download files from the Sun server on which they were stored. I made the decision to abandon Media Manager and work with Intranet Solutions to expand the capabilities of Intradoc so that it would be a Document *and* Image management. The original files that have been submitted to Intradoc reside in what is referred to as a vault. The vault can be on any storage system that can be mapped as a drive either locally within the NT operating system, or remotely using NFS. Since we planned to store our original images on a Sun fileserver, this met our needs quite nicely.

The idea of incorporating image compression into a database product still seemed to hold a great deal of promise, so I proposed it to the VP of product development at Intranet Solutions—he was very receptive to the idea. It became clear that a dialog needed to be established between Intranet Solutions and Lizardtech. Pursuant to this, I brought the two together for a meeting to discuss strategy. At this meeting we soon realized that MrSID could be used to create the thumbnails as well a provide image compression. This meant that we not need to use one product to create the thumbnails and another to do the compression. Shortly after this meeting the two companies issued a joint press release at Seybold Boston announcing they were forming a strategic alliance to incorporate MrSID technology into Intradoc.

With the decision to go with MrSID came the need to make a slight compromise. At present, MrSID accepts only a limited number of file formats: 8-bitgrayscale, 24-bit RGB, TIFF, and Sun Raster. After discussions with Lizardtech we were assured that the number of supported file formats would expand as time went

on, most notably to include CMYK. We realize the limitations on image file formats imposed by our choice of MrSID as our compression tool but feel that this is only a temporary situation. MrSID is an evolving product and we are confident that Lizardtech will be adding to its image format repertoire. For the sake of expediency, I decided that we could live with this limitation. Related to this was the decision to only offer the MrSID compressed file as a downloadable file rather than the original file format. The rationale was that because of the extraordinarily large size of our photo files, we felt the majority of users would find the MrSID file acceptable. Also. Lizardtech offers a free plugin for Photoshop that allows MrSID files to be printed. Because of MrSID's virtually lossless technology, these prints are indistinguishable from the original. We plan to make the original file available but have not, at the time of this writing, decided how this will be accomplished.

This, then, is the current status of the project: Since we made the switch to Intradoc, we are now treating the project as a document *and* image management system. I reality, it could be considered a document and *content* management system since we can manage almost any file input to the system such as video or audio. At present, however, we are concentrating on images. As mentioned above, my CRADA funding was only targeted at including thumbnails of images in Intradoc. We still had to modify Intradoc so that it would compress images submitted to the system. All processing of files submitted to Intradoc is handled in what is called the Document Refinery. Even though MrSID created thumbnails in the process of compressing an image, work needed to be done to somehow build this capability into the Document Refinery. Therefore we made the decision to contract the

Intradoc Engineering Team to perform this custom development work. To make Intradoc even more capable of handling images, we have also contracted for customization of the Document Refinery to accept Adobe PhotoShop and Illustrator file in their native format. (Previously, we had to convert these files to Postscript before submission to the system.) The architecture for this document and image document management system is shown in figure 2.

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Figure 2: Architecture for TID Document Image Management System