The Rise and Fall of Image Spam

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Contents

This document discusses the spammer's use of images in spam email, and documents MailMarshal's success in combating this spam type.

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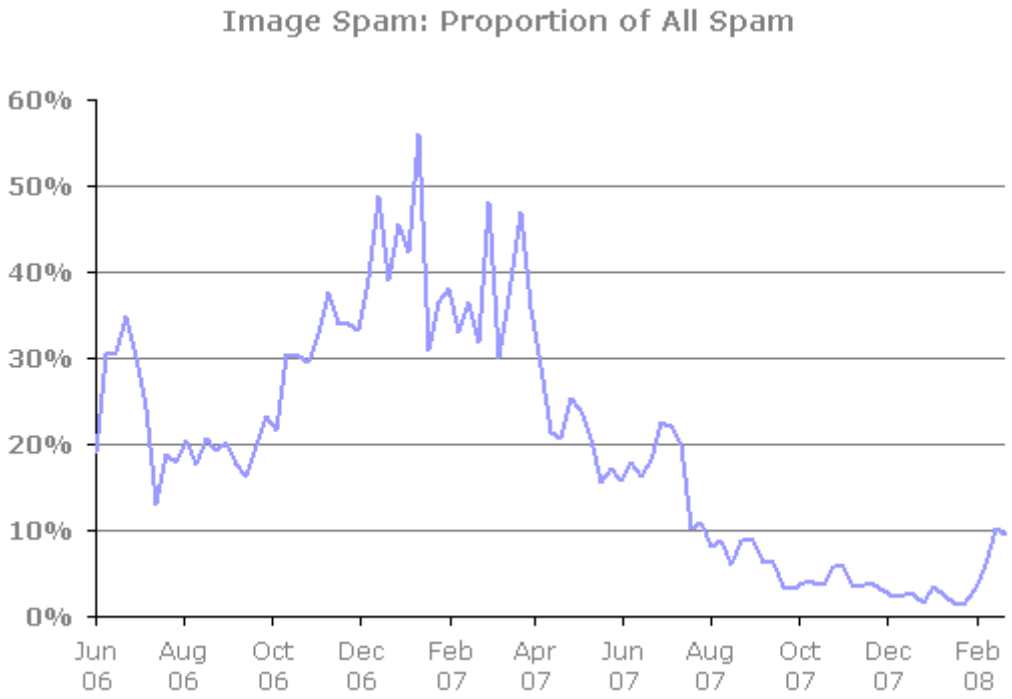
What is Image Spam?

Image spam is simply spam with an attached image. Spam with pictures is not new but in the past almost all spam images were actively downloaded from the web by the email client upon viewing.

Spam with an attached image started to appear in numbers in the second half of 2005. Image spam exploded in mid 2006 and by early 2007 it had reached a peak of over 50% of total spam received. However, by the end of 2007, image spam had dropped back to under 10%. Spammers largely abandoned the technique in the face of better anti-spam defenses against the technique.



Source: Marshal Spam Archives

Why Image Spam?

Why did spammers turn to image spam? To avoid anti-spam devices it seems. Image spam has several advantages for spammers:

- It gets the message across, by-passing anti-spam techniques that scan the message body for spam-like text.
- Pretty graphics can allow for a colorful and “professional looking” message.
- It allows for several techniques for spammers to randomize each message, again by-passing anti-spam techniques based on signatures of the message or image, or technologies based on Optical Character Recognition (OCR) i.e. extracting text from images.

Image Spam Techniques

Various image spam techniques have been used by spammers. This section highlights some of the tricks employed.

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It's only "text"

Some images consist only of words; the image below is from a recent spam email:

Hello,

You have been chosen to participate in an invitation only limited time event!

Are you currently paying over **3%** for your mortgage? STOP! We can help you lower that today!

Answer only a few questions and we can give you an approval in under 30 seconds it is that simple!

