Measures against over-asking in SSI

and the Yivi ecosystem

Master thesis presentation, 13 October 2023
Job Doesburg

Radboud Universiteit

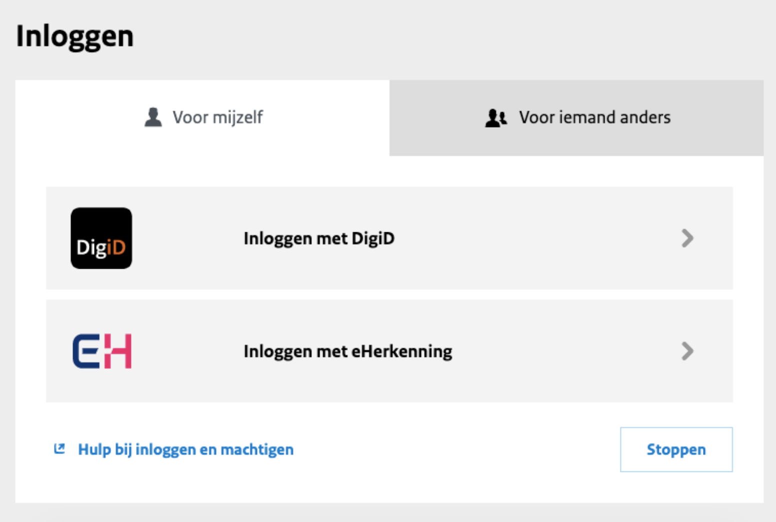
Agenda

1. Brief introduction to **SSI (and Yivi)**
2. Analysis of the **over-asking** problem
3. Some **measures** to reduce the problem

