

# Design and analysis of technical systems for humans

## Introductory talk

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**CHALMERS**  
UNIVERSITY OF TECHNOLOGY

**WASP** | WALLENBERG AI,  
AUTONOMOUS SYSTEMS  
AND SOFTWARE PROGRAM

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# Goals of this presentation

## Introduce myself to iSec

- Where I was / What I did
- What are my interests / What could be my input

## Present my past work

- PhD thesis: Enhancing information and consent in the IoT
- A standard for consent in the IoT
- Recent paper on cookie paywalls

## Expose my perspectives

- For the CyberSecIT project
- In line with my research interests

# Outline

## 1 Introduction

- An introductory talk
- \$ whoami
- Overview

## 2 PhD at Inria

- Motivations
- Contributions

## 3 SCLab

- Interdisciplinary experience
- Cookie paywalls

## 4 Chalmers

- CyberSecIT project
- Perspectives on usable privacy

## 5 Conclusion

# Sweden: there and back again

## Master thesis in Uppsala

Generating co-evolutionary polarized opinion networks

## PhD in France

Inria - Privatics (Lyon), Enhancing information and consent in the IoT

## Back to Sweden

For *kanelbullar*? ~~For *kanelbullar*?~~ For a postdoc at iSec



Kanelbullar by hepp, CC-BY 2.0

# Title explained - *Design and analysis of technical systems for humans*

## Design?

- Not just as in *interface design*
- More like *conception* of systems

## Analysis?

- Technical analysis
- Network and data science background

## Humans?

- Often the weak link of technical systems
- Providing a technical interpretation of legal requirements

# Blending law, design/HCI, and computer science

## Law because

Privacy is also a legal topic

## Design/HCI because

Research is needed on both *architectures* and *interfaces* of systems

## Computer science because

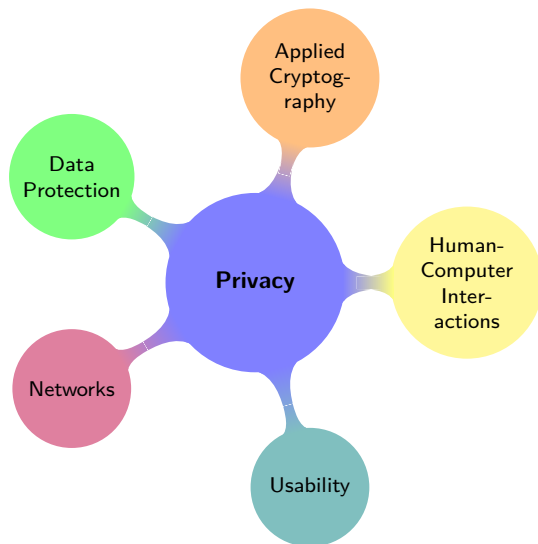
I am still a computer scientist

## The combination of the three...

... results in promising research

... tailored to a *human* society

## Research interests



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# Past, present, future

## Past

PhD work at Inria

## Present (recent past)

Short postdoc in Austria

## Future

Perspectives on the CyberSecIT project

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# The Internet of Things



- Growing infrastructure
- Numerous devices, various uses
- Limited capacities and interfaces
- Different types of data collected

# Privacy concerns in the IoT



## Personal data collection

- Risks of surveillance and abuse of targeted advertising
- Specific issues raised with the IoT
- Difficult to comply with regulations

# General Data Protection Regulation

## GDPR

- Most recent legal framework for personal data protection in Europe
- Extra-territorial scope: impact outside Europe as well
- Introduces rights for data subjects
- And obligations for data controllers



**KEEP  
CALM  
AND  
COMPLY WITH  
GDPR**

## Key ideas

- Bundle of principles (Art. 5)
  - ▶ Fair and transparent processing
  - ▶ Purpose limitation
  - ▶ Data minimization ...
- Content of information (Art. 13/14)
- Conditions for consent (Art. 7, 4(11))

## Research question and global approach

It is possible to design a generic framework to communicate information and manage consent in the Internet of Things?

TL;DR: yes.