And stop fighting for lenders,let them fight for you!
Make them work for your business by giving you the lowest rates around!
Two hundred and thirty thousand dollar loans are available for only three hundred and forty dollars/month!

WE ARE PRACTICALLY GIVING AWAY MONEY!

Think your credit is too bad to get a deal like this? THINK AGAIN!
We will have you saving your money in no time!

Are you ready to save your money?

Regards.

Randomization Techniques

To avoid signature-based anti-spam devices, spammers have acquired the ability to randomize each image file on the fly, by subtly altering size, color and inserting random pixels in each file. Here are some examples:

Stock Spots

Note the insertion of colored pixels at random:

Color Streak

Note the multicolored lines of pixels at the bottom of the image:

Shades of Gray

Can you see the subtle changes in color between these two images?

Stock Splits

This trick, associated with a certain type of stock spam, splits the original image into multiple images, again to avoid signature filters and possibly image scanning software as well.

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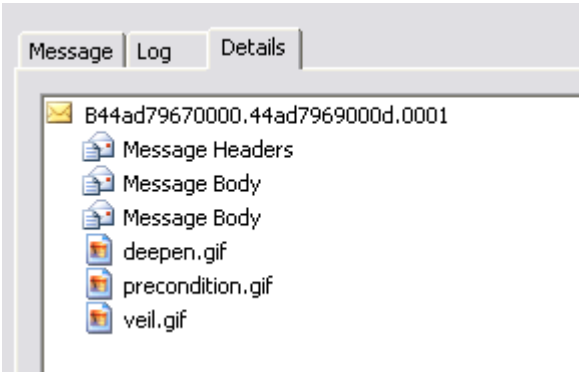
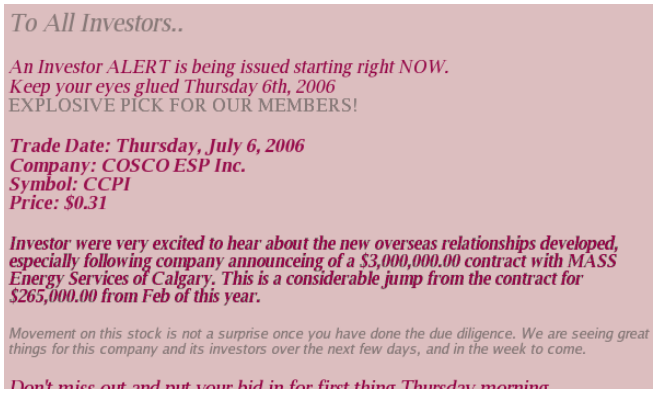
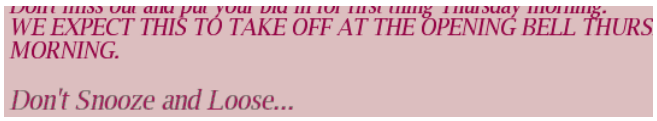
Note the three attached images, viewed in a MailMarshal Console:

