

the browser. Weinberg et al. created several CAPTCHAs out of the pixels of these links; hence, by answering the CAPTCHA, the user exposed the color of the pixels. In this way, the attacker learned whether the link was followed or not. Our attacks extract much more information from the victim site itself. However, the techniques presented by Weinberg et al. [28] to combine many Boolean questions in one CAPTCHA, can be used to optimize the multiple-questions in malicious CAPTCHA attacks, as described in Section 4.

Unlike the malicious CAPTCHA attack, which is suitable to expose sensitive private information from many websites, Weinberg et al. focused on specific Boolean questions: whether or not the victim browsed to a URL with her browser.

8. CONCLUSIONS

We showed a simple and effective attack that allows attackers to expose private details presented by websites. This is done by exploiting the users themselves as a side-channel, tricking the users into disclosing their own private information. The attack works using all standard browsers, and against some of the most well-known and guarded software-as-a-service web-services, such as Google and Facebook (see more in Table 1).

Similar to other web attacks, defending against this sort of attack is not very difficult, as we explain in Section 6. However, appropriate defenses, especially short term defenses that do not assume new client-side mechanisms, may require web services to slightly modify some mechanisms, e.g., social-network buttons. Such changes may involve a small loss in functionality. It would be interesting to see if and how the industry responds to this challenge: will the small loss in functionality be accepted in order to protect user privacy?

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10. REFERENCES

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