



Asynchronous Resources - ActiveMQ

| Agenda



- What
- When
- How
- A practical example
- Discussion

| What

What are Asynchronous Resources?

Synchronous vs. Asynchronous Communication

Synchronous

- A party sends a message and **waits for reply**.
- **Only then** it continues with its business.



Asynchronous

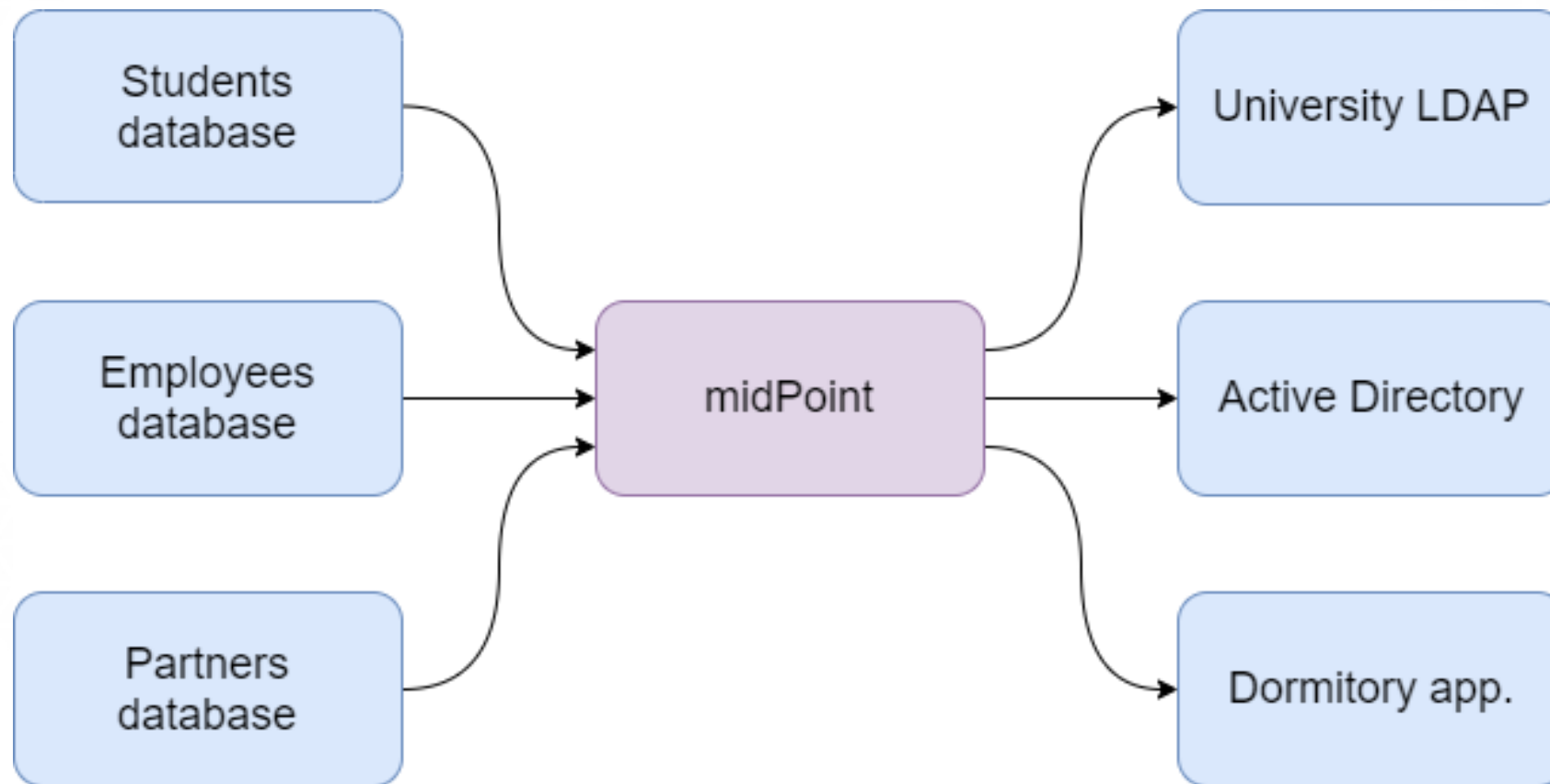
- A party sends a message and **does not wait for reply**. (Or does not expect reply at all.)
- It continues with its business **immediately**.