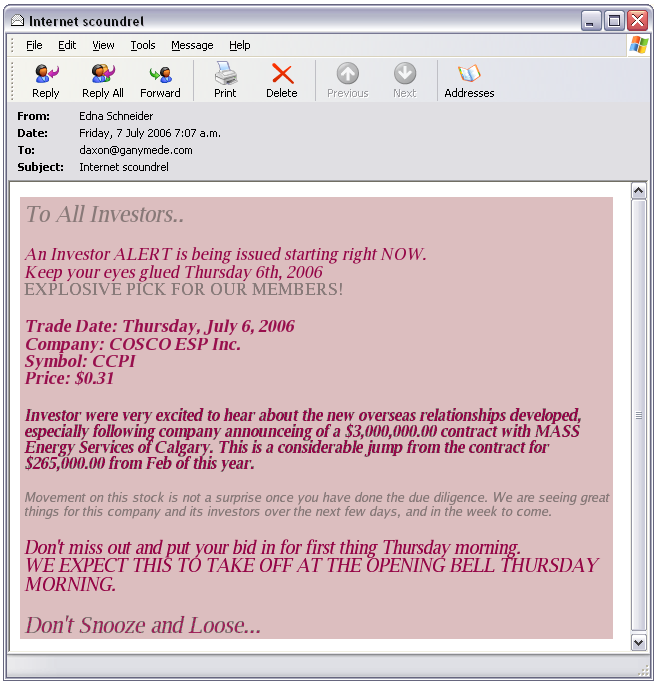


The images are these:





The email client re-assembles the pieces when the message is opened:



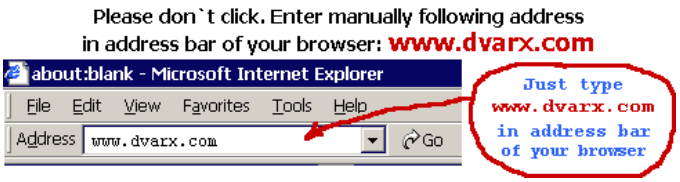
Wild Backgrounds

In their quest to bypass anti-spam filters, spammers have sometimes taken their 'art' to extremes, especially to fool OCR (Optical Character Recognition) technology that aims to scan images to extract text. Some images use highly colored and patterned backgrounds, uneven letters, and randomly inserted pixels around the border. Each image is unique and hard to read by any software attempting to use OCR.

Animated Gifs

Another trick employed is the use of animated gifs. These are created by combining multiple gif images in one file, which when displayed one after another, gives the appearance of movement. Below are two frames from an animated gif spam. The first frame is random stuff, designed to make each image unique and to fool OCR technologies. The second frame is the actual spam message.

Another animated gif example gets around the issue of providing a URL in the message body for a user to click on. Instead the URL is provided in the image. The image is also animated which draws attention to the URL and the user must manually enter it in a browser. The aim here is to evade filters that utilize URL blacklists.



Standard Images

Let's not forget straightforward "standard" images. No obvious tricks are employed, but the mere fact the essential message is contained in the image renders text scanners useless. Moreover, as opposed to the wild tricks described above, standard images can lend an air of professionalism and authenticity to the email:

Why did Image Spam Rise and Fall?

At its peak, image spam was a huge a problem. The mere use of images renders simple text-based scanners useless. The ability of spammers to randomize and split images means each image is unique. Systems relying on "fingerprinting", signatures or OCR become less effective. Moreover, image spam is larger and the explosion of image spam in late 2006 caused headaches for many companies and ISPs as their infrastructure struggled to cope with the extra burden.

However, during 2007, spammers increasingly moved away from image spam, likely in response to an improved range if anti-spam defenses specifically targeting image spam. Also, as image spam is larger, spambots send less spam per hour than smaller, non-image spam. These factors saw spammers swing back to sending greater numbers of 'ordinary' plain text spam in 2007.

Drawbacks of OCR Technology

Many vendors have turned to OCR (Optical Character Recognition) in an effort to improve their detection rates against image spam. This technology aims to scan images to extract text.

While this idea sounds good, in practice there are a number of problems. It is very resource intensive - scanning all images would cripple a high volume mail server. And, even if you do successfully extract text from an image, you are then left with the problem of weighting or scoring that text – hitting some of the limitations of traditional key word scanning. Furthermore, as we have seen in this paper, the spammers have been quick to adjust to OCR technology by introducing irregular and wavy text, and wild backgrounds in their images.

