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Complexities of Identity Provenance Metadata

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Introduction and Motivation

- Identity management = management of identity data
- Where the data came from?

  Data protection, transparency, multi-affiliation, data portability, ...

- We need data about the data → metadata
- Whole new dimension of identity management

- MidPoint: open source identity management platform

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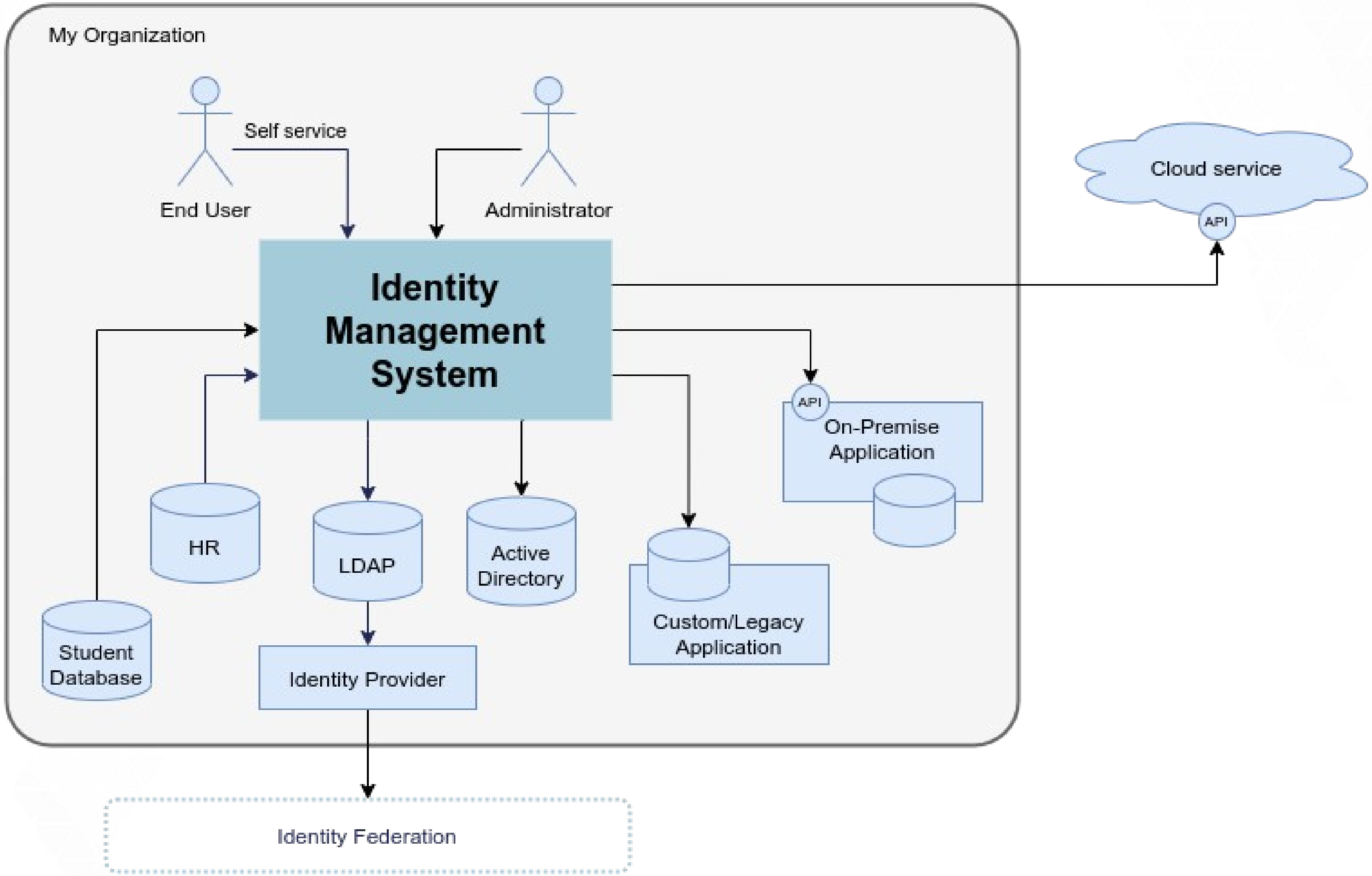
TRUST