SELF-SOVEREIGN IDENTITY (SSI) / YIVI

MEASURES AGAINST OVER-ASKING IN SSI

FEDERATED IDM



Inloggen

Voor mijzelf | Voor iemand anders

Inloggen met DigiD

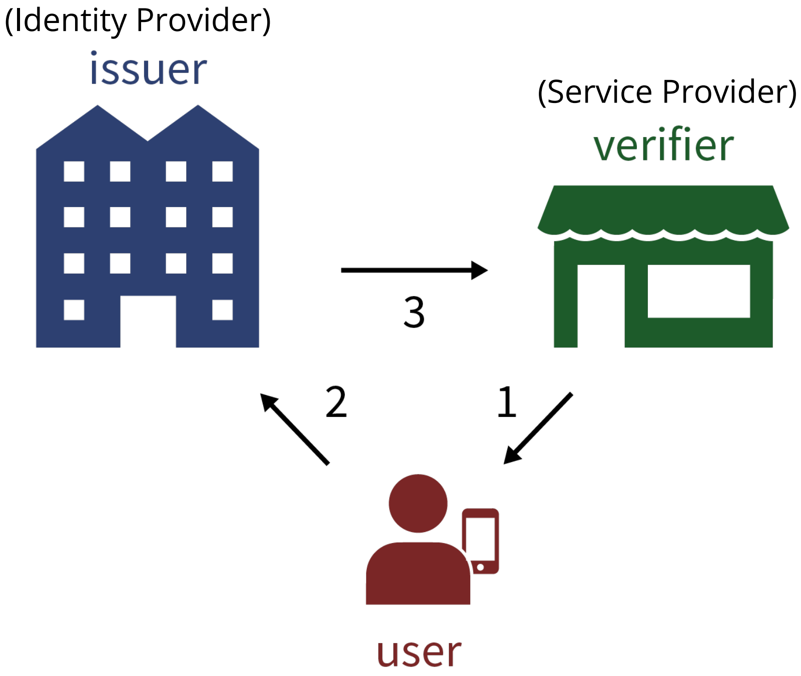
Inloggen met eHerkenning

Hulp bij inloggen en machtigen

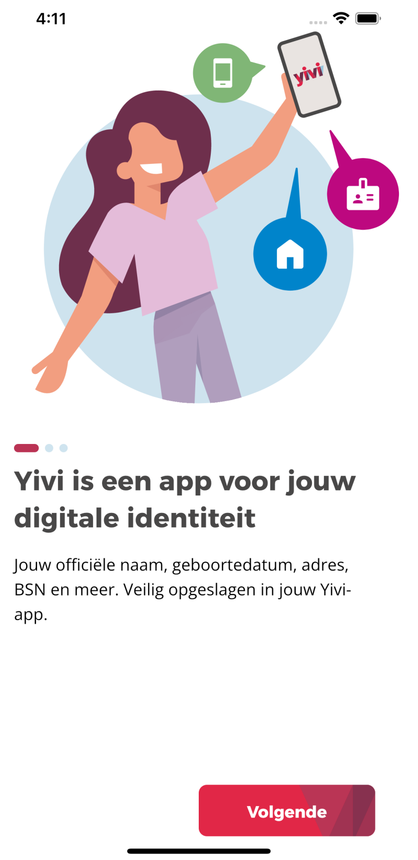
Stoppen

Sign in

Sign in with Google

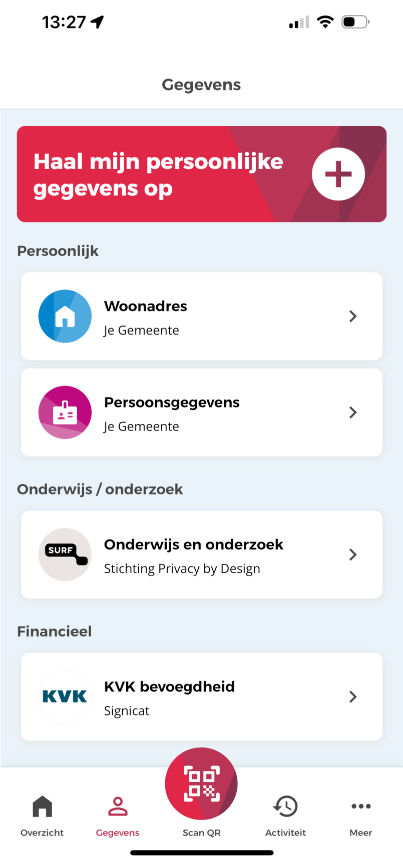


MEASURES AGAINST OVER-ASKING IN SSI
YIVI ECOSYSTEM (PREVIOUSLY IRMA)



Yivi is een app voor jouw digitale identiteit

Jouw officiële naam, geboortedatum, adres, BSN en meer. Veilig opgeslagen in jouw Yivi-app.



Gegevens

Haal mijn persoonlijke gegevens op

Persoonlijk

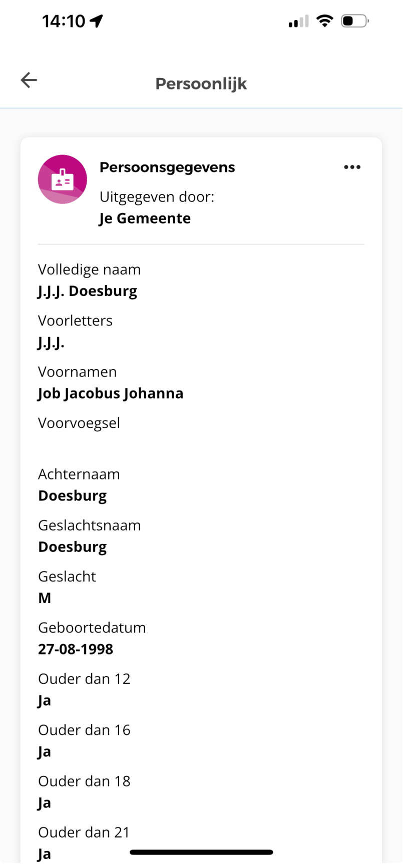
- Woonadres — Je Gemeente
- Persoonsgegevens — Je Gemeente

Onderwijs / onderzoek

- Onderwijs en onderzoek — Stichting Privacy by Design

Financieel

- KVK bevoegdheid — Signicat



Persoonlijk

Persoonsgegevens

Uitgegeven door:
Je Gemeente

Volledige naam
J.J.J. Doesburg

Voorletters
J.J.J.

