



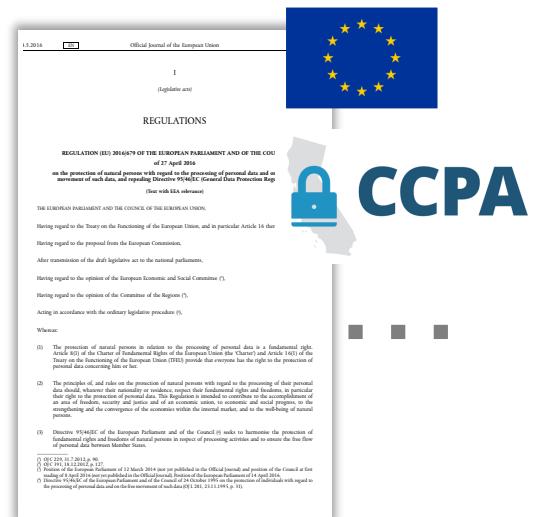
# Cloud Native Privacy Engineering for Transparency and Accountability

Elias Grünwald

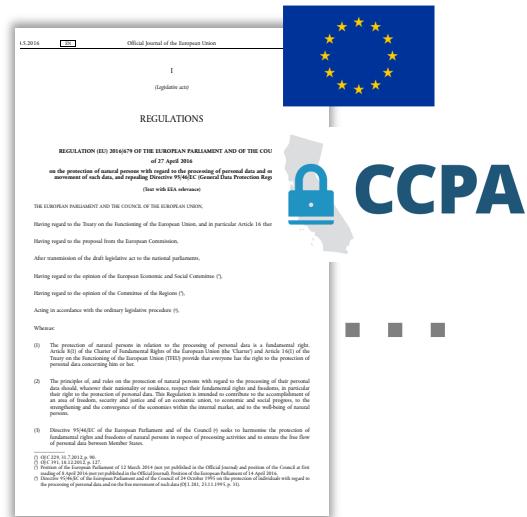
Information Systems Engineering  
TU Berlin

16<sup>th</sup> INTERNATIONAL CONFERENCE 24 - 26 MAY 2023 BRUSSELS, BELGIUM  
COMPUTERS, PRIVACY & DATA PROTECTION  
**#CPDP2023 IDEAS THAT  
DRIVE OUR DIGITAL WORLD**

# Cloud Native Privacy Engineering



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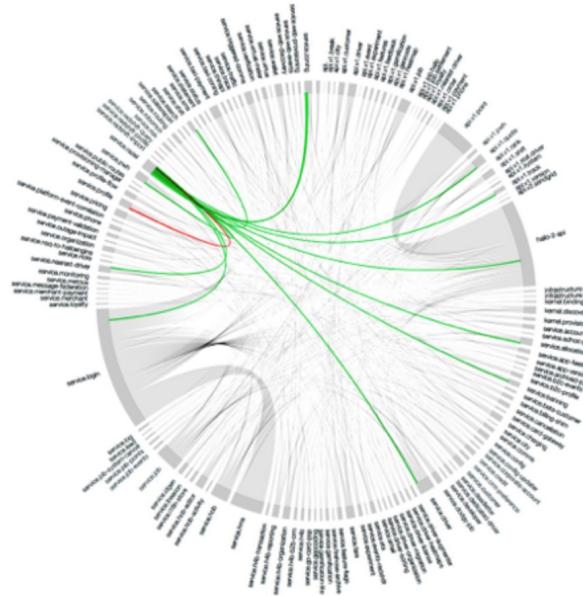


