

Security & Privacy in eHealth (Concepts & XACML examples)

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Concepts and XACML examples

Privacy:

XACML and privacy policies

Example in eHealth

Example in Genomics

Security & Privacy in eHealth

- Digital medical information
 - Lab tests, radiology results, discharge reports, etc.
- Management of medical documents
 - **Security** (confidentiality, integrity, availability)
 - **Privacy** (data access and usage rules)

Security & Privacy in eHealth

- **How to provide security & privacy?**
 - Privacy policies
 - INVOLVES patients, health institutions, health professionals
 - Access rules based on roles and conditions

Example: Privacy in eHealth

- Privacy policies
 - Use of XACML standard
- High level of granularity
- Permitted actions, roles and resources/documents
 - **Actions**: Create, View, ...
 - **Roles**: Defined by different concepts: health professional specialty, function, ...
 - **Resources**: Lab test order, ...

eHealth example: Use of XACML

```
<PolicySet PolicySetId="Create:ProgressNote"...>
<Policy PolicyId="Permissions:Create:BloodTestOrder"...>
  <Rule RuleId=
    "Permission:to:create:a:blood:test:order" Effect="Permit">
    <Target> <Resources> <Resource>
      <ResourceMatch ...>
        <AttributeValue ...">
          urn:va:xacml:2.0:interop:rsa8:resource:hl7:BloodTestOrder
        </AttributeValue>
        ...
      </ResourceMatch>
        </Resource> </Resources>
    <Actions> <Action>
      <ActionMatch MatchId=
        "urn:oasis:names:tc:xacml:1.0:function:string-equal">
        <AttributeValue ...">
          urn:va:xacml:2.0:interop:rsa8:action:hl7:Create
        </AttributeValue>
        ...
      </ActionMatch>
    </Action> </Actions> </Target> </Rule>
  </Policy>
</PolicySet>
```

- Sample XACML policies:
 - Create order
 - Assign permissions

```
<PolicySet PolicySetId="PPD-001: Gynecologist" ...>
  <Target> <Subjects> <Subject>
    <SubjectMatch
      MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
        <AttributeValue ...">
          gynecologist
        </AttributeValue>
        ...
      </SubjectMatch>
    </Subject> </Subjects> </Target>
    <!-- Permissions associated with the gynecologist role -->
    <PolicySetIdReference>
      Create:BloodTestOrder
    </PolicySetIdReference>
  </PolicySet>
```

eHealth example: Use of XACML

```
<PolicySet PolicySetId="Create:ProgressNote" ...>
  <Policy PolicyId="Permissions:Create:BloodTestOrder" ...>
    <Rule RuleId=
      "Permission:to:create:a:blood:test:order" Effect="Permit">
      <Target> <Resources> <Resource>
        <ResourceMatch ...>
          <AttributeValue ...">
            urn:va:xacml:2.0:interop:rsa8:resource:hl7:BloodTestOrder
          </AttributeValue>
          ...
        </ResourceMatch>
        </Resource> </Resources>
      <Actions> <Action>
        <ActionMatch MatchId=
          "urn:oasis:names:tc:xacml:1.0:function:string-equal">
          <AttributeValue ...">
            urn:va:xacml:2.0:interop:rsa8:action:hl7:Create
          </AttributeValue>
          ...
        </ActionMatch>
      </Action> </Actions> </Target> </Rule>
    </Policy>
  </PolicySet>
```