### Global approach

- Machine-readable privacy policies for information and consent
- Controller privacy policies for commitment
- Data subject privacy policies to define choices

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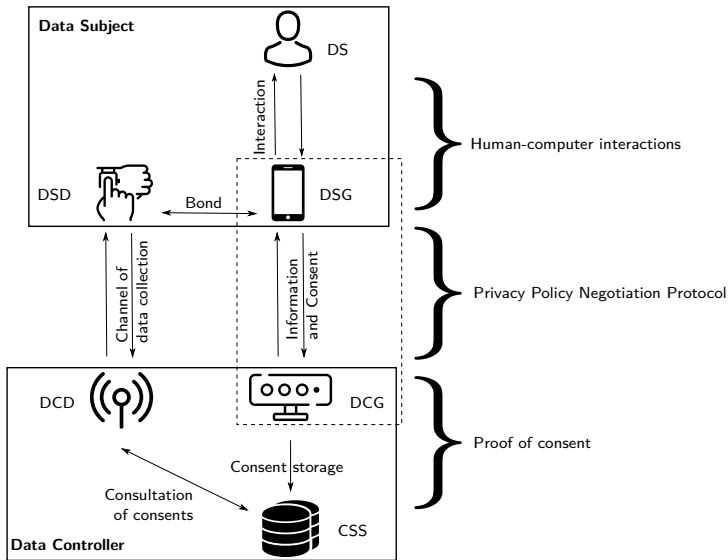
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# A generic framework for information and consent in the IoT



Explanatory diagram of the framework



# ColoT: a proof of concept



ColoT - A Consent and Information assistant for the IoT

## A mobile app

- Designed for Android
- Works with a gateway device (ESP32)
- Implements:
  - ▶ Information through different channels
  - ▶ P2P consent management via BLE
  - ▶ Proof of consent
- Video time!

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# Engaging with other disciplines working on consent

Willfulness to engage with:



Viennese croissants?

## Law

Consent is notably a legal issue

## Design

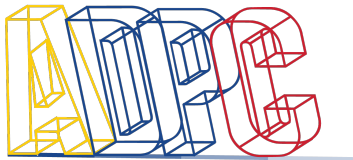
Dark patterns

## Cognitive science

User-centered perception

## Interdisciplinary paper

On DPCCMs (ADPC & GPC)



An alternative to cookie banners



In partnership with the Austrian NGO

Porting ADPC to the IoT

Towards standardization of consent

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# Cookies?



Willkommen bei **DERSTANDARD**

**Mit Werbung weiterlesen**

Nutzen Sie derStandard.at mit Ihrer Zustimmung zur Verwendung von Cookies für Webanalyse und personalisierte Werbemaßnahmen. Details finden Sie in der Datenschutzerklärung.

**EINVERSTANDEN**

Die Zustimmung ist jederzeit widerrufbar.

**derStandard.at PUR**

Das Abo für derStandard.at ganz ohne Werbung und Daten-Tracking auf allen Endgeräten. Jederzeit monatlich kündbar.

**JETZT ABONNIEREN**

Sie haben ein PUR-Abo? [Hier anmelden](#).

Der STANDARD mit Werbung: Wir nutzen aus wirtschaftlichen Gründen die Möglichkeit, unsere Webseite Dritten als digitalen Werbeplatz zur Verfügung zu stellen. Wenn Dritte Ihre Daten via Cookies auf unserer Webseite zu Werbezwecken verarbeiten, liegt die Verantwortung für die datenschutzrechtliche Konformität bei den jeweiligen Dritten. Im Privacy Manager haben die auf unserer Website verbenden Dritten die Möglichkeit Sie über diese Verarbeitungstätigkeiten zu informieren, und somit eine informierte Zustimmung einzuholen. Die Verarbeitungen zu digitalen Werbezwecken erfolgen dabei zu den im **Privacy Manager** aufgezählten Zwecken. Über Verarbeitungen, die in der Verantwortung des STANDARD liegen, können Sie sich in unserer Datenschutzerklärung näher informieren.

More like cookie paywalls!

→ **Overlooked by academia**

Your Consent Is Worth 75 Euros A Year, Morel et al., 2022

# Methodology and findings

## Description

- Manual annotation of top Central Europe websites (Tranco list)
- Presence and type of wall, category of website, general info (price etc)

## Measurement

- 61 of the 2800 websites studied use paywalls (2.72%), and 13 cookie paywalls (0.66%)
- Most cookie paywalls consist of news websites

## Legal analysis of both cookie walls and paywalls

Divergent positions on cookie walls and paywalls from EU DPAs

## Updated classification

*Hard, soft and metered paywall, registration wall, cookie wall, and cookie paywall*

# Future work on cookie paywalls

## We also found out that cookie paywalls:

- They do not track visitors prior to interaction
- Websites present different versions → personalized pricing?

