

Final Report on Activities Related to ARTstor's NDIIPP Grant: Preserving Digital Still Images

I. Introduction

The purpose of ARTstor's NDIIPP grant was to explore how encouraging its professional and scholar photographers to use embedded metadata could facilitate the creation of archive-ready born-digital images. Originally, we had planned to do this by (1) reaching out to our partner photographers and providing them with information about the best way to produce and embed data, (2) coming up with a list of fields that would assist with the creation of useful descriptive data and identifying what technical fields would be required for preservation, and (3) producing a stand-alone tool and custom panel for the purpose of embedding metadata. While we retained the idea of outreach and coming up with some basic metadata requirements, we eventually decided to develop a tool that would facilitate with extracting, rather than embedding metadata. The reason for this is that in analyzing the situation we decided that many photographers are already using tools that have embedding functionality, such as Adobe Photoshop Bridge, Lightroom, and Extensis Portfolio, and that they would be unlikely to want to add yet another piece of software to their workflow. Furthermore, ARTstor's own experience with processing images that were delivered to us with embedded metadata showed that what was really lacking was an easy-to-use tool for extracting embedded metadata for ingestion into external systems and databases. For this reason, ARTstor submitted a revised proposal in 2009 to develop a tool to extract metadata from images as a stand-alone application: EMET (Embedded Metadata Extraction Tool) was released in November 2010 and is now available for download online both from the ARTstor website (<http://www.artstor.org/global/g-html/download-emet-public.html>) and as an open source tool on Source Forge (<http://sourceforge.net/projects/emet/>). This final report will outline the activities and outcomes of ARTstor's grant and reflect upon the benefits and challenges of using embedded metadata as a means of managing the life-cycle and preservation of born-digital images.

II. Reaching out to Photographers and Partners

ARTstor has been doing outreach with its photographers and partners since it was founded in 2002. We rely upon receiving high quality images and accompanying metadata so that we can ingest them into the Digital Library and make them available to our users. In some instances, our partners are in a position to provide exactly what we require, but in others we have had to scale back our imaging and metadata requirements to meet our needs as a content provider. In the early years of ARTstor, we relied primarily upon digitization of existing analog collections in building the digital library, and we managed most of the scanning and cataloging ourselves. With the growing use and availability of high end digital cameras, however, we have been receiving more born-digital content directly from photographers, many of whom are scholars for whom digital photography is not a primary occupation. Determining the best method for content providers to deliver the descriptive information about their images has always been a challenge for images that were not already cataloged, in the case of slides and prints this information was often written directly on the materials being scanned and entered into inventory databases. Now that we are receiving digital images, the process of associating the images with the data is more complicated and the use of embedded metadata presented itself as a possible solution.

As part of our outreach to photographers we convened a meeting in May 2009 to learn more about their concerns and provide them with information about embedded metadata and how it works. As a result of this meeting, we decided to try providing some of our contributors with XMP panels that they could use with Adobe Bridge to catalog their images. As previously reported, the results were mixed. Christopher Roy, an Africanist who has been documenting rituals and practices in West Africa since the 1970s, had a mixture of born-digital and scanned images that he wanted to make available in ARTstor. Rather than provide him with an Excel spreadsheet to catalog his images, we created a custom panel so that he could embed the data directly through Adobe Bridge. He had little problem entering the data, but when we eventually extracted it, it turned out that there were spelling and consistency issues that could only be corrected in the extracted spreadsheet.

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Larry Qualls has been photographing gallery shows in New York since the early 1980s and began shooting digitally in 2008. Up until then, ARTstor had been scanning his slides and going through the laborious process of matching the slides to image lists Qualls provided in Microsoft Word. The images were then transferred to a cataloging database so that the data could be entered in a fielded format. For the born-digital images, ARTstor provided Qualls with a template for his digital images, and he has been using Adobe Bridge for cataloging. While we had hoped that having Qualls enter the data into the images would make it unnecessary for ARTstor to continue cataloging them, the limitations of Adobe Bridge as a cataloging tool (and the fact that Qualls is not a professional cataloger) has meant that Qualls' data still is not reliable enough for ingestion directly into the digital library. That said, being able to easily associate the extracted data with the embedded information has made ARTstor's process of ingesting the images into our system and associating them with the correct data records has substantially cut down on the time it takes us to process his images.