This project has received funding from the European Unions Horizon 2020 research and innovation program under the NGI_TRUST grant agreement no 825618

Identity Management System



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Identity Data

```
givenName:  Radovan
familyName: Semančík
fullName:   Radovan Semančík
```

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Identity Metadata

```
givenName:  Radovan
  origin:  HR system
  created: 28th May 2021 9:16
familyName: Semančík
  origin:  HR system
  created: 28th May 2021 9:16
fullName:   Radovan Semančík
  origin:  HR system
  created: 28th May 2021 9:16
```

Identity Metadata: Complex Origin

givenName: Rado ← ~~Radovan~~

origin: user entry

familyName: Semančík

origin: HR system

fullName: Rado Semančík

origin: ???

Identity Metadata: Complex Origin

givenName: Rado ← ~~Radovan~~

origin: user entry

familyName: Semančík

origin: HR system

fullName: Rado Semančík

origin: user entry + HR system

Identity Metadata: Multiple Origins

givenName: Rado ← ~~Radovan~~

origin: user entry

familyName: Semančík

origin: HR system

fullName: Rado Semančík

origin: user entry + HR system

origin: The Institute

Identity federation

Complex Identity Metadata (JSON)

```
"fullName" : {
  "@value" : "Rado Semančík",
  "@metadata" : [
    {
      "provenance" : {
        "acquisition" : [
          {
            "timestamp" : "2020-06-22T10:52:03Z",
            "originRef" : {
              ... reference to "User entry" origin ...
            }
          },
          {
            "timestamp" : "2020-03-06T23:05:42Z",
            "originRef" : {
              ... reference to "HR" origin ...
            }
          }
```

Identity Metadata Complexities

- Yield (concept)
  - Single origin of the data: our system, other organization, mapping/transform, ...
  - Acts as a container for rich metadata
  - Multiple yields for each value
- This means complex data structures – in metadata
- Extensibility: no hope to standardize every metadata item
- Big problem: no support in existing data modeling languages
  - JSON Schema, XSD, SCIM, YANG – they deal with data, not metadata

Axiom Data Modeling Language

- New data modeling language

  I know, I know, re-inventing the wheel and all that. But not this time.

  We have been living with XSD for 10 years, extending and hacking. Enough is enough. No, JSON Schema is no better.

- Modeling data <u>structures</u>, not data <u>representation</u> (JSON/XML)
- Native support for “meta” concepts
- Prototype works well
- Further development is needed

`https://docs.evolveum.com/midpoint/devel/axiom/`

Axiom Example: Data (a.k.a. old boring stuff)

```
model common {
    …

    object User {
      ...
      property givenName {
        type string;
      }
      property familyName {
        type string;
      }
      property fullName {
        type string;
        minOccurs 1;
      }
      ...
    }
    …
}
```

```
{
    “givenName” : “Radovan”,
    “familyName” : “Semančík”,
    “fullName” : “Radovan Semančík”,
    …
}
```

```
<user>
    <givenName>Radovan</givenName>
    <familyName>Semančík</familyName>
    <fullName>Radovan Semančík<fullName>
    …
</user>
```