# Cloud Native Privacy Engineering

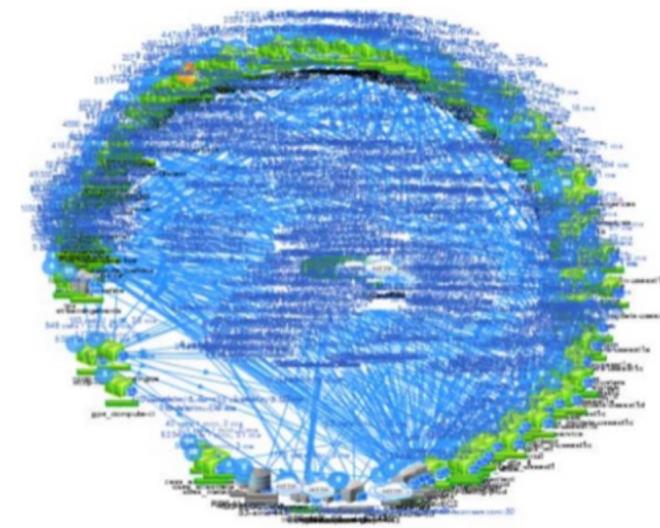


# How modern software architectures look like

450+ microservices

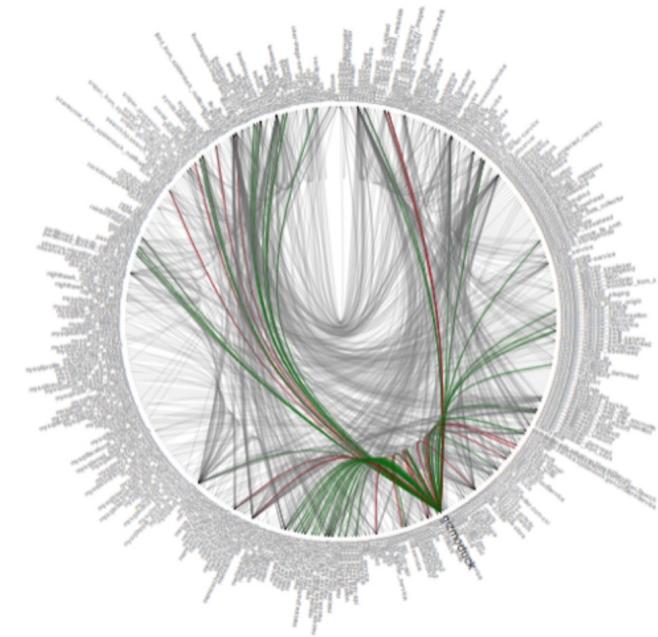


500+ microservices



NETFLIX

500+ microservices



[https://sp-ao.shortpixel.ai/client/to\\_auto,q\\_glossy,ret\\_img,w\\_530,h\\_262/](https://sp-ao.shortpixel.ai/client/to_auto,q_glossy,ret_img,w_530,h_262/)<https://www.peerislands.io/wp-content/uploads/2020/07/microservices-death-star.png>

# How current transparency measures look like



<https://www.fastcompany.com/90171107/printing-out-the-privacy-policies-of-facebook-snap-and-others>

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# How current accountability measures look like

record-processing-activities (2)

Home Insert Draw Page Layout Formulas Data Review View Automate Tell me

B35 Data backup

**1 Example of a completed record of processing form**  
This example is based on a fictitious processing and should not to be repeated as it is, but to be adapted according to your processing (cf. tab 3).

**Description of the processing operation**

Name of the processing operation	Payroll management				
Nº / REF	1 - Example				
Data of creation of the processing	May 26, 2018				
Update of the processing	May 13, 2019				
Stakeholders	Name	Address	ZIP Code	Town	Country
Controller	Louise DUPONT	1 rue Rivoli	75001	Paris	France
Data protection officer	Martin HENRI	1 rue Rivoli	75001	Paris	France
DPO's Organisation (if external DPO)	N/A				

**Purpose(s) of the data processing**

Main purpose	Payroll management				
Sub-purpose 1	Calculation of remuneration				
Sub-purpose 2	Calculation of the amount of payments made to social security organisations				
Sub-purpose 3	Transfer orders to the bank				

**Categories of personal data**

	Description	Data reten

Tutorial 2\_- Processing\_List 3\_- Template\_ 4\_- Example\_ 5\_- Listes +

Ready Accessibility: Investigate 100%

<https://www.cnil.fr/en/record-processing-activities>

# Scope

## Cloud Native Architectures, esp. Microservices

P1: Such architectures introduce **new privacy challenges**

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## Transparency and accountability aligned with European legislation & beyond