Some issues remain regarding using embedded metadata as a vehicle for conveying descriptive information from the image creator to the digital library. There is no easy way to check spelling or normalize data and developing a standardized template that will suit the needs of needs of novice catalogers is challenging. Nevertheless, we decided to come up with a simple custom panel as a test case for the extraction and validation tool, the details of which will be outlined below. Furthermore, in tandem with the development of EMET, ARTstor has been working with the Embedded Metadata Working Group of the Visual Resources Association's Data Standards Committee has developed an XMP panel that follows very closely the VRA Core data standard that is geared toward both professional and novice catalogers. As interest embedding metadata increases in the community, we expect to be able to point our contributors to external resources that will facilitate cataloging.

III. EMET (Embedded Metadata Extraction Tool)

A. Description and Functionality

EMET is a stand-alone, cross-platform tool for use with TIFF and JPEG files. It checks for corrupt files, extracts custom XMP data, and extracts fields associated with EXIF, IPTC, Photoshop, TIFF, and Dublin Core, among others. Used in conjunction with ARTstor's custom Photoshop panel, the tool may also be used for very simple metadata verification. After images have been loaded into EMET, the extracted data is saved in a .csv file and launched together with an error report that performs simple data verification on the ARTstor Panel. (See Attachment A)

B. ARTstor Panel

The ARTstor XMP panel was developed on the basis of a core minimum set of fields selected by Johanna Bauman (Senior Production Manager) and Dustin Wees (Director of Metadata) of ARTstor.

- Work Creator
- Work Title
- Work View Description
- Work Description
- Work Date
- Work Repository
- Work Repository Accession Number
- Work City
- Work Country
- Photographer
- PLUS Creator Number
- PLUS License Number

The fields map to VRA Core (though they represent only a small subset of the fields in that standard) and they meet the bare minimum requirements for ingestion into ARTstor. Furthermore, based on our experience with analog materials (slides and prints) we determined that if this data were embedded in a digital image, it would provide enough descriptive data to identify and preserve it down the line. In developing EMET we

decided that we wanted to explore the possibility of having the tool not only extract data but also do some simple data verification. Rather than use existing comparable fields available in IPTC, it was simpler for the purposes of developing EMET to use a completely new custom XMP schema. When an image is loaded into EMET that contains any of the fields in the ARTstor panel, it will note that the panel is present and it will also check for the presence or absence of the photographer and title field. If either of these fields are not present, it will show up in the error report. (See Attachment A for more information)

C. EMET 1.0 Release Update

EMET has been available as a stand-alone tool from the ARTstor website since November 9th, 2010 (<http://www.artstor.org/news/n-html/current-projects.shtml>) and was announced to the community of visual resources and museum professionals via listserv notices on November 17th, 2010. Before releasing EMET, the tool was tested internally, as well as by a group of outside testers:

- David Riecks, Stock Artists Alliance
- Howard Brianen, Two Cat Digital
- Greg Reser, University of California, San Diego (Embedded Metadata Working Group)
- Kari Smith, University of Michigan

The external user testing revealed a few issues regarding how the data was formatted, but beyond that it was deemed useful. As of the finalizing of this report there have been over 120 downloads of the tool and no major issues have been reported. (For a list of known issues, see Attachment A.)

ARTstor will continue to make the tool available both on its public site and on SourceForge, and although there are no current plans to continue developing it in the future, the lessons learned and the code created will contribute to the development of the Shared Shelf Image Management System and how it will handle embedded metadata.

(For more on Shared Shelf, see <http://www.artstor.org/shared-shelf/s-html/shared-shelf-home.shtml>)

IV. Collaboration with the Embedded Metadata Subcommittee of the VRA Data Standards Committee

In addition to working directly with our photographers and partners, ARTstor reached out to the larger community of visual resources professional, who traditionally provided images for teaching and learning to the same audience that comprises the ARTstor user community. Johanna Bauman worked with other members of the Data Standards Committee of the Visual Resources Association to form the Embedded Metadata Working Group. The purpose of this group is to explore the value of and disseminate information about embedded metadata in the management of digital images. Bauman co-authored two articles on embedded metadata with Greg Reser, a Metadata Librarian at UCSD and the Co-Chair of the Embedded Metadata Working Group, that were published in the VRA Images Newsletter,¹ in addition to sponsoring a session on embedded metadata at the annual VRA conference in March 2010. (For slides from this presentation, go to: <http://www.slideshare.net/VisResAssoc/embedded-metadata-share-deliver-preserve-3541376>) This session included a presentation by David Riecks of the Stock Artist's Alliance whose NDIIPP grant was focused on encouraging stock photographers to provide good metadata about the images they shoot, which provided the VR community with a glimpse into how professional photographers handle embedded metadata.