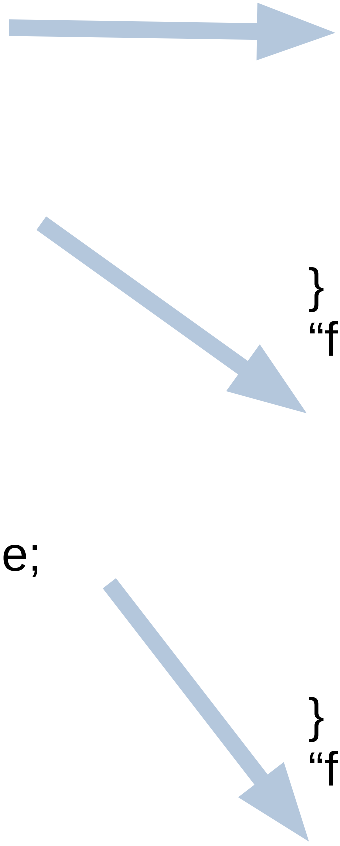
Notation is slightly simplified (namespace, prefixes)

Axiom Example: Metadata (a.k.a. new exciting stuff)

```
model common-metadata {
    …

    metadata CommonMetadata {
      …
      container provenance {
        type ProvenanceMetadata;
      }
      …
    }

    container ProvenanceMetadata {
      container acquisition {
        type ProvenanceAcquisitionType;
        maxOccurs "unbounded";
      }
    }
    …
}
```



```
{
    “givenName” : {
        “@value” : “Radovan”,
        “@metadata”: [
            {
                “acquisition” : { … }
            }
        ]
    }
    “familyName” : {
        “@value” : “Semančík”,
        “@metadata”: [
            {
                “acquisition” : { … }
            }
        ]
    }
    “fullName” : {
        “@value” : “Radovan Semančík”,
        “@metadata”: [ …
```

Notation is slightly simplified (namespace, prefixes)

MidPoint and MidPrivacy

- MidPoint: open source identity management platform

  Provisioning, identity connectors, RBAC, self service, delegated administration, organizational structure, auditing, access certification, ...

- MidPrivacy: privacy and data protection

  Long-term initiative to implement complete set of data protection features

- MidPrivacy Phase 1: Data provenance prototype

  IDM + Axiom + metadata + mappings + GUI

  NGI_TRUST funding

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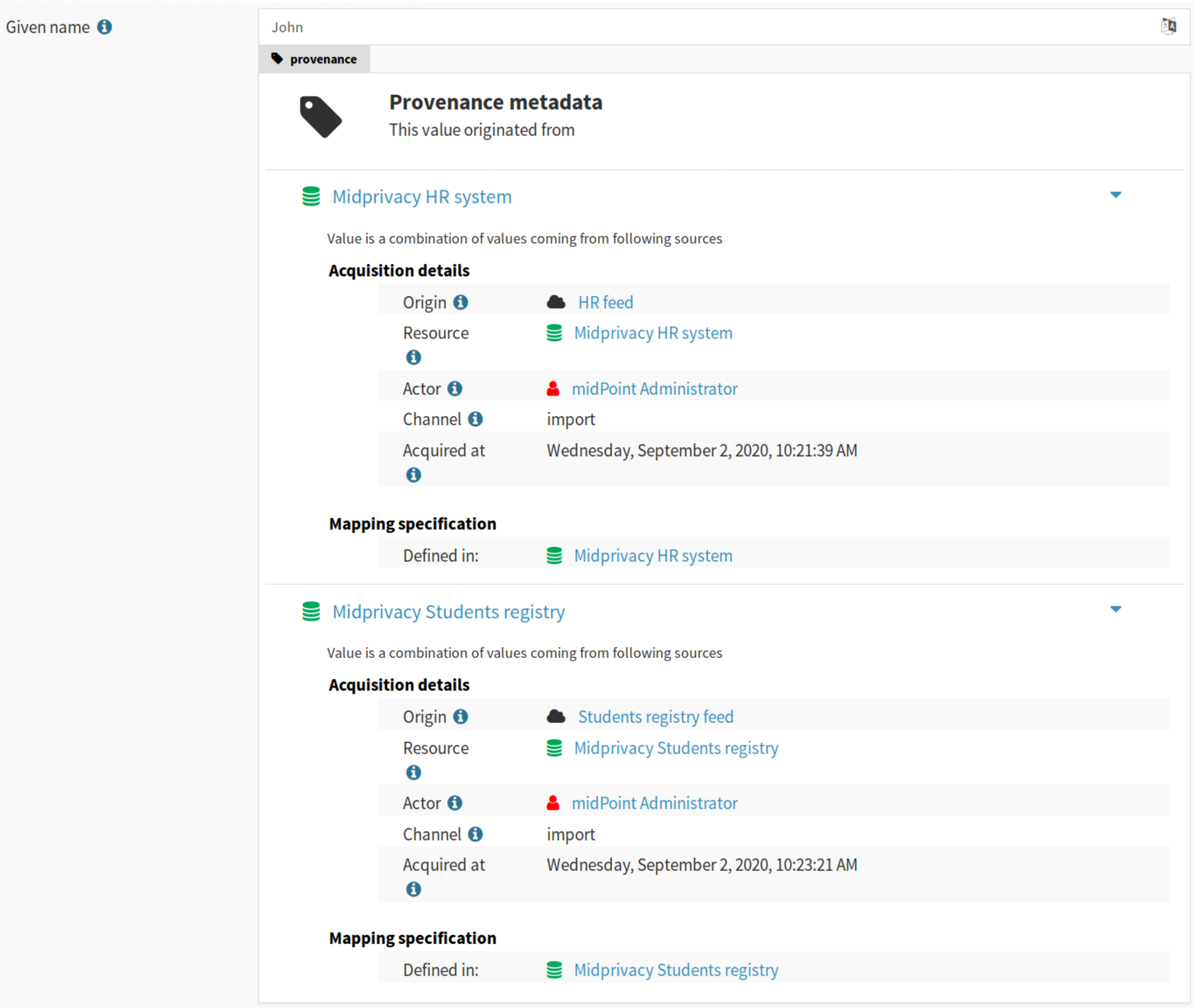
Complex Provenance Metadata GUI (Prototype)