P2: **Software engineers are ill-equipped** with appropriate measures

for transparency and accountability

# Scope

## Cloud Native Architectures, esp. Microservices

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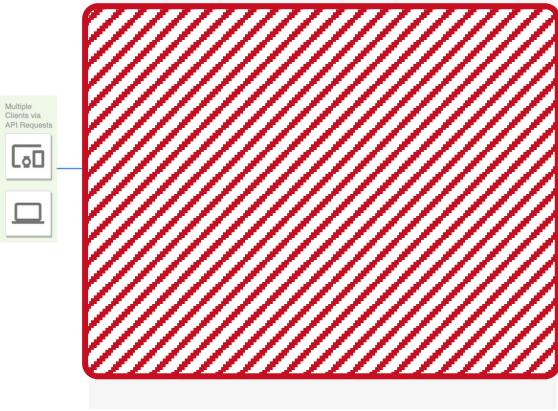
for transparency and accountability

## Benevolent / well-intentioned actors, not adversaries

P3: **Agile Development methods** still (mostly) neglect or contradict established privacy principles

# Architect's / Privacy Engineer's perspectives

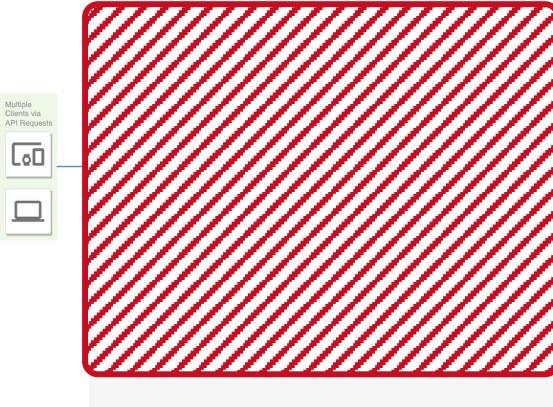
## 1 “Black box” / Overview



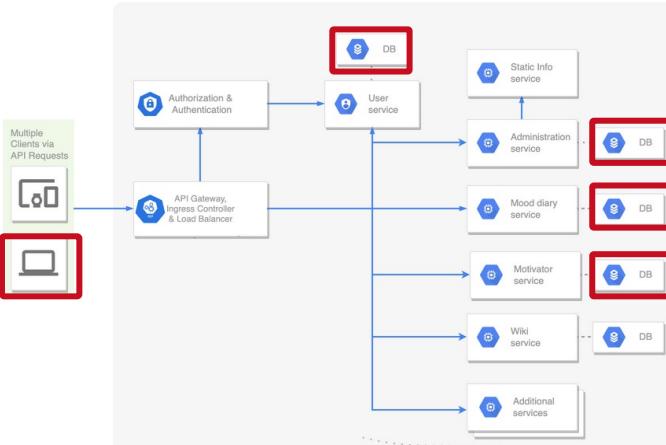
Elias Grünewald and Frank Pallas. 2021.  
TILT: A GDPR-Aligned Transparency  
Information Language and Toolkit for  
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In *Proceedings of the 2021 ACM FAccT*,  
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# Architect's / Privacy Engineer's perspectives