After much consideration, the working group decided upon three use cases that would be facilitated by using embedded metadata: (1) faculty or scholar photographers in the field who need to tag their images so that they can be contributed to local database systems or archives like ARTstor, (2) faculty or scholar photographers who would like to

¹ Reser, Greg and Johanna Bauman, "Embedded Metadata, Part 1: The Basics and a History," *Images: The newsletter of the VRA* 6 (2009): <http://www.vraweb.org/publications/imagestuff/vol6no6.html#4>; and Reser, Greg and Johanna Bauman, "Embedded Metadata, Part 2: Use Cases," *Images: The newsletter of the VRA* 7 (2010): http://www.vraweb.org/publications/imagestuff/vol7no2_2.html

easily find and track their images for personal use and to be uploaded into such websites as Flickr in such a way that the data will display, and (3) visual resources collections that would like to use embedded metadata as part of their production workflow. To this end the working group developed an embedded metadata schema that fulfills the requirements of these use cases and meets the needs of the community served by the Visual Resources Association. This schema is based upon and maps easily to the VRA Core metadata schema developed by members of the association for cataloging surrogate images of cultural heritage objects. The schema, like the IPTC schema, does not rely solely upon a custom set of XMP fields, but rather seeks to utilize IPTC and IPTC extension fields whenever possible for maximum interoperability. Based upon this schema, Reser was able to develop an XMP panel for Photoshop CS4 for data entry. This XMP panel is still in beta form, but is available for download on the Wiki of the Embedded Metadata Working Group at <http://metadatadeluxe.pbworks.com/w/page/32300275/VRA-XMP-Info-Panel-%28beta%29>. The current plan is to eventually create a stand-alone, cross-platform tool that would not require users to have Adobe Photoshop or Bridge installed on their computer to perform image tagging according to the VRA Core 4.0 standard, used in conjunction with EMET, VR curators would then have a viable means of both embedding and extracting metadata for use in their external database systems.

Attachment A: EMET Help Documentation

Version Date: November 11, 2010

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Description and System Requirements

EMET is a tool designed to extract metadata embedded in JPEG and TIFF files. EMET is compatible with Mac OS 10.4+, as well as Windows XP, Windows Vista, and Windows 7. EMET also requires Adobe Air 2.0, which can be downloaded free of charge at the following url: <http://get.adobe.com/air/>. For optimal performance the following are recommended:

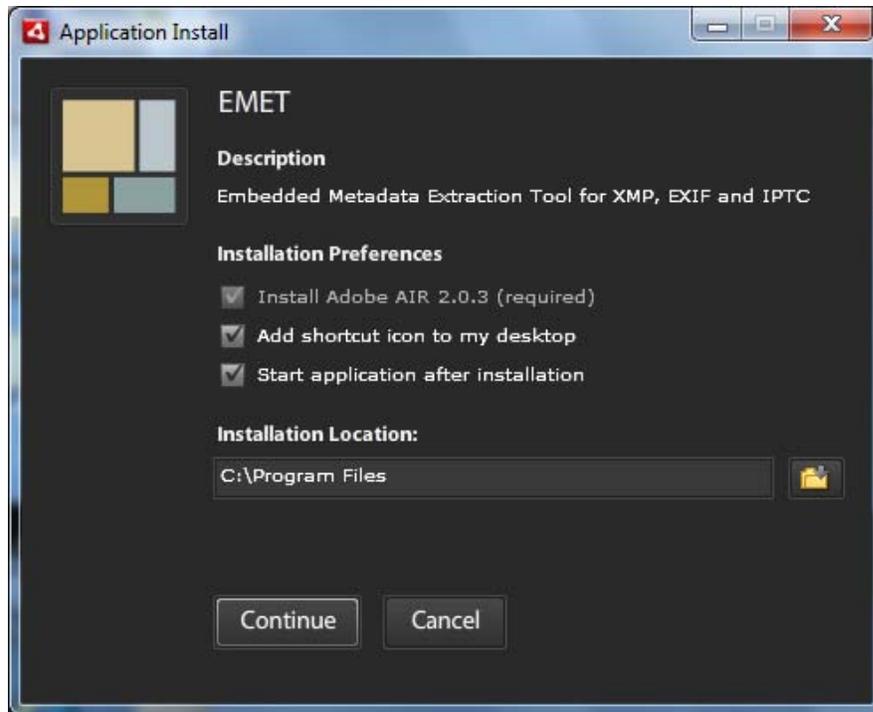
- Mac OS - Multicore Intel processor and 1GB of RAM
- Windows - Intel® Pentium® 4 or AMD Athlon® 64 processor and 1 GB of RAM