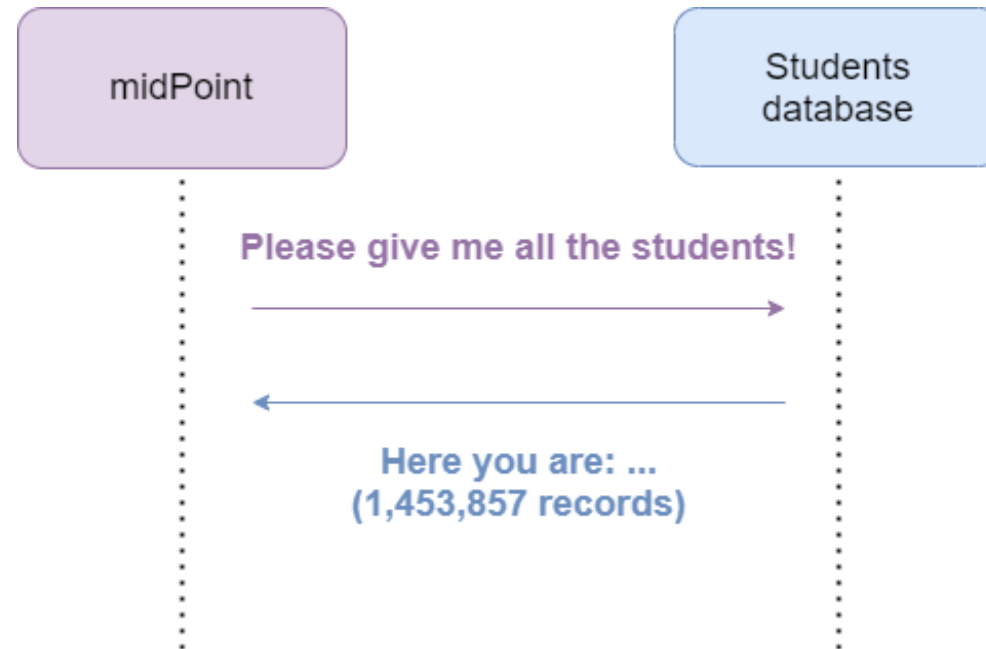
Synchronous vs. Asynchronous Communication in MidPoint

| | Synchronous Communication | Asynchronous Communication |
|--------------|---|----------------------------|
| From Sources | Reconciliation Live Synchronization | Asynchronous Update |
| To Targets | Standard Provisioning (Reconciliation) | Asynchronous Provisioning |

