NAMFS Technology Committee - Photo Management Best Practices

Purpose

To provide discussion topics, definitions and industry best practices related to photo capture and photo management for the mortgage default service industry.

Definitions and Terms

- Asset Manager
- Chargebacks
- Content
- Duplicate Photos
- EXIF Content
- Field Staff
- Labels
- Local Vendor
- National Vendor
- Photo Certification
- Photo Context
- Photo File
- Photo Geo-Tagging
- Redundant Photos
- Regional Vendor
- Tags
- Tamper-Evident
- Tamper-Proof

- Work Providers

Problem Statement

"**Work Providers**" are defined as companies that request work results and request photos that are organized to make certain the work was completed properly. Field workers, also known as "Inspectors or Contractors," often want to take more photos than are needed to make sure they get paid for work done, and reduce their liability related to any claims that may arise saying the work was not done properly. Both participants want the related effort to be managed efficiently and minimize cost to support the photo requirements of our industry.

There are several topics related to photo management that will be addressed in this paper. See table of contents below for the top five related photo topics in our industry.

Five Photo Topics

1) The Photo File

Photos once captured result in a "**Photo File**" that is typically shared with the world. To keep the photo file in context it must be associated with something, like a work order, a survey answer, or more generically a text message or an email. Limited "**Photo Context**" is stored within the photo file itself. Additional photo context is often stored in a database or similar structure that gives additional context and attributes not contained within the photo file itself.

This section addresses the information that is typically contained in the photo file. This information is shared to help the reader separate the discussion of what is in a photo file itself versus what data and context may be stored in other systems that give the photo additional context.

Photo resolution and file size

The photo resolution is set by the user of the camera or smartphone. Most devices are capable of exceedingly high resolution which results in large file storage requirements. Our industry has standardized on relative low-resolution images of 640x480 pixels, which results in files typically under 2 Kilobytes in size. If the camera is not capable of this low-resolution capture, the larger image must be resized prior to the photo file being shared with the requestor. Some requestors may have a portal that automatically resizes images. Note that images captured in low resolution may not provide desired detail and look pixelated if enlarged.

Resizing an image is a one-way street. One can always capture higher resolution photos but once the original file is resized the resulting duplicated image cannot be returned to the previous higher resolution image.

The pros of high-resolution photos are you can zoom and enlarge the image to provide more image details.

The cons of a high-resolution photo requirement are the associated cost and complexity of photo capture, storage and transfer time and the related cost of compatible devices and services to capture and transfer these large images.

Location Geo-tagging of photo files

Some cameras and most smartphone devices today typically have location services and accurate time data that make their internal cameras capable of adding the location and time within the photo file's “**EXIF Content**.” More information on EXIF Content and related data structure within a photo file can be found here https://en.wikipedia.org/wiki/Exif.

All photo data provided by the camera device (smartphone or point/shoot camera) is made available to NAMFS mobile applications technology providers which can store this information remotely and verify the accuracy of the time and location related to the work being performed. These mobile applications can also automate the transfer of the photo files and automatically provide the required context to make the photo useful to the photo requestor.

Some point/shoot cameras offer location and time/date services. These devices must be properly set up by the user to be effective. These devices typically require manual transfer of photo files to a separate system by the user and must have required context applied manually.

The pros of Geo-Tagging are the added benefit of location and time context associated with the photo.

The cons of Geo-Tagging are the simplicity of spoofing this information and the complexity of requesting vendors to comply with proper tagging and the task of verifying the accuracy of such data.

Timestamp and watermarking of photo files

The “**Photo Watermark**” refers to any overlay or visible information added to the viable image, such as a date and time stamp, typically in a red font on the lower right of the image.

Most Smartphones do not watermark photos with red date and time stamps like older "point and shoot" digital cameras. These point and shoot cameras have been replaced in our industry with smartphone devices.

Smartphones alone easily capture images but often do not watermark the image with a red date/time watermark in the lower right corner as required in our industry. This is done one of two ways. The vendor will i) use a mobile application designed to watermark the date-timestamp on the image as it is captured, or ii) the watermark is applied after the image has been transmitted or uploaded from the field device.

If the field device watermarks the image with the accurate date and time in the field, this may or may not be desirable. If the work requestor wants the image watermarked when work is completed, not when captured, this will cause additional work for the field staff to remove the watermark and add the proper watermark.

If the image is watermarked after the image is transferred it is likely that the watermark will not represent when the image was captured. If the work requestor thinks this is the date and time the image was captured, it may be inaccurate.

Storing data within photo files

A photo file stores considerable information about the camera that took the image such as the storage size required, the photos resolution (length and width in pixels) and much more within

the EXIF structure within the photo file (Exif Content). Some cameras and most smartphone cameras include location coordinates and the time/date of photo capture within the photo file EXIF structure.

We mention the topic EXIF because some readers may assume the EXIF includes all the information needed to be certain of the location and time the image in the photo file was taken. It is true that most smartphones do include this information. It should be noted however that the time and location of EXIF data is easily edited and modified using the device itself, or by third-party tools that modify the photo file. EXIF data typically does not accurately represent the actual time/location of the image capture.

Photos can also have data "**Tags**" or "**Labels**" written into the photo file itself using the EXIF structure, however this is not typically done in practice. The tagging and contextualization of photos is usually done after the image is stored in some sort of database that associates the stored context with the photo file itself.

In short, a photo file and its EXIF data without additional photo context that is stored outside of the photo file is not much use to our industry and should not be relied upon.

2) Management of Photo Files

Redundant photos files showing the same image

The term "**Redundant Photo**" is used to describe the act of capturing multiple images rapidly, creating multiple photo files of almost the same image. This is often the case when field staff feel like they must capture many images to document the work being done.