## 1 “Black box” / Overview



## 2 Personal data at rest

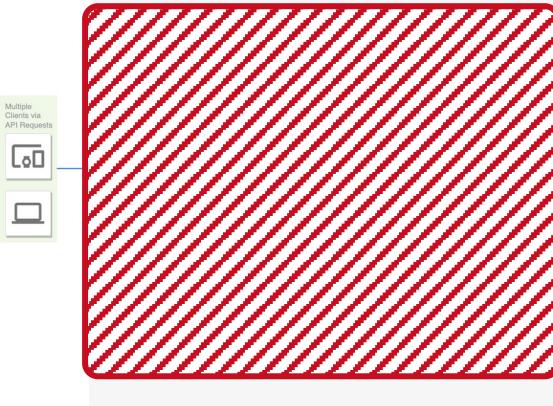


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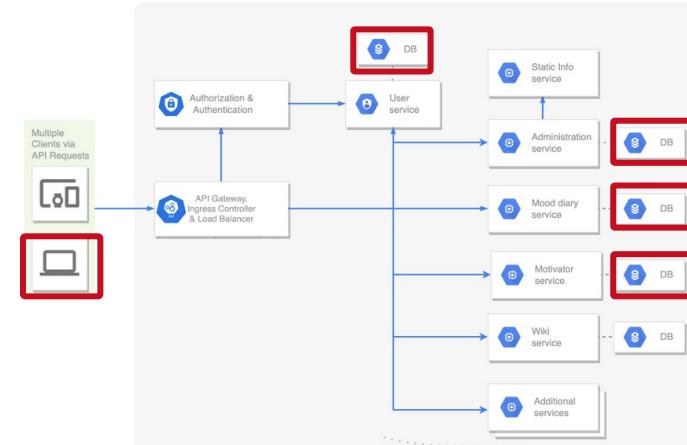
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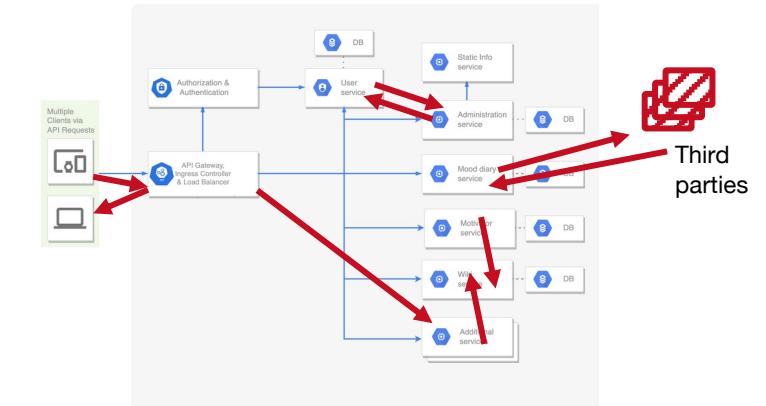
## 1 "Black box" / Overview



## 2 Personal data at rest



## 3 Personal data in transit



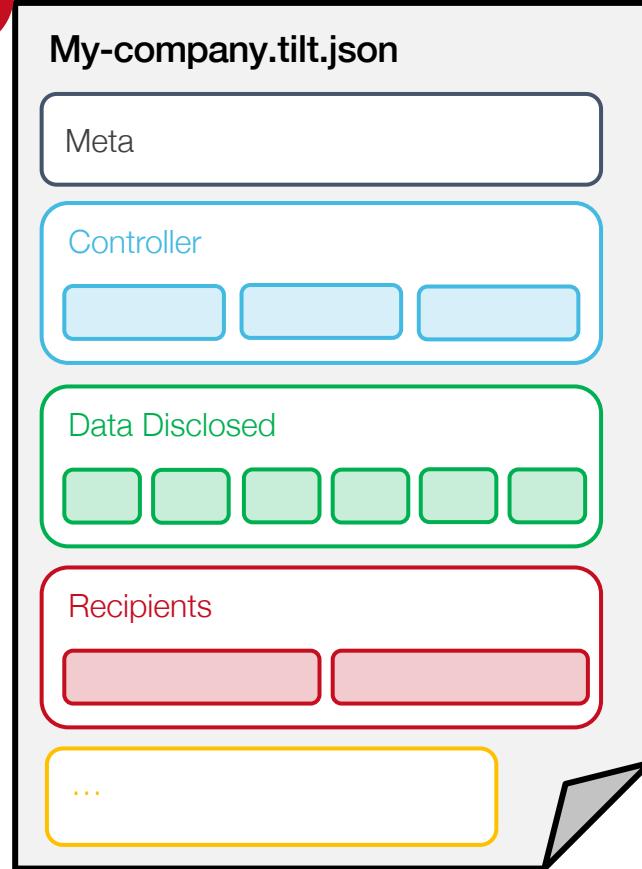
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Elias Grünewald, Paul Wille, Frank Pallas, Maria C. Borges and Max-R. Ulbricht. 2021. TIRA: An OpenAPI Extension and Toolbox for GDPR Transparency in RESTful Architectures. In: *Proceedings of the 2021 EuroS&PW (IWPE)*, pp. 312-31