Voornamen
Job Jacobus Johanna

Voorvoegsel

Achternaam
Doesburg

Geslachtsnaam
Doesburg

Geslacht
M

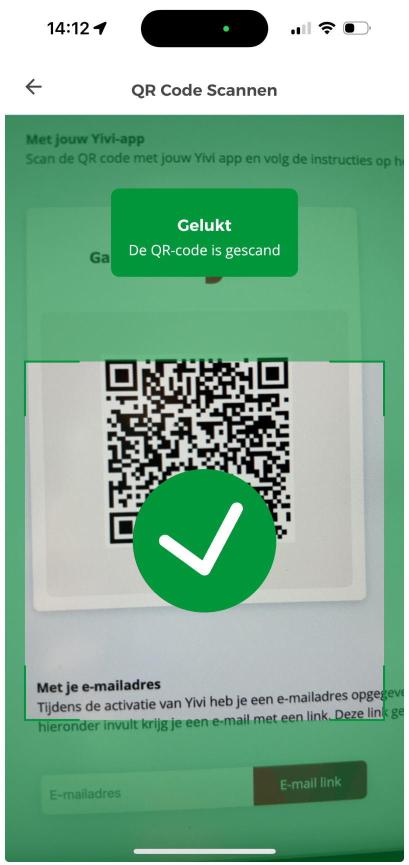
Geboortedatum
27-08-1998

Ouder dan 12
Ja

Ouder dan 16
Ja

Ouder dan 18
Ja

Ouder dan 21
Ja

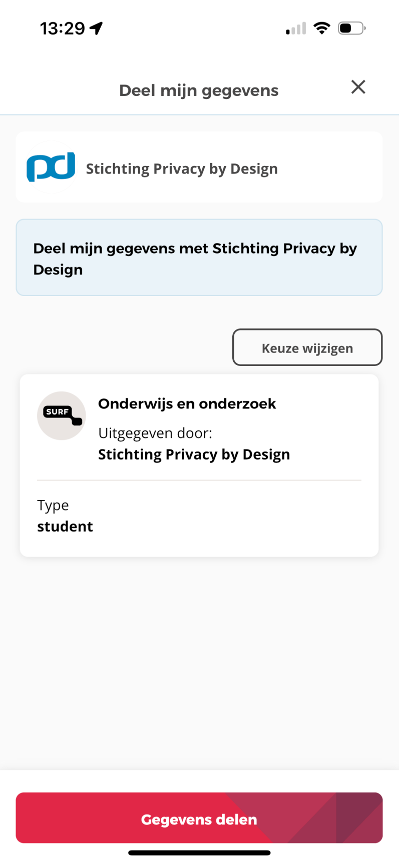


QR Code Scannen

Met jouw Yivi-app
Scan de QR code met jouw Yivi app en volg de instructies op h

Gelukt
De QR-code is gescand

Met je e-mailadres
Tijdens de activatie van Yivi heb je een e-mailadres opgege
hieronder invult krijg je een e-mail met een link. Deze link ge



Deel mijn gegevens

Stichting Privacy by Design

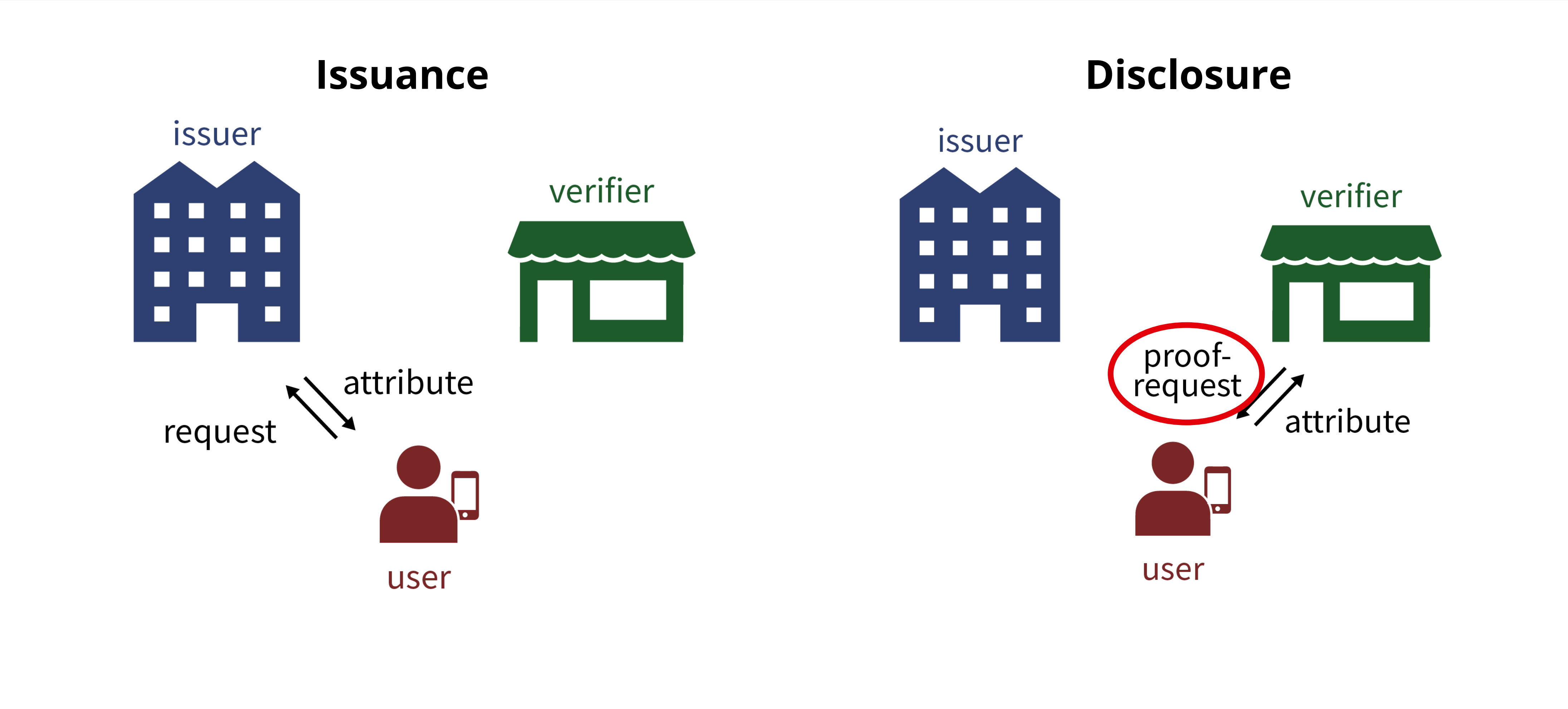
Deel mijn gegevens met Stichting Privacy by Design