- Sample XACML policies:
 - Create order
 - Assign permissions

```
<PolicySet PolicySetId="PPD-001: Gynecologist" ...>
  <Target> <Subjects> <Subject>
    <SubjectMatch
      MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
        <AttributeValue ...">
          gynecologist
        </AttributeValue>
        ...
      </SubjectMatch>
    </Subject> </Subjects> </Target>
    <!-- Permissions associated with the gynecologist role -->
    <PolicySetIdReference>
      Create:BloodTestOrder
    </PolicySetIdReference>
  </PolicySet>
```

eHealth – “Create order” example

- Creation of an order for a blood test

```
<PolicySet PolicySetId="Create:ProgressNote"...>
  <Policy PolicyId="Permissions:Create:BloodTestOrder"...>
    <Rule RuleId=
      "Permission:to:create:a:blood:test:order" Effect="Permit">
      <Target>    <Resources>    <Resource>
        <ResourceMatch ...>
          <AttributeValue ...">
            urn:va:xacml:2.0:interop:rsa8:resource:h17:BloodTestOrder
          </AttributeValue>
          ...
        </ResourceMatch>
          </Resource> </Resources>
        <Actions>    <Action>
          <ActionMatch MatchId=
            "urn:oasis:names:tc:xacml:1.0:function:string-equal">
            <AttributeValue ...>
              urn:va:xacml:2.0:interop:rsa8:action:h17:Create
            </AttributeValue>
            ...
          </ActionMatch>
        </Action>    </Actions>    </Target> </Rule>
      </Policy>
    </PolicySet>
```


eHealth example: Use of XACML

```
<PolicySet PolicySetId="Create:ProgressNote"...>
  <Policy PolicyId="Permissions:Create:BloodTestOrder"...>
    <Rule RuleId=
      "Permission:to:create:a:blood:test:order" Effect="Permit">
      <Target> <Resources> <Resource>
        <ResourceMatch ...>
          <AttributeValue ...">
            urn:va:xacml:2.0:interop:rsa8:resource:hl7:BloodTestOrder
          </AttributeValue>
          ...
        </ResourceMatch>
        </Resource> </Resources>
      <Actions> <Action>
        <ActionMatch MatchId=
          "urn:oasis:names:tc:xacml:1.0:function:string-equal">
          <AttributeValue ...">
            urn:va:xacml:2.0:interop:rsa8:action:hl7:Create
          </AttributeValue>
          ...
        </ActionMatch>
      </Action> </Actions> </Target> </Rule>
    </Policy>
  </PolicySet>
```

- Sample XACML policies:
 - Create order
 - Assign permissions

```
<PolicySet PolicySetId="PPD-001: Gynecologist" ...>
  <Target> <Subjects> <Subject>
    <SubjectMatch
      MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
        <AttributeValue ...">
          gynecologist
        </AttributeValue>
        ...
      </SubjectMatch>
    </Subject> </Subjects> </Target>
    <!-- Permissions associated with the gynecologist role -->
    <PolicySetIdReference>
      Create:BloodTestOrder
    </PolicySetIdReference>
  </PolicySet>
```

eHealth – “Assign permissions”

- Assign permissions to gynecologist

```
<PolicySet PolicySetId="PPD-001: Gynecologist" ...>
  <Target> <Subjects> <Subject>
    <SubjectMatch
      MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
        <AttributeValue ...>
          gynecologist
        </AttributeValue>
      ...
    </SubjectMatch>
  </Subject> </Subjects> </Target>
  <!-- Permissions associated with the gynecologist role -->
  <PolicySetIdReference>
    Create:BloodTestOrder
  </PolicySetIdReference>
</PolicySet>
```

Example of XACML 3.0 policy

```
<Rule RuleId="urn:oasis:names:tc:xacml:3.0:RuleSAM" Effect="Permit">
  <Description> A physician may view a document about his/her patient
</Description>
  <Target>
    <AnyOf> <AllOf>
      <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
        <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
          Physician
        </AttributeValue>
        <AttributeDesignator MustBePresent="false"
          Category="urn:oasis:names:tc:xacml:3.0:role" AttributeId="role"
          DataType="http://www.w3.org/2001/XMLSchema#string"/>
      </Match>
      <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:regexp-string-match">
        <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
          my-patient-document.pdf
        </AttributeValue>
        <AttributeDesignator MustBePresent="false"
          Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"
          AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id"
          DataType="http://www.w3.org/2001/XMLSchema#string"/>
      </Match>
      <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
        <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
          View
        </AttributeValue>
        <AttributeDesignator MustBePresent="false"
          Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action"
          AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id"
          DataType="http://www.w3.org/2001/XMLSchema#string"/>
      </Match>
    </AllOf> </AnyOf>
  </Target>
</Rule>
```