# Key: TILT | Machine-readable transparency information

1



- One **structured, machine-readable format for all transparency information** according to Art. 12, 13, 14, 15, 30 GDPR
- To be integrated into **state-of-the-art developer tools**

# Developer-focused Transparency Enhancing Technologies

2

## Personal data at rest

### Data Loss Prevention | Teiresias

Data Analysis

• analysisTitle

Teiresias<sub>metric</sub>: 1  
Number of entities: >=1  
Has data matches: True  
Mean of attribute-to-lookup proximities: 92%



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3

## Personal data in transit

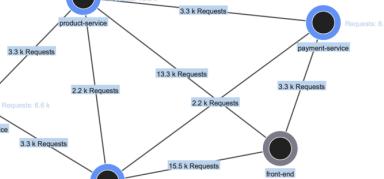
### API documentation | TIRA

```
x-tira:  
  retention_time:  
    days: null  
    months: null  
    years: 10  
    # volatile: true  
    # no_limit: true  
    periodic_review: true  
    review_frequency:  
      days: 1
```



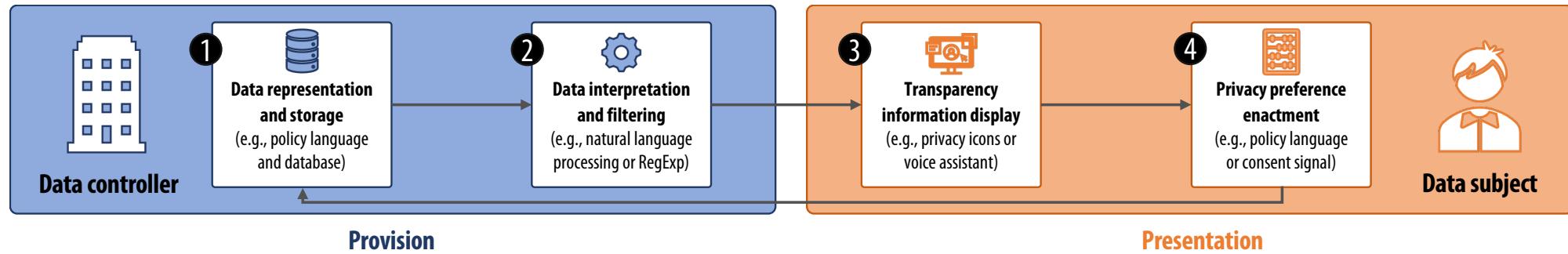
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### Infrastructure monitoring | Hawk