Onderwijs en onderzoek
Uitgegeven door:
Stichting Privacy by Design

Type
student

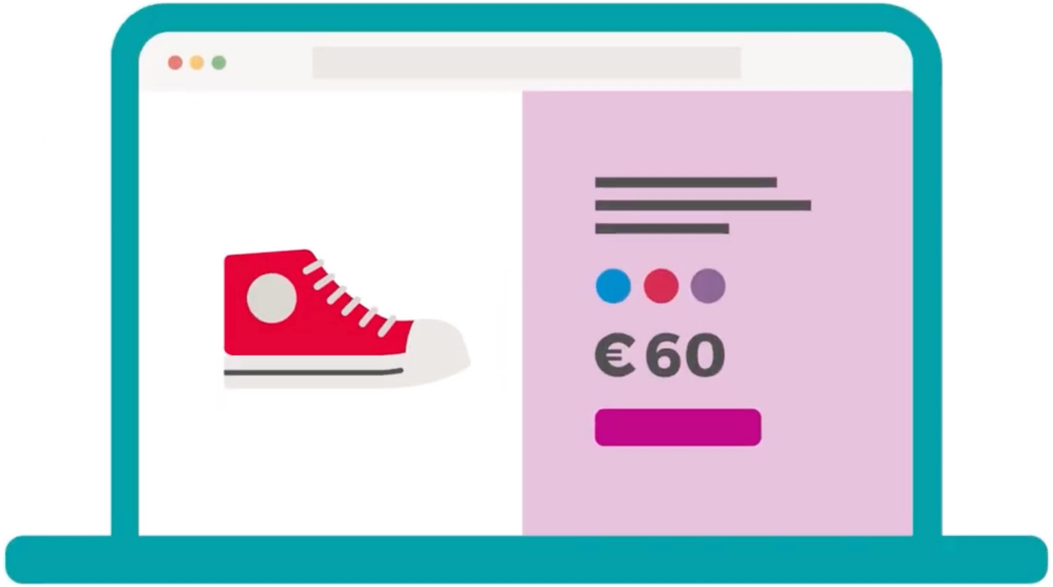
MEASURES AGAINST OVER-ASKING IN SSI

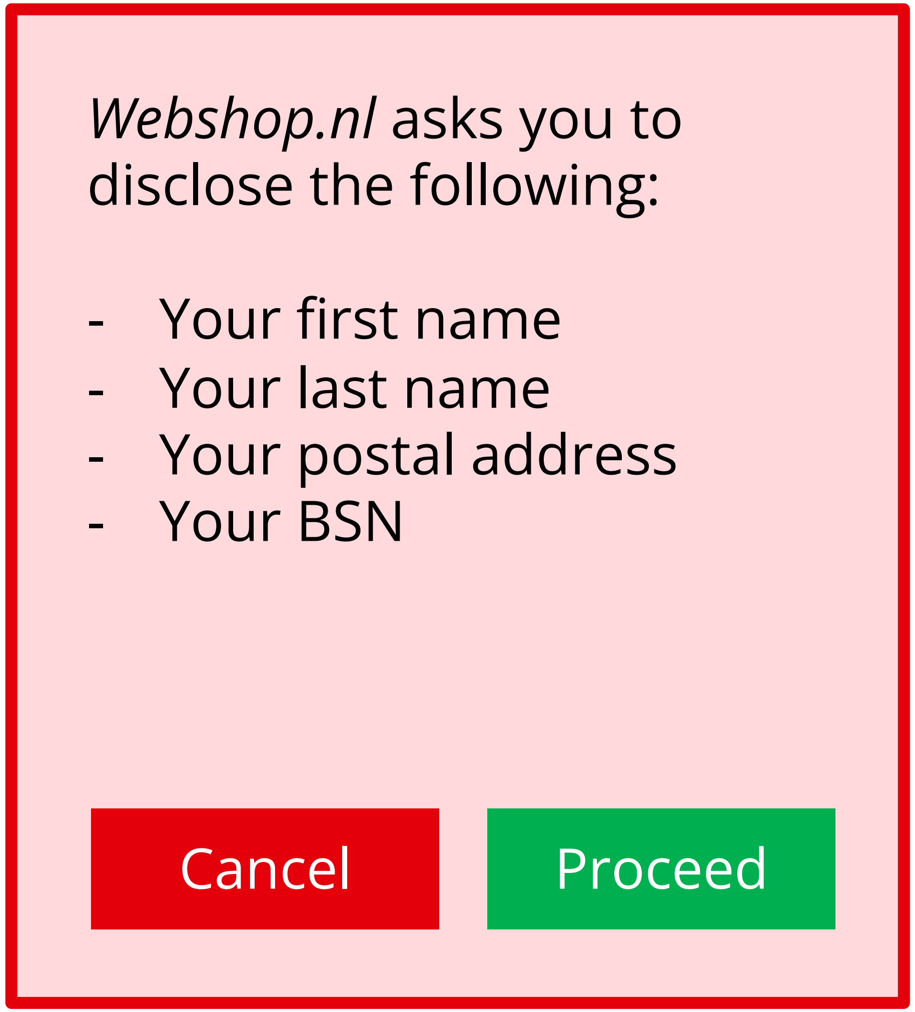
YIVI ECOSYSTEM (PREVIOUSLY IRMA)