Example of XACML 3.0 policy

<Rule RuleId="urn:oasis:names:tc:xacml:3.0:RuleSAM" Effect="Permit"> Rule effect

```
<Description> A physician may view a document about his/her patient
</Description>
<Target>
  <AnyOf> <AllOf>
    <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
      <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
        Physician
      </AttributeValue>
      <AttributeDesignator MustBePresent="false"
        Category="urn:oasis:names:tc:xacml:3.0:role" AttributeId="role"
        DataType="http://www.w3.org/2001/XMLSchema#string"/>
    </Match>
    <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:regexp-string-match">
      <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
        my-patient-document.pdf
      </AttributeValue>
      <AttributeDesignator MustBePresent="false"
        Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"
        AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id"
        DataType="http://www.w3.org/2001/XMLSchema#string"/>
    </Match>
    <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
      <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
        View
      </AttributeValue>
      <AttributeDesignator MustBePresent="false"
        Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action"
        AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id"
        DataType="http://www.w3.org/2001/XMLSchema#string"/>
    </Match>
  </AllOf> </AnyOf>
</Target>
</Rule>
```

Example of XACML 3.0 policy

```
<Rule RuleId="urn:oasis:names:tc:xacml:3.0:RuleSAM" Effect="Permit">
```

Rule effect

```
<Description> A physician may view a document about his/her patient
```

```
</Description>
<Target>
  <AnyOf> <AllOf>
```

Authorized role: Physician

```
    <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
      <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
        Physician
      </AttributeValue>
      <AttributeDesignator MustBePresent="false"
        Category="urn:oasis:names:tc:xacml:3.0:role" AttributeId="role"
        DataType="http://www.w3.org/2001/XMLSchema#string"/>
    </Match>
```

```
    <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:regex-string-match">
      <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
        my-patient-document.pdf
      </AttributeValue>
      <AttributeDesignator MustBePresent="false"
        Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"
        AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id"
        DataType="http://www.w3.org/2001/XMLSchema#string"/>
    </Match>
```

```
    <Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
      <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
        View
      </AttributeValue>
      <AttributeDesignator MustBePresent="false"
        Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action"
        AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id"
        DataType="http://www.w3.org/2001/XMLSchema#string"/>
    </Match>
```

```
  </AllOf> </AnyOf>
</Target>
</Rule>
```

Example of XACML 3.0 policy

<Rule RuleId="urn:oasis:names:tc:xacml:3.0:RuleSAM" Effect="Permit"> Rule effect

<Description> A physician may view a document about his/her patient

</Description>

<Target>

<AnyOf> <AllOf>

Authorized role: Physician

```
<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
  <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
    Physician
  </AttributeValue>
  <AttributeDesignator MustBePresent="false"
    Category="urn:oasis:names:tc:xacml:3.0:role" AttributeId="role"
    DataType="http://www.w3.org/2001/XMLSchema#string"/>
</Match>
```

Resource

```
<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:regex-string-match">
  <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
    my-patient-document.pdf
  </AttributeValue>
  <AttributeDesignator MustBePresent="false"
    Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"
    AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id"
    DataType="http://www.w3.org/2001/XMLSchema#string"/>
</Match>
```

</Match>

```
<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
```

```
  <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
```

```
    View
```

```
  </AttributeValue>
```

```
  <AttributeDesignator MustBePresent="false"
```

```
    Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action"
```

```
    AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id"
```

```
    DataType="http://www.w3.org/2001/XMLSchema#string"/>
```

```
</Match>
```

```
</AllOf> </AnyOf>
```

```
</Target>
```

```
</Rule>
```