Sample Scenario

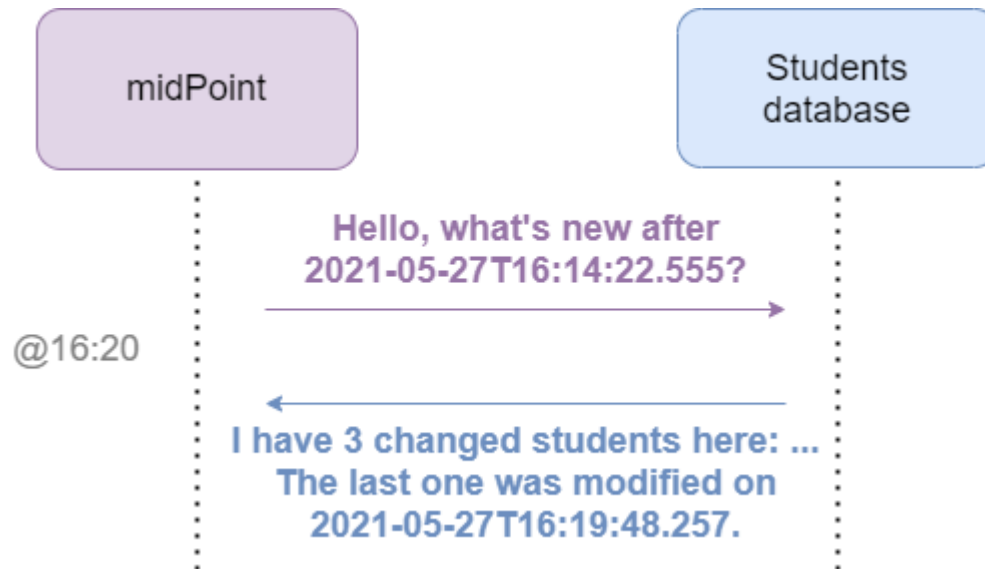


Source Side: Reconciliation

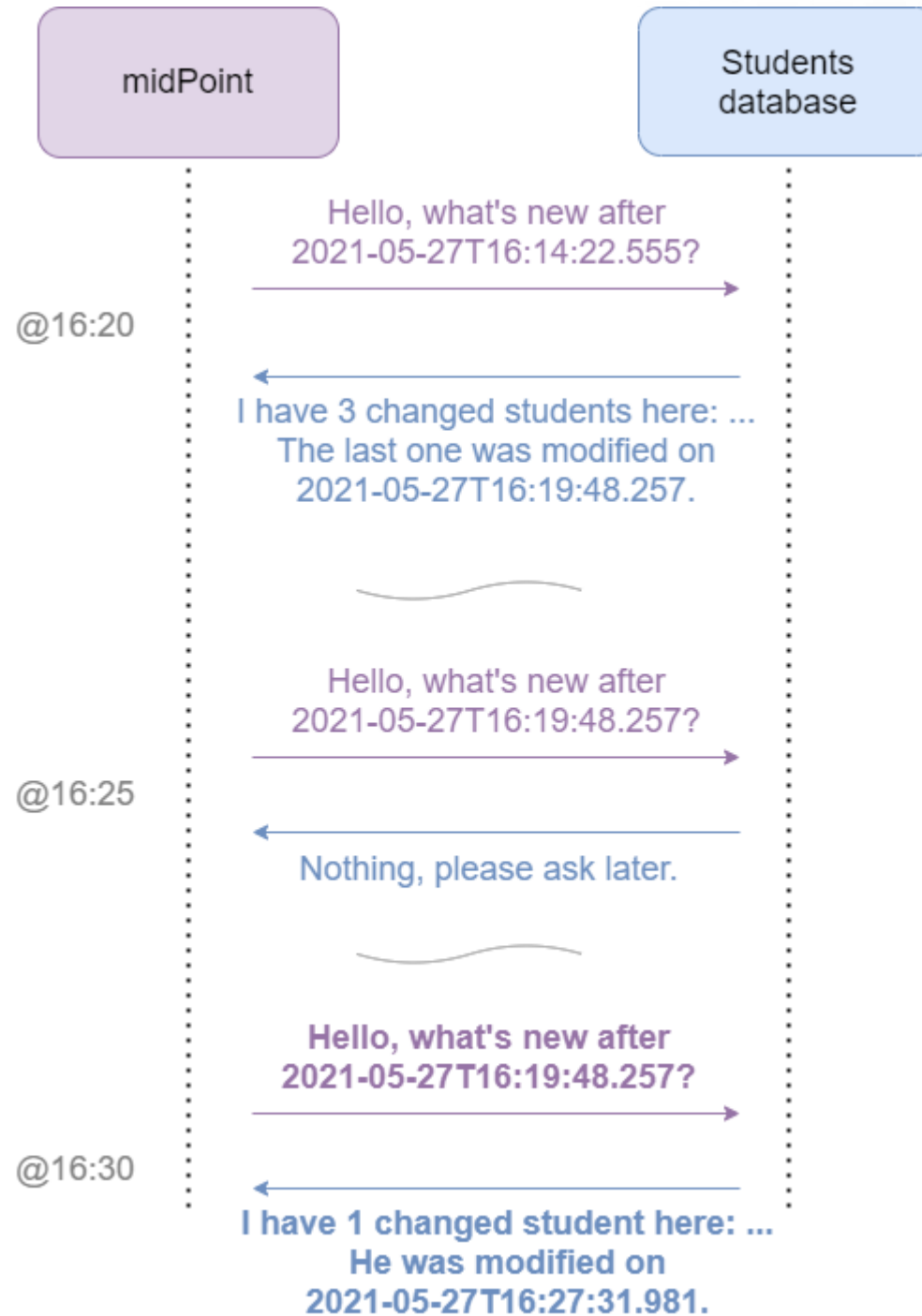