These multiple images can cause issues with the work requestor when uploaded to their work portal. Most work requestors do not want many redundant photos.

Redundant photos should not be confused with duplicate photos.

Reusing or duplicating photos files

The term "**Duplicate Photo**" refers to a photo file that is reused or a file copied exactly, and that copy is modified or used as-is.

Duplicated photos can be used legitimately to satisfy multiple, minimum, or redundant photo requirements when the field staff does not have enough original photo files to meet the request. Duplicate photos allow a single photo file to be used more than once.

Duplicated photos have also been used to fraudulently represent that work was done when in fact it was not completed on the date and time represented by the photo file. Older photo files from previous work can be modified with a new watermark and EXIF data to represent current work completed when in fact it was not completed on the date and time represented.

Storage of photo files

All participants in our industry deal with the storage of photo files in their own way. A computerized file folder system can provide a simple and uncomplicated way to store the photo files in context, for example by property address, then a subfolder of each work order completed on that property address would contain the photo files captured on the property.

Most field professionals use third party systems to manage their photos and to add additional context to the photos captured. These systems are easily searchable to find photos on a specific date, taken by a specific employee for a specific client and offer significant advantages over simple computer file storage of the photo file.

For example, a national "**Asset Manager"** may hire a "**National Vendor**" as a vendor manager or general contractor to manage the work done on some or all their assets under management. In this case the asset manager may simply request an auditable trail of photos for all work done and not require the actual photos or related context but expects the national to provide these historical archiving and storage services.

The "**Regional Vendor**" that works for the national vendor will get a "**Work Order**" from the national that indicates what work needs to be done and will likely keep a copy of all photos captured as evidence that the work was completed properly. This information is often needed to perfect payment and reduce the liability of "**Chargebacks**" for work that may be in question.

The regional vendor company typically has a third-party database or order management system to store these photos with all work order context for all the work done by their employees and subcontractors. Subcontractors working for a regional company are typically called "**Local Vendors**" and the person in the field doing the work is often called "**Field Staff**."

In turn the local vendors and field staff are also likely to keep a copy of the photos and related context that he or she has captured. The field staff may store this information on their mobile devices, in computerized file systems and/or within their own internal systems for the same reason the regional and local vendor keeps the photos as evidence of work done and worksite condition.

In general, there is a significant redundancy of work order data and related photos stored by each vendor in the related ecosystem. This storage cost can be significant.

To reduce storage costs, it is wise to have a methodology to reduce redundant photos and a process to limit total photos captured by the field.

3) Context associated with Photo Files

Data associated with a photo file, but not stored within the photo file itself, is referred to as "**Photo Context**."

Associating Work Order context to photos

Work order context (or work order data) is often associated with the photo file captured and stored within a database-oriented work order management system used by vendors. This data is usually obfuscated by the work requestor to eliminate any concerns over confidential or non-public personal information being printed or stored within the vendor's work order management system(s).

Associating Survey/Form answers to photos

Work requestors may provide mobile forms or surveys that need to be completed by the field staff related to the work orders issued to complete work. The answers to these form or survey questions may also require one or more photos associated with each answer. This adds not only work order data to the photo context, but the survey/form question and the answer to photo context. Again, this content is typically limited to public information to eliminate concerns over confidentiality or any related privacy issues.

Photo labeling and tagging

Additionally, work requestors may ask photos to be labeled (one label per photo) and tagged (multiple tags for each photo).

Work order data, survey/form questions and answers, the photo labels and photo tags are all related to photo context and must be responsibly managed and stored outside of the photo file itself.

4) Certification of Photos

"**Photo Certification**" refers to the ability to audit the content of the photo file and related photo context collected by the field staff. The certification must include a chain of custody of the related photo file and any added context. Certification must ensure that the original photo file and related context is accurate and has not been altered. Certification services can determine if the photo has been modified (tamper evident features) and help prevent photo tampering (tamper proof features).

What does it mean for a photo to be tamper-evident

"**Tamper-evident**" service providers will report if the photo file contents (image pixels and EXIF data) have been modified after the image was captured by a trusted photo capture device. For example, a mobile application that digitally captures an image and stores that image securely in the trusted device can verify if it was modified during transfer to the trusted storage location.

Furthermore, any copy of the photo file can be compared to the original to determine if the image has been altered in any way.

What does it mean for a photo to be tamper-proof

"**Tamper-proof**" service providers will provide safeguards in the trusted mobile application to prevent field staff from modifying the date, time, or location that the image was taken. These solutions will also provide safeguards to manage the chain of custody of the original photo image file and securely transfer the image to a trusted storage location for safekeeping. These certification services also provide a globally unique identifier for each photo file and the related context for comparison against copies stored outside of the trusted storage location.

5) Video (photos in video format)

Video provides a series of photographic images that offer additional context such as sound and greater detail to the work being performed.

A discussion of video's place in our industry

Video traditionally has not been used widely in our industry. This is due to the storage cost and time it takes to manage and review video images. Video is often used at the local vendor and field vendor level but is not typically shared up the supply chain.

Benefits of video from the field include the sharing of damage and the justification for related repair work (bids). Video is also useful by allowing untrained workers to communicate with experts remotely.

Video storage can be manageable if the video size is limited to under one hundred kilobytes which usually is a compressed standard definition video less than 15 to 30 seconds in length.

Video to Photo conversion tools

There are tools that can be used to capture still images from video, allowing field staff to capture video then comply with photo capture from the resulting video. This method is not widely used in our industry.

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