Installing EMET

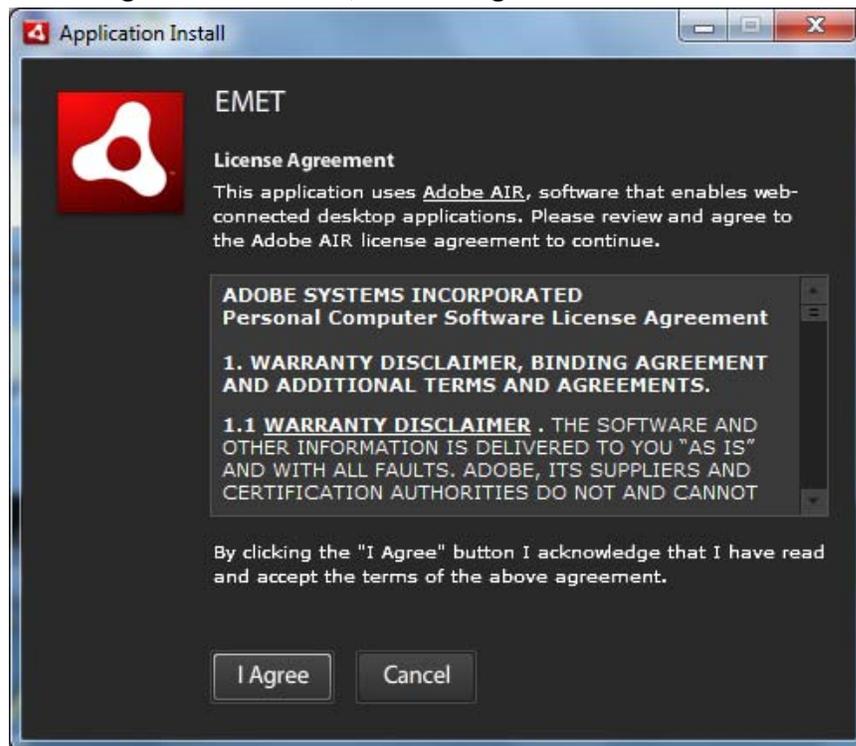
1. Before you install EMET, first install Adobe Air 2.0. This is a free software download available at: <http://get.adobe.com/air/>.
2. Download the EMET installation file from the following link: <http://www.artstor.org/global/g-html/download-emet-public.html>.
3. Before completing the download, you will be required to fill out a short webform questionnaire.
4. Once the installation files have been downloaded, open the file package and proceed through the installation steps.
5. Click “Install” in the window which opens