Example of XACML 3.0 policy

`<Rule RuleId="urn:oasis:names:tc:xacml:3.0:RuleSAM" Effect="Permit">` Rule effect

`<Description> A physician may view a document about his/her patient`

`</Description>`

`<Target>`

`<AnyOf> <AllOf>`

Authorized role: Physician

```
<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
  <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
    Physician
  </AttributeValue>
  <AttributeDesignator MustBePresent="false"
    Category="urn:oasis:names:tc:xacml:3.0:role" AttributeId="role"
    DataType="http://www.w3.org/2001/XMLSchema#string"/>
</Match>
```

Resource

```
<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:regex-string-match">
  <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
    my-patient-document.pdf
  </AttributeValue>
  <AttributeDesignator MustBePresent="false"
    Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"
    AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id"
    DataType="http://www.w3.org/2001/XMLSchema#string"/>
</Match>
```

```
<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">
  <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">
    View
  </AttributeValue>
  <AttributeDesignator MustBePresent="false"
    Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action"
    AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id"
    DataType="http://www.w3.org/2001/XMLSchema#string"/>
</Match>
```

`</AllOf> </AnyOf>`

`</Target>`

`</Rule>`

Authorized
action: View

Concepts and XACML examples

Privacy for Internet applications:

XACML and privacy policies

Example in eHealth

Example in Genomics

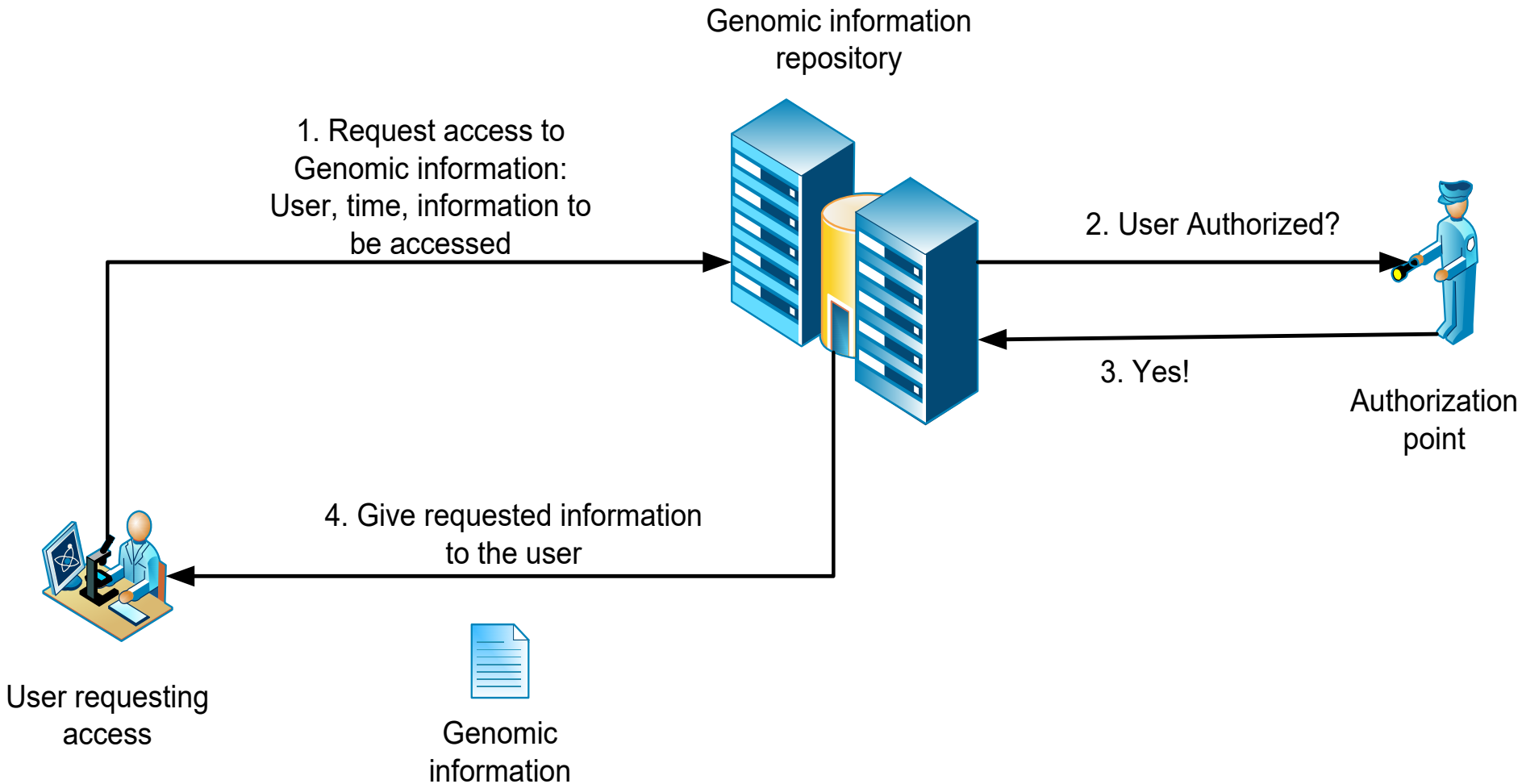
Security & Privacy in Genomics

- Use of **privacy policies** to express *which specific parts of the content, for which purposes and under which conditions*, could be accessed.
- Encryption to protect content from unauthorized access. Protection of content parts in a flexible way.
- The more granularity to which **blocks of the genome** we encrypt, the better privacy protection we achieve.