OVER-ASKING

Problem





Webshop.nl asks you to disclose the following:

- Your first name
- Your last name
- Your postal address
- Your BSN

MEASURES AGAINST OVER-ASKING IN SSI

Problem

Your future employer asks you to disclose the following:

- Your first name
- Your last name
- Your diplomas
- Your medication list

Cancel Proceed

Problem

Is clicking the “proceed” button actually true (freely given, informed) consent?

- **Unawareness** / **ignorance** of the user
- **Power imbalance** between verifier and user

How can we protect users against unacceptable disclosure requests?

“Requiring users to *know* which verifiers to trust is very similar to asking users to know which websites to trust, even when they have not visited them before. [...]

Web browsers indicate if a secure TLS session has been established [...] by displaying a lock icon next to the web site’s URL. Something similar will be needed for SSI [...] to enable human users to determine if a verifier is trustworthy or not”

(Chadwick et al., 2023)

Problem

Is clicking the "proceed" button actually true (freely given, informed) consent?

- **Unawareness** / **ignorance** of the user
- **Power imbalance** between verifier and user

- Users actively need help protecting their own privacy!
  - **Duty of care?** For platform (Yivi)? Issuer? Government?

Problem

Why over-asking is a *greater* risk in SSI than in other forms of IdM:

- **Unsiloing of data** → more data that is more easily available
- **No gatekeepers** → no IdP can be held accountable
- **Loss of context-awareness** → no intuitive context association with specific IdP

- **Unfair expectations**: SSI is advertised as a privacy-friendly technology. People might expect that simply by using it, violating your own privacy is *impossible*.

- **Decentralized nature of SSI makes over-asking intransparent and harder to detect**

MEASURES AGAINST OVER-ASKING IN SSI

THE CURRENT YIVI ECOSYSTEM (AND THE GENERAL SSI LANDSCAPE)

- Few issuers, many verifiers
- Deliberate choice: **everyone can be a verifier**
- Being a verifier is **easy** (important for adoption)

- **Yivi: "Back in charge of your digital data. All you. All yours"**
- Users choose to whom they disclose ***their data*** (autonomy).
- *Ideologically*: full autonomy is a *feature*

  Pragmatically: some data might be too sensitive to be requestable by anyone (even with permission from the user)…

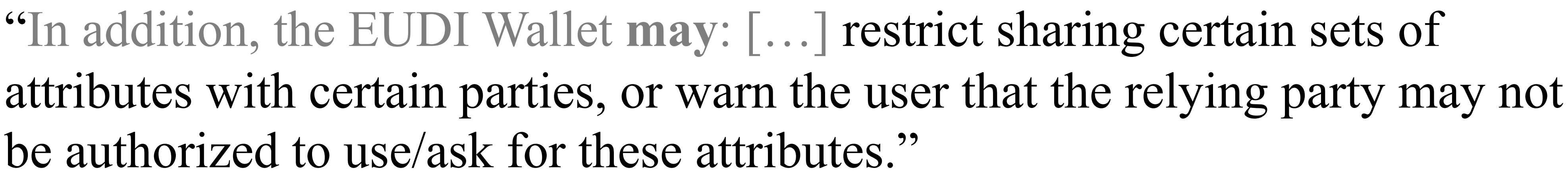
  → *Don't give a monkey a gun*

MEASURES AGAINST OVER-ASKING IN SSI

BACKGROUND

- Use cases:
  - BSN
  - DNA medication passport (LUMC)
  - Biometric attributes
  - Other use cases… (possibly economic interests from the issuer!)