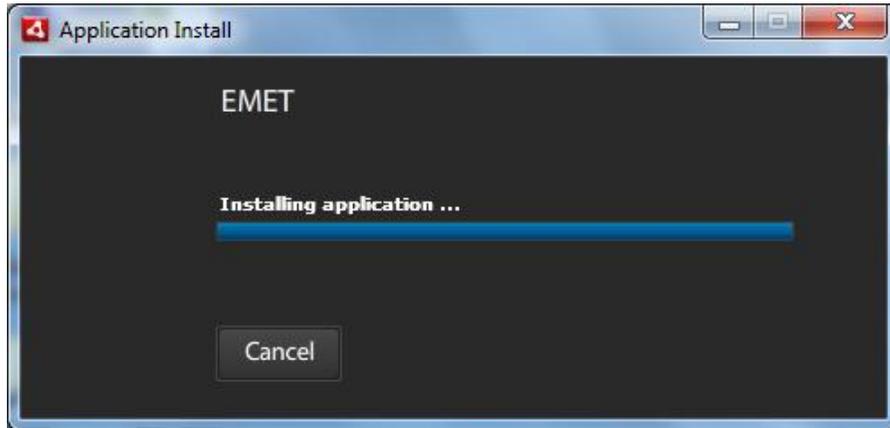
6. Next, click “Continue”



7. In the License Agreement window, click “I Agree”

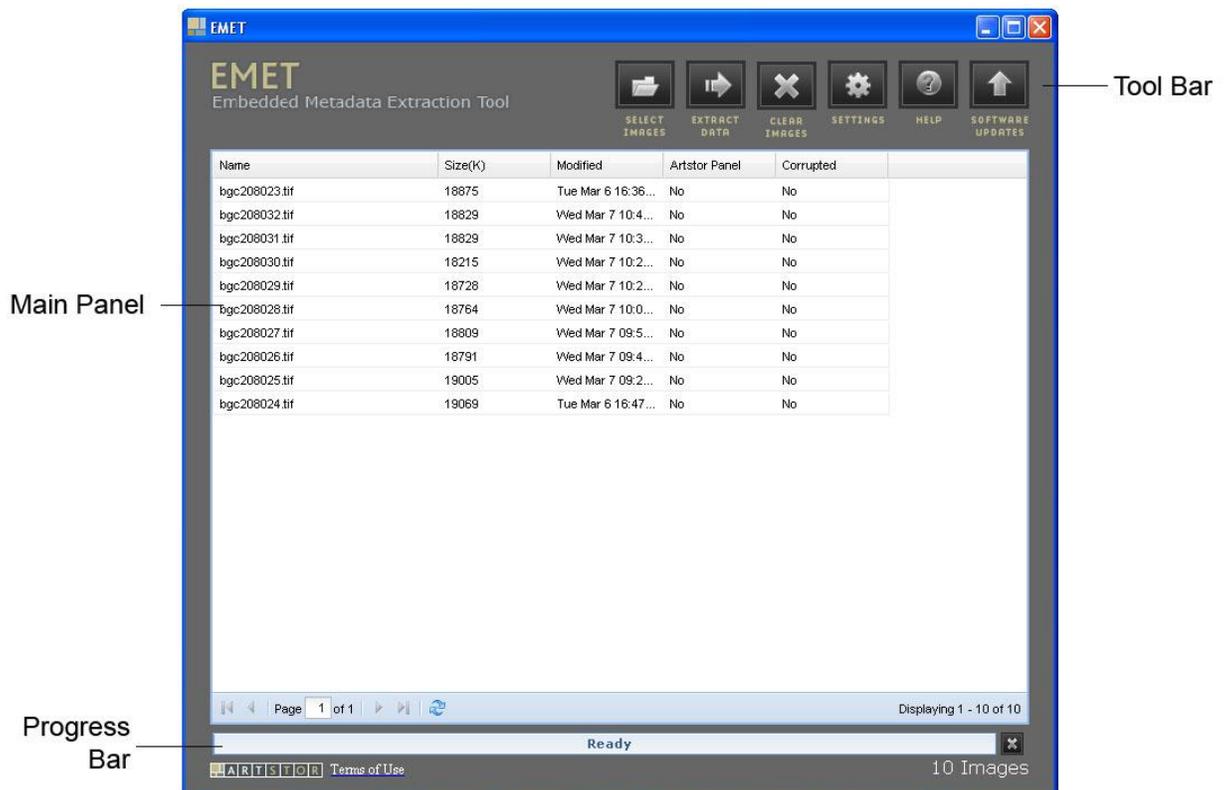


8. Finally, wait for the installation to completely install.



9. Once EMET is fully installed, the program will be available in your computer's Programs or Applications directory as well as through a shortcut icon on your desktop.

V. Screenshot of EMET Window



VI.