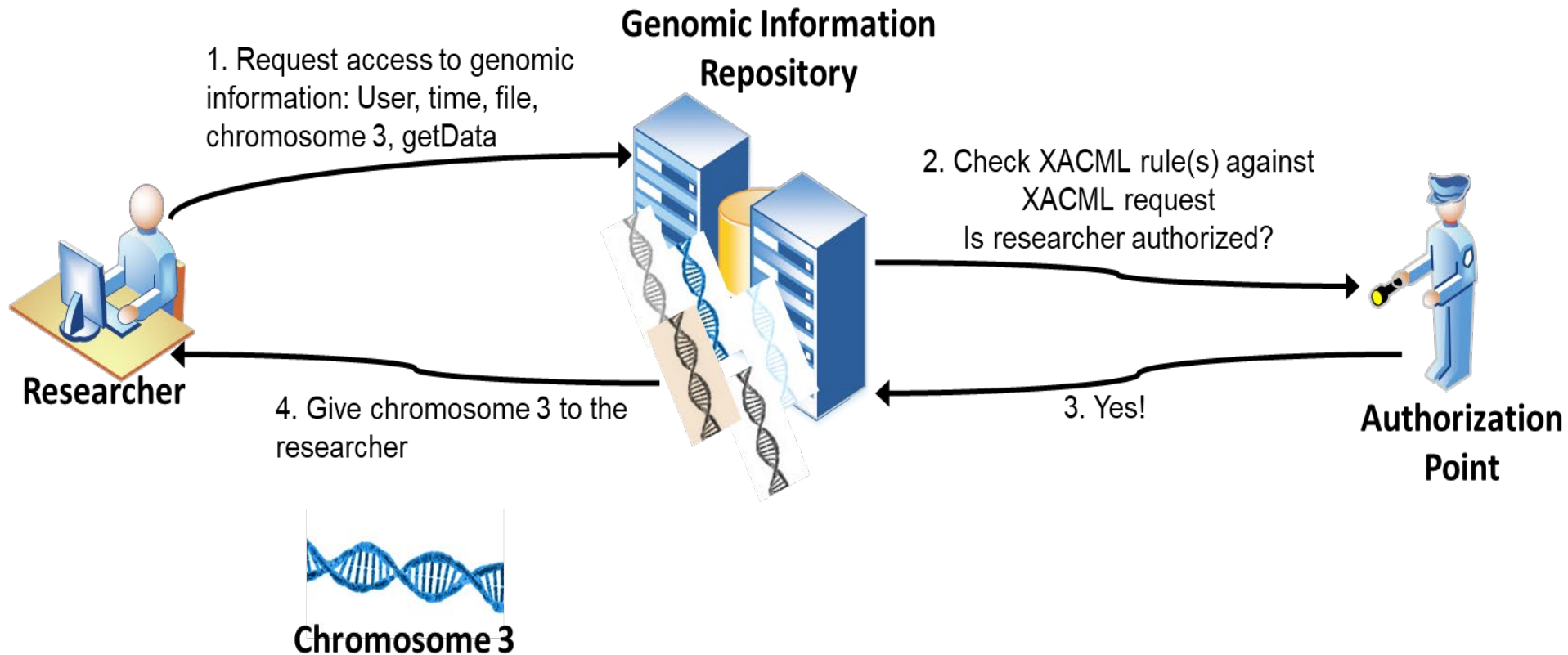
Privacy approach - Rules

- Rules may include:
 - **Who** is able to access (user roles or individuals)
 - **What** information can be accessed (the complete file, a chromosome, etc.)
 - **When** it can be accessed
 - With which **purpose** (genetic analysis, anonymized study, etc.)
 - If the data provider has to be **informed** when information is accessed
 - Which **action** is allowed to execute
(viewFile, viewChromosome, etc.)

Access Control for Genomic information



Access Control workflow



Basic example of Genomic XACML Rule

<Rule RuleId="urn:oasis:names:tc:xacml:3.0:ejemplo:RuleMPEGG" Effect="Permit">

<Description> A researcher has permission to view chromosome 3 </Description>

<Target>

<AnyOf>

<AllOf>

<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">

<AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">researcher</AttributeValue>

<AttributeDesignator MustBePresent="false" Category="urn:oasis:names:tc:xacml:3.0:role" AttributeId="role" DataType="http://www.w3.org/2001/XMLSchema#string"/>

</Match>

Role

<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:regexp-string-match">

<AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">

file.mgg#chromosome3</AttributeValue>

<AttributeDesignator MustBePresent="false"

Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"

AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id"

DataType="http://www.w3.org/2001/XMLSchema#string"/>

</Match>

Resource

<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">

<AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">getData</AttributeValue>

<AttributeDesignator MustBePresent="false"

Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action"

AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id"

DataType="http://www.w3.org/2001/XMLSchema#string"/>

</Match>

Action

</AllOf>

</AnyOf>

</Target>

</Rule>

Basic example of Genomic XACML Rule

<Rule RuleId="urn:oasis:names:tc:xacml:3.0:ejemplo:RuleMPEGG" Effect="Permit">

<Description> A researcher has permission to view chromosome 3 </Description>

<Target>

<AnyOf>

<AllOf>

<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">

<AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">researcher</AttributeValue>

<AttributeDesignator MustBePresent="false" Category="urn:oasis:names:tc:xacml:3.0:role" AttributeId="role" DataType="http://www.w3.org/2001/XMLSchema#string"/>

</Match>

Role

<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:regexp-string-match">

<AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">

file.mgg#chromosome3</AttributeValue>

<AttributeDesignator MustBePresent="false"

Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource"

AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id"

DataType="http://www.w3.org/2001/XMLSchema#string"/>

</Match>

Resource

<Match MatchId="urn:oasis:names:tc:xacml:1.0:function:string-equal">

<AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">getData</AttributeValue>