**Chceme vám zobrazovať Denník N a reklamy v rovnakej podobe ako doteraz, podľa zákona preto potrebujeme váš súhlas na:**

-  Personalizované reklamy a obsah, meranie reklamy a obsahu, štatistiky cieľových skupín a vývoj produktov
-  Uchovávanie a/alebo prístup k informáciám na zariadení
-  Ďalšie informácie

Vaše osobné údaje budú spracované a informácie z vášho zariadenia (súbory cookie, jedinečné identifikátory a ďalšie údaje zariadenia) môžu byť uchovávané, používané a zdieľané s dodávateľmi tretích strán, prípadne používané konkrétne týmto webom alebo aplikáciou.

Niektorí dodávateľia môžu spracovávať vaše osobné údaje na základe oprávneného záujmu, proti ktorému môžete vzniesť námietku pomocou možnosti nižšie. Súhlas môžete zrušiť prejdением na odkaz v dolnej časti tejto stránky alebo v našich pravidlách ochrany súkromia.

**Súhlas**

[Spravovať možnosti](#)

„Prišiel akýsi chlapík a vedel všetko, o niekoľko tried prevyšoval ostatných uchádzačov o toto miesto,“ hovoril o Mečiarovi vtedajší podpredseda vlády Vladimír Ondruš. Čo všetko Mečiar vedel? Podľa spomienok vtedajších aktérov ovládal aj štruktúru ministerstva, ani samotní ľudia z VPN ju tak nepoznali.

Jeden z lídrov VPN, Fedor Gál, si na prvý dojem z Mečiara spomína podobne: „Mal som dojem razantného, rozhodného a rýchleho chlapa. Bol mi sympatický“

**Tento článok je exkluzívnym obsahom pre predplatiteľov Denníka N.**

Ste predplatiteľom?

[PRIDAJTE SA K PREDPLATITEĽOM](#)

[PRIHLÁSTE SA](#)

Different presentations on Chrome and Firefox

→ Requires *large scale analysis* **and** *automated tracking detection*



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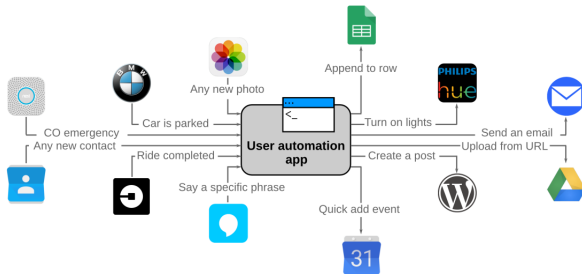
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# Overview of CyberSecIT



## Two key challenges for security and privacy in IoT app platforms

- Automation → securing software from malicious attackers
- Autonomy → securing machine-learning for IoT apps

## WP2: Usable privacy-enhancing permission management

### High-level goal

To develop usable UI techniques and prototypes, supported by machine learning

### Task 2.1

Privacy Profiles for IoT application permissions (relates to consent)

### Task 2.2

ML-supported usable and privacy-compliant permission management

### Task 2.3

Usable UIs for permission management

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# User studies

## How to build privacy profiles?

- By conducting user studies (surveys)
- With focus on legal, cross-cultural, and gender aspects
- Using vignette studies

## Example of a vignette

Consider that you exercising using a *fitness device* that collects your *HeartRateVariability* to *assess your sport performance*. This data will be stored for a year on the servers of *Fitbits*, a private company.

## Research questions

- What are the privacy preferences and expectations in Trigger-App Platforms with respect to privacy permissions and privacy notifications?
- What is the influence of the legal framework in these preferences and expectations?

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# Summary

What was this presentation about? Mostly pastries! 🥐

But also consent and human factors:

- A technical interpretation of GDPR requirements
- Interdisciplinary view on consent management
- Cookie paywalls
- User studies for the CyberSecIT project



Grab a coffee? (With pastries *naturligtvis*)

# Bibliography



Cunche, Mathieu, Daniel Le Métayer, and Victor Morel (2020). “ColoT: a Consent and Information assistant for the IoT”. In: *Proceedings of the 13th ACM Conference on Security and Privacy in Wireless and Mobile Networks*, pp. 334–336.



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