- Meanwhile, the EU Digital Identity Architecture and Reference Framework (outline):



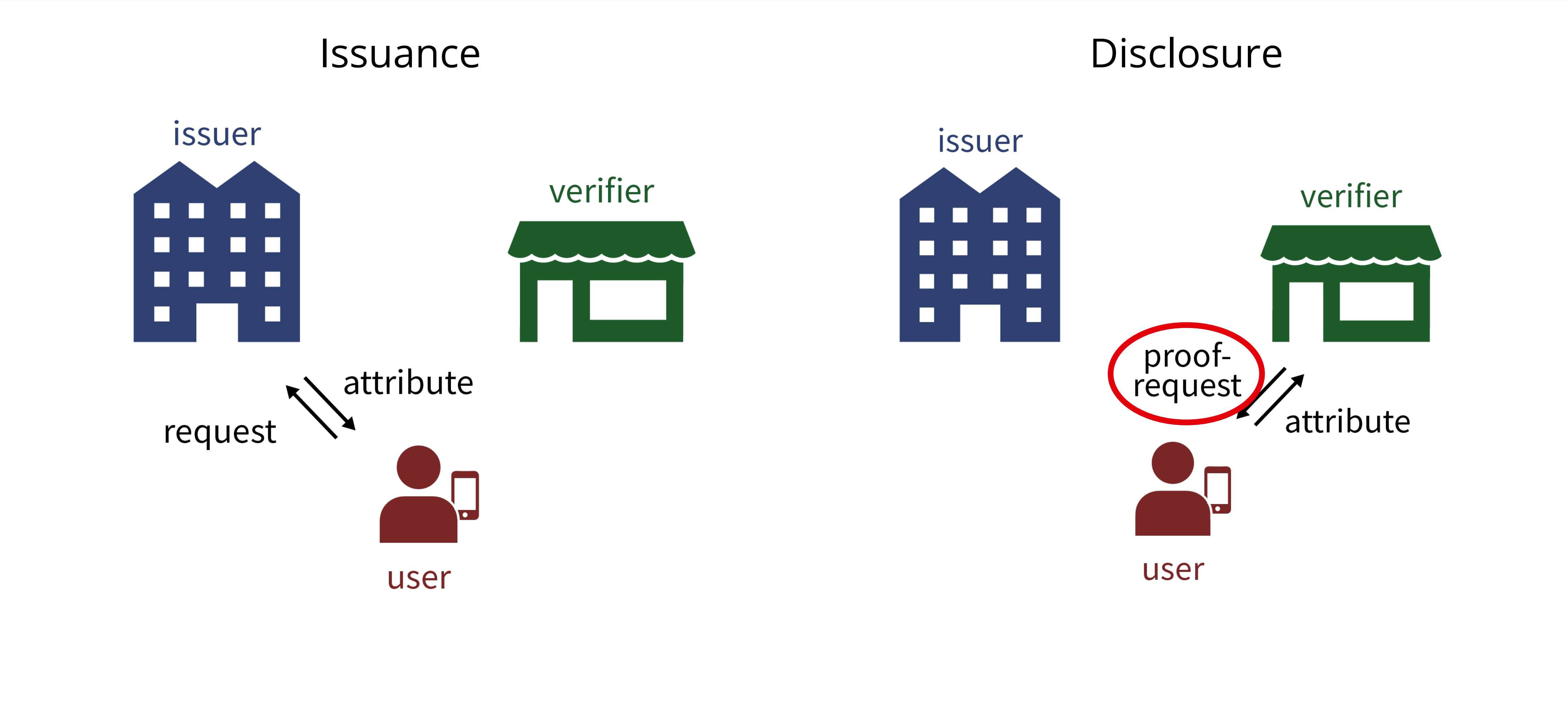
"In addition, the EUDI Wallet **may**: […] restrict sharing certain sets of attributes with certain parties, or warn the user that the relying party may not be authorized to use/ask for these attributes."

→ so, authorisation of relying parties will *be a thing…*

…while current SSI implementations ignore this

SOLUTIONS

MEASURES AGAINST OVER-ASKING IN SSI
RECALL: YIVI ECOSYSTEM (PREVIOUSLY IRMA)



CHALLENGES

Challenges for proof-requests:

1. Authentication
2. Authorisation

Goals for implementation:

- Technically feasible (easy to implement and maintain)
- Ease of use for verifiers (easy adoption)
- Maintaining SSI benefits (privacy, user autonomy)
- Minimal administrative workload, at the responsible parties

→ don’t introduce a dedicated PKI if it’s not necessary

MEASURES AGAINST OVER-ASKING IN SSI

SOLUTION 1: PROTECTED ATTRIBUTES

- Attributes that can only be requested by an authorised party
- Easy to implement