Given name ℹ

John

provenance

Provenance metadata

This value originated from

Midprivacy HR system

Value is a combination of values coming from following sources

Acquisition details

Origin ℹ	HR feed
Resource ℹ	Midprivacy HR system
Actor ℹ	midPoint Administrator
Channel ℹ	import
Acquired at ℹ	Wednesday, September 2, 2020, 10:21:39 AM

Mapping specification

Defined in:	Midprivacy HR system

Midprivacy Students registry

Value is a combination of values coming from following sources

Acquisition details

Origin ℹ	Students registry feed
Resource ℹ	Midprivacy Students registry
Actor ℹ	midPoint Administrator
Channel ℹ	import
Acquired at ℹ	Wednesday, September 2, 2020, 10:23:21 AM

Mapping specification

Defined in:	Midprivacy Students registry

- 5th design iteration
- Still not very intuitive
- Suitable for identity administrators
- Obviously, GUI for common users will be a major challenge

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Provenance and Data Protection

- Legal basis for data processing
  - Specified by GDPR, requirement for personal data processing
  - Employment contract, business/service requirement, … and consent
- Tracking *bases for processing* is non-trivial
  - Overlaps: *student*, *employee* and *volunteer* at the same time
- Provenance is closely related to data protection (and portability)
  - However, *provenance* and *basis* are not the same
- Further research and development is needed

https://docs.evolveum.com/midpoint/projects/midprivacy/phases/01-data-provenance-prototype/provenance-origin-basis/

Conclusion

- Identity provenance metadata
  - Complex (meta)data structures
- Prototype: included in midPoint 4.2
- Still limited provenance information
  - Look from inside of organization (“next hop”), the best we can do now
- Axiom data modeling language
  - very promising, but needs further development
- Avenue to data protection features (basis for data processing)

Additional Resources

- MidPoint Project

  https://midpoint.evolveum.com/

- MidPrivacy Initiative

  https://docs.evolveum.com/midpoint/projects/midprivacy/

- Axiom Data Modeling Language

  https://docs.evolveum.com/midpoint/devel/axiom/

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