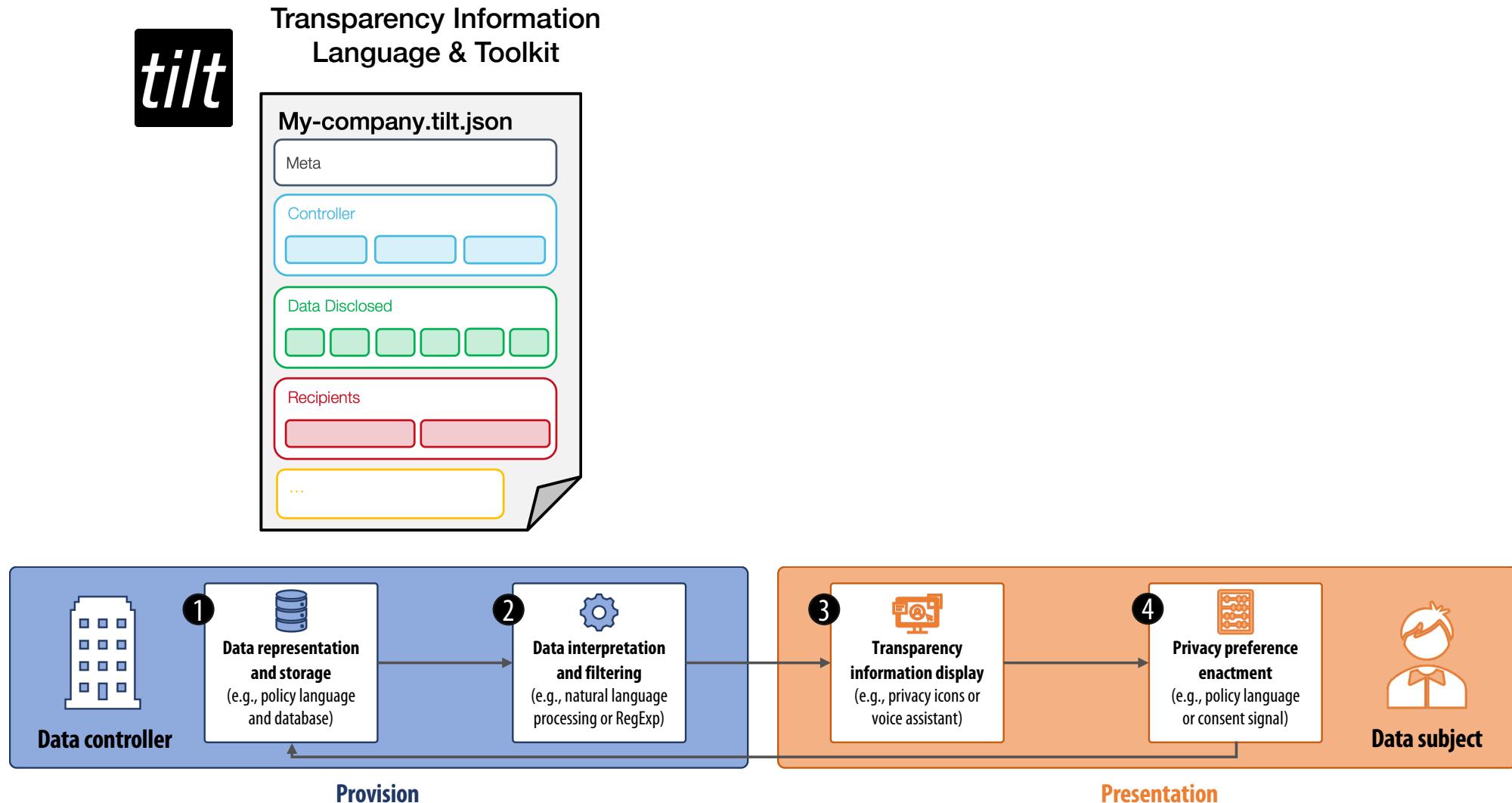


Elias Grünewald, Jannis Kiesel, Siar-Remzi Akbayin and Frank Pallas. 2023. Hawk: DevOps-driven Transparency and Accountability in Cloud Native Systems. To appear in: Proceedings of the IEEE Intl. Conference on Cloud Computing