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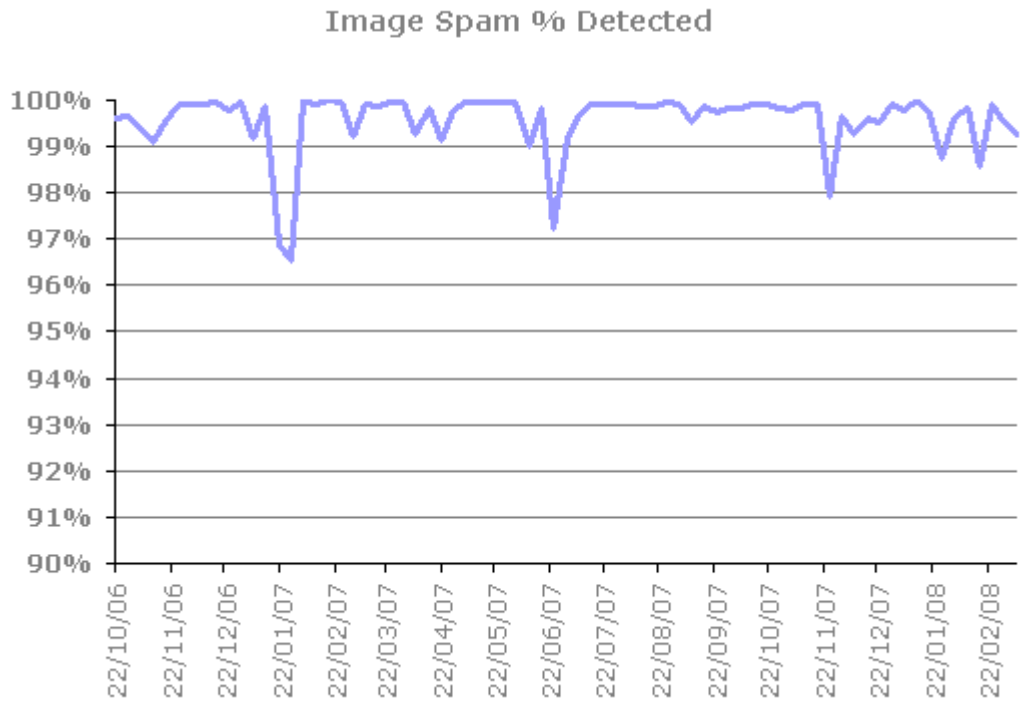
In sum, OCR is not suitable as a frontline defense against image spam. There is plenty of other information about a typical image spam message to identify it as spam.

Effectiveness of MailMarshal Against Image Spam

MailMarshal performs exceptionally well against image spam. The graph below shows MailMarshal performance against image Spam since the image spam 'flood' in latter half of 2006. Performance typically remained well above 99% with an average over the period of 99.4%. MailMarshal's lowest point in the whole period still remained above 96.5%.



Source: Marshal live "honeypot" streams

Why is MailMarshal So Effective?

MailMarshal utilizes the "Defense-in-Depth" concept, where multiple technologies are used to lessen the risk from one component being circumvented. Solutions relying on only one or two technologies are extremely vulnerable to changing spammer tactics. MailMarshal utilizes defense-in-depth with a range of proven anti-spam and content filtering technologies to provide a true layered anti-spam system.

In particular, MailMarshal incorporates Marshal's own SpamCensor technology, which analyzes message content, size and composition, and attachments. The SpamCensor incorporates unique scanning technology that targets the footprints left by spambots - devices installed on compromised computers which are responsible for the overwhelming majority of spam sent today. By targeting these 'botprints' and other repeatable characteristics, the SpamCensor detects new waves of spam, over and over again. The fact that spam may include an image is of little significance. Rather, it is the other information in the email around the image that is important. MailMarshal seeks to target those distinctive patterns.

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Conclusion

The image spam phenomenon of late 2006 showed the inventiveness and technological prowess of spammers. Image spam was initially successful at evading anti-spam devices based on simple text scanning, signatures and even newer technologies such as OCR.

Enterprises need a multi-faceted solution that goes beyond traditional spam detection technologies. MailMarshal provides such a solution, and it has proven itself very effective against image spam.

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