VII. Checking for Corruption and Extracting Data

1. Launch EMET.
2. Loading Images
 - a. There are two ways to load images into EMET to prepare for data extraction.
 - i. The first method is to drag and drop files directly from your desktop or file directory window into the Main Panel.
 - ii. You may also go to the Tool Bar icons at the upper-right corner of the EMET window and click the “Select Images” icon. Your computer’s directory will open. Use it to browse to the location of your image files. EMET can import JPEG and TIFF file formats. Select individual files to upload or hold the CTRL (or ⌘) key to select multiple files. Click **Open** to upload the selected files. The original file(s) will remain on your computer and EMET will extract the data.
 - b. While performing the metadata import, EMET will check for corruption and the presence of the ARTstor Panel as it loads the files. *(NB: Because of issues with Windows, users will not be able to use the “Select Images” icon for more than 5,000 images. When selecting more than 5,000 images, users can select to drag and drop the files, or return to the same directly and select the images in batches.)*
3. Managing Main Panel Display
 - a. EMET displays twenty-five images per page on a list of images. To browse from one page to the next, click the arrow buttons at the lower-left corner of the Main Panel.
 - b. To sort the list of files, click the header of the data column you wish to sort at the top of the Main Panel.
4. Extracting Data
 - a. To extract the data click on the “Extract Data” icon. EMET will extract all data from all images that have been loaded into the Main Panel.
 - b. A dialog box will appear noting that the ARTstor Panel is not present for some or all of the images, to proceed with the extraction, press the “Continue All button”, or cancel the extraction by pressing the “No” button. *(For more information on the ARTstor Panel, see “Installing and Using the ARTstor Panel below.)*
 - c. EMET will automatically launch Microsoft Excel (or another spreadsheet or text software designated to open .csv files) and open the error report and the extracted data. By default, these files are saved to the My Documents directory on a PC and in the Documents directory on a Mac.

5. EMET Data Files

- a. EMET creates two spreadsheets of data when performing the data extraction. One is an error report, the other is the extracted data.
 - i. **Error Report:** By default, this file is named EMET_Error_Report_[date and time stamp]. It lists any corrupt files and provides information regarding the absence or presence of the ARTstor Panel (*For more information see “Installing and Using the ARTstor Panel” below.*)
 - ii. **Extracted Data:** By default, this file is named EMET_Extraction[date and time stamp]. It contains the extracted data. The first four columns of the extracted data are Name, Size(k), Path, and Corrupted. Any remaining data fields are extracted in alphabetical order (lower case first and then upper case) and are grouped by the first letter of the xmp namespace. (*For more information about the data that is extracted, see the FAQ under “What data does EMET extract?”*)

VIII. Customizing EMET

1. Changing the prefix of the filename of the error report or extraction file
 - a. By default EMET saves names the two data files:
 - i. EMET_Error_Report_[date and time stamp]
 - ii. EMET_Extraction_[date and time stamp]
 - b. Click on the Settings icon in the Tool bar and enter the desired prefix in the Extract Prefix and Error Report text boxes. (*NB: The prefixes for the extraction and the error report cannot be identical. If they are they will overwrite one another.*)
 - c. EMET will remember these settings the next time you launch the application.
2. Disabling the Error Report
 - a. If you are not using the ARTstor Panel and would like to disable the error report, you may do so by clicking on the Settings icon in the Tool bar and turning off the Generate Error Report check box.
 - b. EMET will not remember these settings the next time you launch the application, so if you would like to disable error reporting, you will have to change this setting every time you start the application. (See Release Notes below.)
3. Saving extracted data to a custom location
 - a. By default, EMET saves the two Excel files to My Documents on a PC and Documents on a Mac).

- b. Change the default location by clicking on the Settings icon in the Tool Bar and choosing the Change Location button at the bottom of the dialog box. Then press Save.
- c. EMET will remember this location the next time you launch the application.