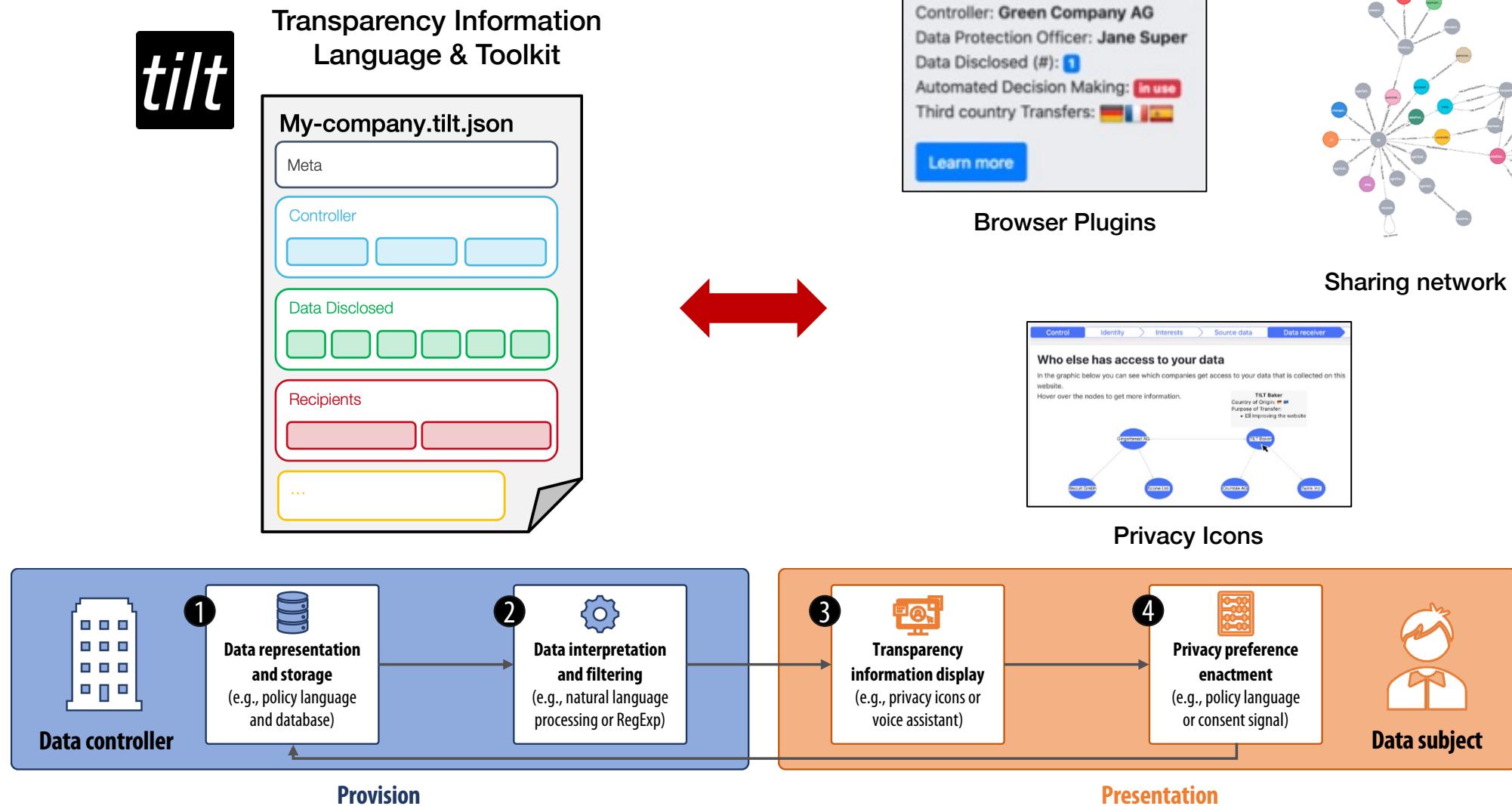
# Enabling Versatile Privacy Interfaces



# Enabling Versatile Privacy Interfaces



# Enabling Versatile Privacy Interfaces



# Cloud Native Privacy Engineering for Transparency and Accountability

Elias Grünewald



TOUCAN: Transparency in Cloud-Native  
Architecture and Engineering

► <https://tu.berlin/ise/toucan>



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and Research

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@eliasgruenewald  
[in/eliasgruenewald](https://www.linkedin.com/in/eliasgruenewald)

## DaSKITA

DaSKITA: Data Sovereignty through AI-based  
Transparency and Access

► <https://tu.berlin/ise/daskita>



Federal Ministry  
for the Environment, Nature Conservation,  
Nuclear Safety and Consumer Protection

# Cloud Native Privacy Engineering for Transparency and Accountability

Elias Grünewald

Download these slides.



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