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ICT

DiskMan

User-friendly and highly accurate continuous user authentication without the need for passwords

Logins and passwords are by most users considered to be a hassle as authentication tools. Long passwords with complex characters are inconvenient to enter in applications, especially on mobile devices such as smartphones and smart watches.

On the other hand, this old technology can be prone to security issues. When entering a password, a user is typically logged in to a session for a certain period of time. However, within that time frame the user's identity is not verified anymore.

Newer authentication methods typically use biometrics, such as fingerprinting or facial recognition. While these technologies score better on user-friendliness, placing a photo in front of a smartphone camera can still mislead the facial recognition algorithm.

Cumbersome and unsafe passwords may soon be a thing of the past. DiskMan proposes a secure and user-friendly alternative that is based on collaborative authentication. Taking advantage of the user's smartphone and wearables such as a smart watch, a continuous authentication can be ensured that is also secure through the combination of authentication methods on these devices. One of the challenges that has been tackled was getting authenticating information out of wearables with a primitive or no user interface.

At the same time DiskMan takes on the challenge of safeguarding privacy in this multi-device authentication scenario. Privacy problems arise for example when a behaviometric template that identifies a person would be stored on a server. By applying cryptographic techniques DiskMan uses a 'key' from the biometric/behaviometric signal instead of the signal itself, so that sensitive and personal information remains local.

THE OUTCOMES

1. An equal error rate (EER) of 1% was reached with behaviometrics not involving any user interaction

DiskMan succeeded in reaching a challenging 1% EER already with a single behaviometric by using not more than 2 minutes of accelerometer data while a person is walking. The EER refers to the point where the proportion of falsely accepting a wrong identity is equal to the proportion of falsely rejecting a correct identity and is used to compare different systems. With an EER of only 1%, DiskMan surpasses the state-of-the-art accuracy level that is described in literature with single authenticators.

Security is further substantially increased by using several behaviometrics and combining their results. Achieving the 1% EER highlights the potential for practical implementation of this research. Moreover, these research results were subsequently validated and confirmed in realistic, non-laboratory conditions.

2. Development of a mobile middleware that integrates the authentication algorithms

The middleware ensures that the combinations of authenticators that were identified in the DiskMan project, can be coupled to concrete applications. It includes extra functionalities to search the available devices for the strongest combination of authentication methods that fulfill the security demands of the application.

Additionally, cryptographic means were developed that automatically select a subset of registered devices that the user carries at any moment, guaranteeing authentication with the required security level. This increases the user-friendliness of the software since it does not oblige the user to always carry around the same devices.

3. Extension of the middleware with backend functionalities to allow for frictionless integration in existing applications

When coupling the middleware to existing online applications, an additional coupling between the existing identity and access management (IAM) systems and the new information from the wearable devices is desired. Therefore, DiskMan extended the middleware with backend functionalities that provide the existing IAMs with continuous feedback from the wearables. Thereby creating a type of next-generation IAM that also includes behaviometrics and machine learning.

These extra functionalities can be coupled to existing protocols and standards, so that the complex integration steps from the DiskMan project are shielded off from the application itself, while still allowing access to the application developers through the existing protocols. This ensures that the coupling with the end application is implemented as frictionless as possible.

NEXT STEPS

The academic partners, DistriNet and COSIC, two imec research groups at KU Leuven, will continue their research on authentication procedures, specifically based on behaviometrics, and look further into the techniques behind them, such as deep learning and machine learning. Understanding the models and algorithms behind these techniques is a step towards addressing potential security issues.

The industrial partners are preparing the DiskMan results for potential commercial employment. Sony Belgium will continue research to improve behaviometrics as a hassle-free authentication tool. The underlying deep learning models were thus far trained per person using several days of behaviometric data; Sony will now develop pretrained models. IS4U will continue its work on server side to ensure that all solutions proposed in the project can be made scalable. Televic will streamline the authentication tools employed in the DiskMan project for their conferencing system to make the switch from access badge readers to a more advanced authentication system based on a combination of biometrics/ behaviometrics.

FACTS

NAME	DiskMan
OBJECTIVE	Developing a dynamic risk-based access management toolset
TECHNOLOGIES USED	Deep learning and machine learning algorithms, identity and access management platforms
TYPE	imec.icon project
DURATION	01/10/2016 – 30/09/2018
PROJECT LEAD	Hugo Embrechts, Sony Belgium
RESEARCH LEAD	Wouter Joosen, DistriNet, an imec research group at KU Leuven
BUDGET	2,444,975 euro
PROJECT PARTNERS	Sony Belgium, IS4U, Televic conference
RESEARCH GROUPS	DistriNet and COSIC, two imec research groups at KU Leuven

Diskman project partners:

SONY IS4U information security solutions televic

WHAT IS AN

IMEC.ICON PROJECT?

The imec.icon research program equals demand-driven, cooperative research. The driving force behind imec.icon projects are multidisciplinary teams of imec researchers, industry partners and/or social-profit organizations. Together, they lay the foundation of digital solutions which find their way into the product portfolios of the participating partners.

The DiskMan project was co-funded by imec (iMinds), with project support from Agentschap Innoveren & Ondernemen.

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