IX. Installing and Using the ARTstor XMP Panel

1. A link to the installers for the ARTstor XMP Panel for use with Adobe CS3 and CS4 and above will be available after downloading the EMET application.
2. Clicking on the link (http://www.artstor.org/pubsiteforms/artstor_xmp_panel_install.zip) will download a compressed file containing the ARTstor XMP Panel installers in directories labeled by operating system.
3. Select the appropriate directory for your operating system and launch the installer for the version of Photoshop you are running. *(NB: For CS3 there is one installer that will work for both Photoshop and Bridge. For CS4 and above, the installations must be run separately.)*
4. After installation, the panel may be used to enter data in Adobe Photoshop CS3, CS4, and CS5 and Bridge. To locate the panel in Adobe Photoshop, open an image and go to File>FileInfo. The panel will be labeled ARTstor and will appear as one of the tabs in the pop up window. *(For more information about how to use the panel in Photoshop, please see the Photoshop support pages: <http://www.adobe.com/support/photoshop/>.)*
5. In Bridge, you can access the panel in the Metadata window. *(For more information about how to enter metadata in Bridge, please see the Adobe Bridge support pages: <http://www.adobe.com/support/bridge/?promoid=GWEL0>.)*
6. If data has been entered in any field in the ARTstor Panel, EMET will display “Yes” in the Main Panel when the image is loaded into EMET. This will allow a user to see whether or not the ARTstor panel has been used for a given image. Further verification occurs upon export. If no value appears in either the Title or Photographer fields, or the ARTstor panel is not present, the image will appear in the Error Report, noting the missing panel and the missing fields.

Frequently Asked Questions

D. What is EMET?

EMET is a stand-alone, cross-platform tool for use with TIFF and JPEG files. It checks for corrupt files, extracts custom XMP data, and extracts fields associated with EXIF, IPTC, Photoshop, TIFF, and Dublin Core, among others. Used in conjunction

with ARTstor's custom Photoshop panel, the tool may also be used for very simple metadata verification. (See "What is the ARTstor custom Photoshop panel?") EMET runs on the Adobe Air platform. It was created by ARTstor with funding from the Federal Government's National Digital Information Infrastructure Preservation Program (NDIIPP).

E. How does EMET check file corruption?

EMET checks to see if the filetype in the header matches the extension and looks for any inconsistencies in the bit stream.

F. What data does EMET extract?

The first four columns of the extracted data are Name, Size(k), Path, and Corrupted. Any remaining data fields are extracted in alphabetical order (lower case first and then upper case) and are grouped by the first letter of the xmp namespace. Header values are constructed by combining the namespace and the tag for each discrete data field. In instances where a complex bag array is extracted, the hierarchy is replicated in the header of the extracted data.

With the exception of a few technical fields, EMET extracts data in its raw format and will automatically open two spreadsheets in MS Excel in .csv format (or whatever application has been designated to open .csv files). This means that the values for some technical fields, such as exif:ColorSpace will show up as alphanumeric characters rather than displaying the translated form of the value. For the exif:ColorSpace field, for example, the value extracted is 1 and it stands for "RGB." The only other value available for this field is 2, which stands for "Unidentified."

There are some instances where EMET works not only as an extractor of raw data but as a translator for data that has been determined to be useful for the purpose of managing image files. Translation has been enabled for the following fields:

- Exif:ColorSpace
- Photoshop:ColorMode
- ICC Profile

G. Is there a limit to the number of images that can be loaded in to EMET for extraction?

There is no limit to the number of files and file size of the images you load into EMET, however the more files you select, the longer the loading and extraction process will take. Furthermore, if your computer does not have the recommended RAM and processor speed (Mac OS - Multicore Intel processor and 1GB of RAM; and Windows - Intel® Pentium® 4 or AMD Athlon® 64 processor and 1 GB of RAM), you may have trouble running EMET with large files.

H. Where does EMET save the extracted data?

Upon extraction, EMET will automatically launch MS Excel (or whatever spreadsheet or text software has been designated to open .csv files) and open the error report and the extracted data. By default, these files are saved to the MyDocuments directory on a PC and in the Documents directory on a Mac.

I. Why are some of the technical data showing up as date fields in the extracted data?

Some fields, such as exif:DigitalZoomRatio and exif:ExposureTime will be rendered as 10-Jun, for example, rather than the original ratio 6/10. This is a function of MS Excel, which renders certain data as dates automatically. This feature cannot be turned off in Excel, but if the data is viewed in another application such as FileMaker or MS Access the data can be viewed in its original format. Please note that if the .csv file is saved as an Excel file, it will retain the rendered date values.