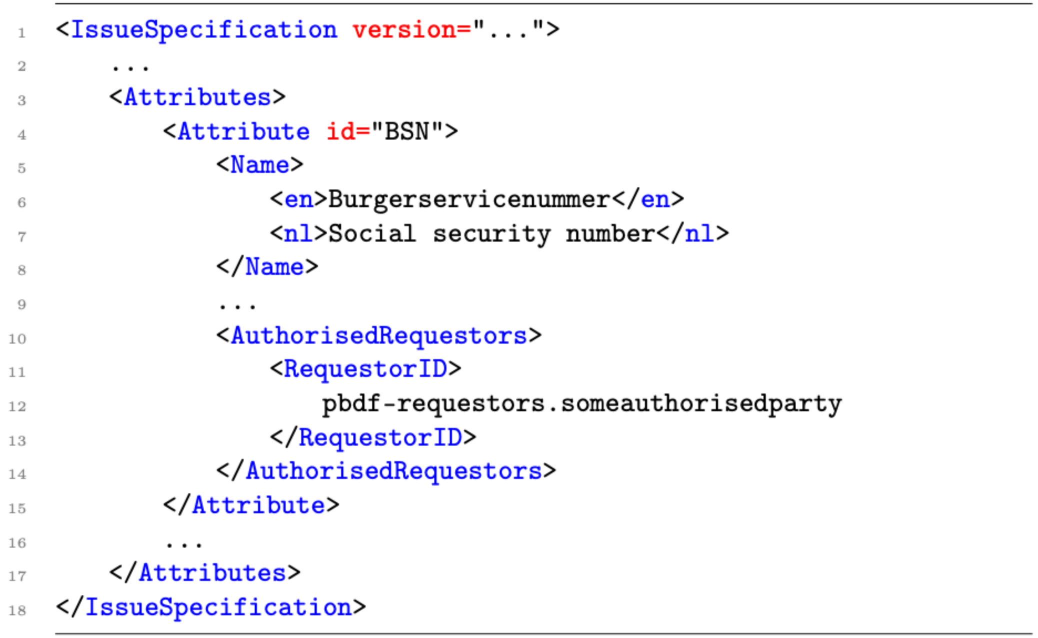
- Yivi: authentication based on TLS hostnames
  (like already existing *pretty verifiers*)
  - Scheme links hostnames to requestor ID
  - No (extra) key management, TLS already required!

- Authorisation:
  - Via *issuer*-scheme (list authorised requestor IDs)
  - Via authorisation server (similar to revocation server)

⇒ **For selected, (highly) sensitive attributes (issuer's responsibility)**

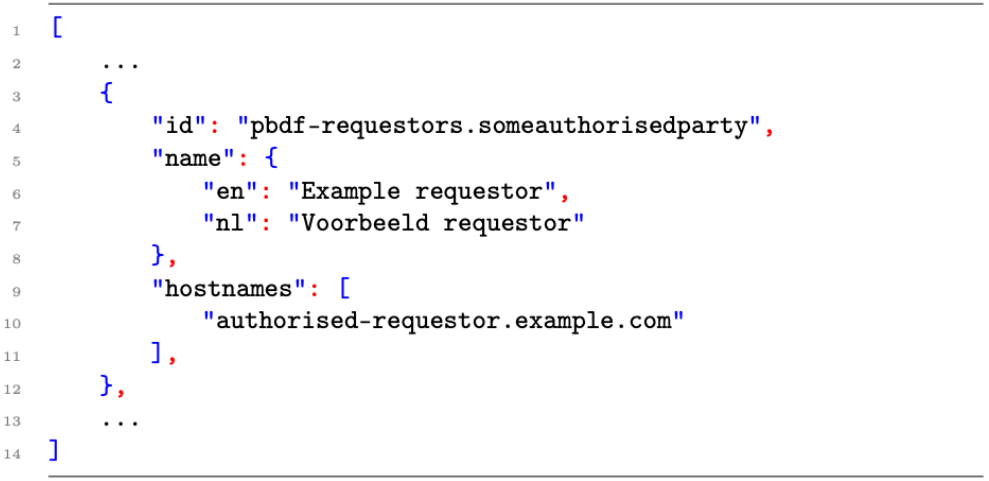
MEASURES AGAINST OVER-ASKING IN SSI

SOLUTION 1: PROTECTED ATTRIBUTES



```
<IssueSpecification version="...">
    ...
    <Attributes>
        <Attribute id="BSN">
            <Name>
                <en>Burgerservicenummer</en>
                <nl>Social security number</nl>
            </Name>
            ...
            <AuthorisedRequestors>
                <RequestorID>
                    pbdf-requestors.someauthorisedparty
                </RequestorID>
            </AuthorisedRequestors>
        </Attribute>
        ...
    </Attributes>
</IssueSpecification>
```

Issuer scheme



```
[
    ...
    {
        "id": "pbdf-requestors.someauthorisedparty",
        "name": {
            "en": "Example requestor",
            "nl": "Voorbeeld requestor"
        },
        "hostnames": [
            "authorised-requestor.example.com"
        ],
    },
    ...
]
```

Requestor scheme

MEASURES AGAINST OVER-ASKING IN SSI

SOLUTION 2: CERTIFIED DISCLOSURE REQUESTS

- Protected attributes are no general solution against over-asking
  - Consider a book-store asking for your email address
  - *Context* of a data request is essential!