<AttributeDesignator MustBePresent="false"

Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action"

AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id"

DataType="http://www.w3.org/2001/XMLSchema#string"/>

</Match>

Action

</AllOf>

</AnyOf>

</Target>

</Rule>

Concepts in the example XACML Rule

- Role
 - Who can access the genomic information:
A researcher
- Resource
 - Which information is requested:
Chromosome 3 inside **file.mgg**
- Action
 - Which action can be done over the resource by the user with the corresponding role:
getData

How to authorize: XACML Request

<Request ...>

```
<Attributes Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-subject">  
  <Attribute AttributeId="urn:oasis:names:tc:xacml:3.0:example:attribute:role" IncludeInResult="true">  
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">lab_technician</AttributeValue>  
  </Attribute>  
</Attributes>
```

```
<Attributes Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action">  
  <Attribute AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id" IncludeInResult="true">  
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">getDataDataset</AttributeValue>  
  </Attribute>  
</Attributes>
```

```
<Attributes Category="urn:oasis:names:tc:xacml:3.0:date">  
  <Attribute AttributeId="accessDate" IncludeInResult="true">  
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#date">2019-10-10</AttributeValue>  
  </Attribute>  
</Attributes>
```

</Request>

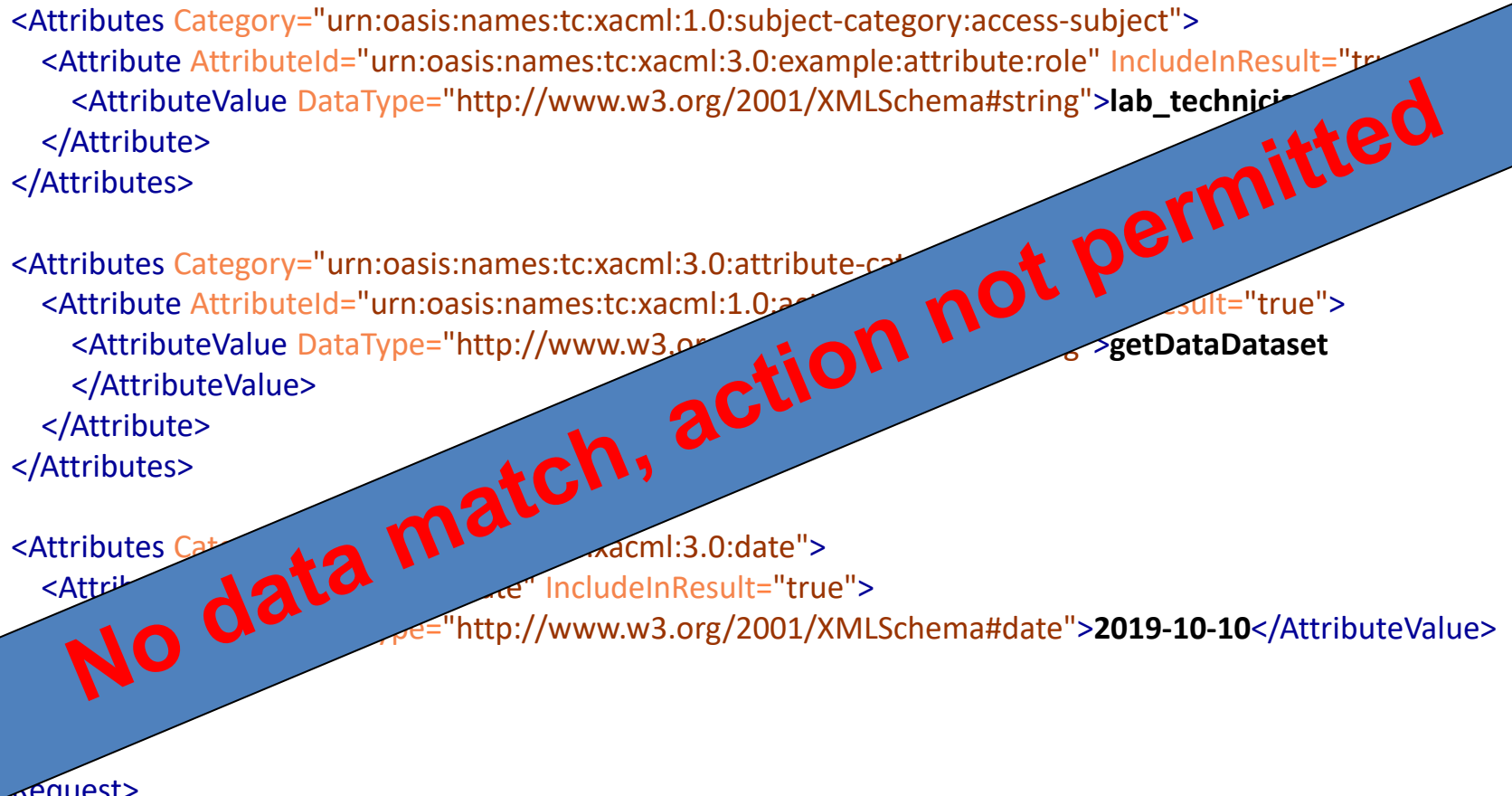
How to authorize: XACML Request

<Request ...>

```
<Attributes Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-subject">
  <Attribute AttributeId="urn:oasis:names:tc:xacml:3.0:example:attribute:role" IncludeInResult="true">
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">lab_technician</AttributeValue>
  </Attribute>
</Attributes>

<Attributes Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action">
  <Attribute AttributeId="urn:oasis:names:tc:xacml:1.0:action:perform" IncludeInResult="true">
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">getDataDataset</AttributeValue>
  </Attribute>
</Attributes>

<Attributes Category="urn:oasis:names:tc:xacml:3.0:date">