J. Why isn't some data that I know is embedded in my file being extracted by EMET?

EMET works best with flat xmp data and should extract any xmp namespace. There are, however, known issues when data has been embedded using complex bag arrays. (See Release Notes below.) If EMET does not extract all data, you may want to

try EXIF Tool to see if the data will appear there:

<http://www.sno.phy.queensu.ca/~phil/exiftool/>.

K. Can EMET extract data that has been embedded using the PLUS panel?

The PLUS panel uses many complex bag arrays to structure its data, so there are quite a few fields that may not export as expected. For users seeking to extract PLUS data from their images according to PLUS standards, ARTstor recommends using the PLUS panel for Adobe Bridge. This tool may be downloaded here:

<http://www.iptc.org/cms/site/single.html?channel=CH0099&document=CMS1279131209658>.

L. How can the data extracted from EMET be used?

The data can be used in a variety of ways. Descriptive data can be isolated and ingested into an external database for further cataloging and clean up. Technical metadata may be also be ingested into external systems that do not have the capacity to interpret embedded data. Please note, however, that EMET does not translate the data, but merely extracts it. This means that some of the technical data will come up as alphanumeric codes that require translation to be interpreted. (See the FAQ “What data do EMET extract?") For more information about embedded metadata and how it can be used, see the wiki of the Visual Resource Associations’ Embedded Metadata Working Group: <http://metadatadeluxe.pbworks.com/>, as well as Adobe’s XMP site:

<http://www.adobe.com/products/xmp/>.

M. What happens if I don’t have Excel installed on my computer and I use EMET?

If you do not have MS Excel installed on your computer, then the files will be opened in whatever spreadsheet or text software has been designated to open .csv files and will be saved into the My Documents (for a PC) or Documents (Mac) folder, or in the directory specified in the Settings.

N. What is the ARTstor custom Photoshop panel?

The ARTstor Custom Panel includes the following bare minimum set of fields for describing cultural heritage works.

- Work Creator
- Work Title
- Work View Description
- Work Description
- Work Date
- Work Repository
- Work Repository Accession Number
- Work City
- Work Country
- Photographer
- PLUS Creator Number
- PLUS License Number

The panel can be used to embed data in files with either with CS3, CS4 and CS5. This panel is not intended to represent a standard for ARTstor submissions, and while it maps very loosely to such standards as VRA Core it was created primarily to demonstrate the metadata validation capabilities of EMET. (For more information, see “Installing and Using the ARTstor Panel”.)

O. How do I install the ARTstor Photoshop XMP Panel?

A link to the installers for the ARTstor XMP Panel for use with Adobe CS3 and CS4 and above will be available for download after downloading the EMET application at the following url (http://www.artstor.org/pubsiteforms/artstor_xmp_panel_install.zip)

This panel can be used with Adobe Bridge and Photoshop CS3, 4, and 5 on a PC or a Mac and was developed primarily to test data verification with EMET. (For more information, see “Installing and Using the ARTstor XMP Panel”.)

Release Notes

X. Version 2.31.0 – September 2010

P. New Features / Changes:

- Personal setting customization
- Image selection
- Data extract and report

Q. Known issues

1. EMET-81 PC (Vista 32 bit, 64 bit, and Windows 7) cannot load the image files more than 5k; but it works fine in Mac

NOTE: The issue is based on a windows system call limitation. The function `GetOpenFileName` [<http://msdn.microsoft.com/en-us/library/ms646927%28VS.85%29.aspx>] can only support 32K of data. The error being thrown: "Sorry. Select fewer files" is a windows error.

This error only comes up when the user selects "Select Images" > Go to folder and make a selection with more than 32K of filenames (including spaces & quotes). There exist the following workarounds:

1. Use Drag & Drop for selections of that size
 2. Use browse & select multiple times ensuring that each selection is under 32K of file names. (Directory only counts as one name).
2. EMET extracts the root value of data in a bag array and concatenates values and separates them with a comma. [e.g. Creator 1 (artwork),Creator 2 (artwork),Creator 3 (artwork),Creator 4 (artwork)] Users may choose to separate the concatenated fields after the data has been extracted using Excel or some other spreadsheet program.
 3. EMET does not retain the setting to disable reporting when the application is shut down and relaunched.