  → Third-party judgement required, certifying disclosure requests

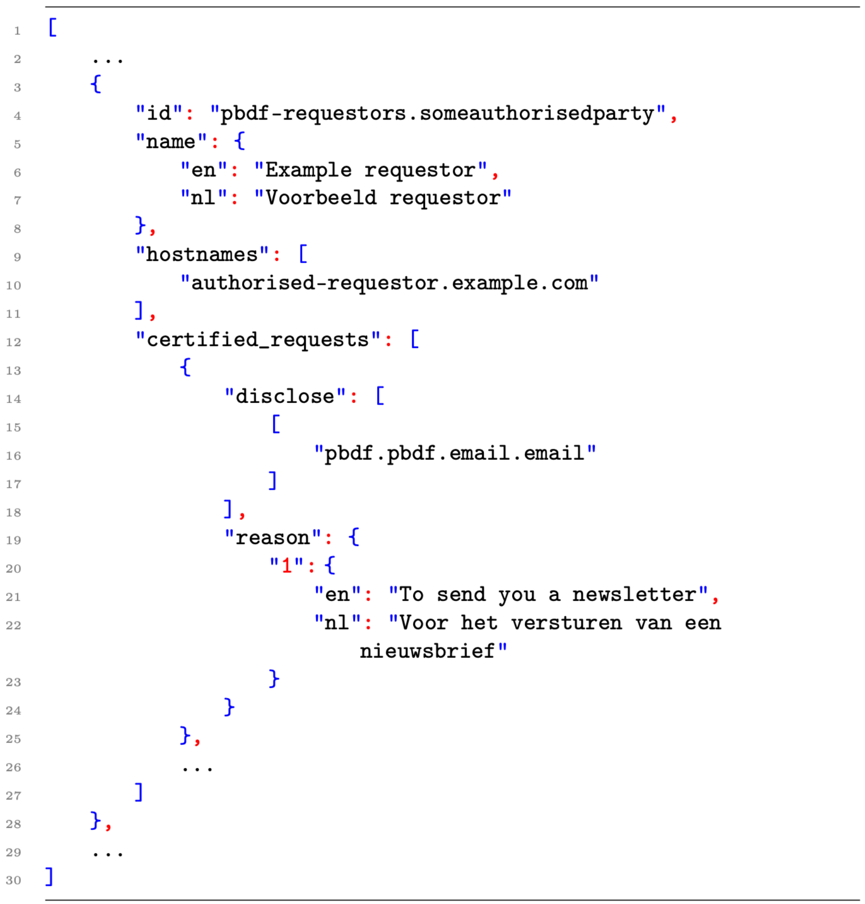
- General authority
  - Expensive & unrealistic on a global scale
- Open public self-registration (only authentication)
  - Democratic bodies and interest groups can perform audits
  - Transparency → self-regulatory incentive
- Hybrid approach!

⇒ No perfect technical solution, but a sufficient countermeasure in practice

MEASURES AGAINST OVER-ASKING IN SSI

SOLUTION 2: CERTIFIED DISCLOSURE REQUESTS

Requestor scheme



```
[
    ...
    {
        "id": "pbdf-requestors.someauthorisedparty",
        "name": {
            "en": "Example requestor",
            "nl": "Voorbeeld requestor"
        },
        "hostnames": [
            "authorised-requestor.example.com"
        ],
        "certified_requests": [
            {
                "disclose": [
                    [
                        "pbdf.pbdf.email.email"
                    ]
                ],
                "reason": {
                    "1": {
                        "en": "To send you a newsletter",
                        "nl": "Voor het versturen van een nieuwsbrief"
                    }
                }
            },
            ...
        ]
    },
    ...
]
```

MEASURES AGAINST OVER-ASKING IN SSI

CONCLUSION

- Protected attributes: *issuer's responsibility*
- Certified disclosure requests: *third-party responsibility*
- Hybrid implementations are possible, systems can co-exist!

- User experience design is important, too!

- TLS-based authentication and scheme-based authorisation is easiest for Yivi and verifiers
  - Scalability might be problematic long-term
  - Federated schemes + *Just-In-Time*-scheme retrieval can reduce this problem

Measures against over-asking in SSI

and the Yivi ecosystem

Master thesis presentation, 13 October 2023
Job Doesburg

Radboud Universiteit

ADDITIONAL SLIDES

MEASURES AGAINST OVER-ASKING IN SSI
USABILITY ASPECTS

- Wallet should display disclosure request context
  - Who receives the data?
  - Why do they need the data / for what reason are they authorised to receive this data?
- Permissive or strict wallets (warning or error)
  - Different kinds of warnings, should create awareness
  - Generally, permissive > strict
- Categorised credentials and verifiers
  - Sphere transgression will happen (and can be okay!), but users need to be made extra aware when it happens

MEASURES AGAINST OVER-ASKING IN SSI
FEDERATED SCHEME & JIT SCHEME-RETRIEVAL

- Including all verifiers in the central scheme is bad for scalability

- Wallet only needs to know (partial) verifier scheme upon communication with that verifier
  - Idem issuer/credential scheme

  → only send the partial scheme when it’s needed!

- Only send (signed!) partial schemes during disclosure/issuance session

- Scheme can be split up in hierarchical / federated schemes for governance