  <Attribute AttributeId="urn:oasis:names:tc:xacml:1.0:date" IncludeInResult="true">
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#date">2019-10-10</AttributeValue>
  </Attribute>
</Attributes>
</Request>
```



No data match, action not permitted

How to authorize: XACML Request

<Request ...>

```
<Attributes Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-subject">  
  <Attribute AttributeId="urn:oasis:names:tc:xacml:3.0:example:attribute:role" IncludeInResult="true">  
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">researcher</AttributeValue>  
  </Attribute>  
</Attributes>
```

```
<Attributes Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action">  
  <Attribute AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id" IncludeInResult="true">  
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">getData</AttributeValue>  
  </Attribute>  
</Attributes>
```

```
<Attributes Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource">  
  <Attribute AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id" IncludeInResult="true">  
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">file.mgg#chromosome3  
  </AttributeValue>  
</Attribute>  
</Attributes>
```

</Request>

How to authorize: XACML Request

<Request ...>

```
<Attributes Category="urn:oasis:names:tc:xacml:1.0:subject-category:access-subject">
  <Attribute AttributeId="urn:oasis:names:tc:xacml:3.0:example:attribute:role" IncludeInResult="true">
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">researcher</AttributeValue>
  </Attribute>
</Attributes>

<Attributes Category="urn:oasis:names:tc:xacml:3.0:attribute-category:action">
  <Attribute AttributeId="urn:oasis:names:tc:xacml:1.0:action:action-id" IncludeInResult="true">
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">getData</AttributeValue>
  </Attribute>
</Attributes>

<Attributes Category="urn:oasis:names:tc:xacml:3.0:attribute-category:resource">
  <Attribute AttributeId="urn:oasis:names:tc:xacml:1.0:resource:resource-id" IncludeInResult="true">
    <AttributeValue DataType="http://www.w3.org/2001/XMLSchema#string">file.mgg#chromosome3</AttributeValue>
  </Attribute>
</Attributes>
```

Data match, action allowed

</request>