Note: slightly simplified

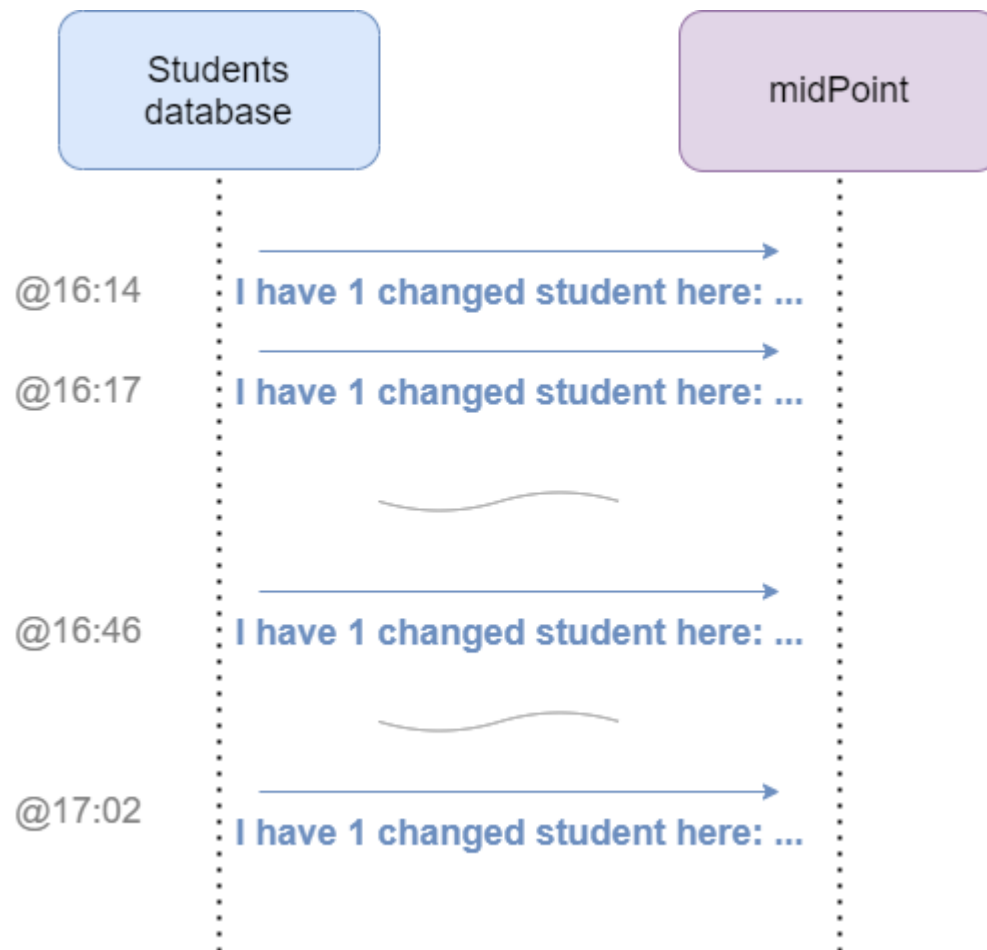
Source Side: Live Sync



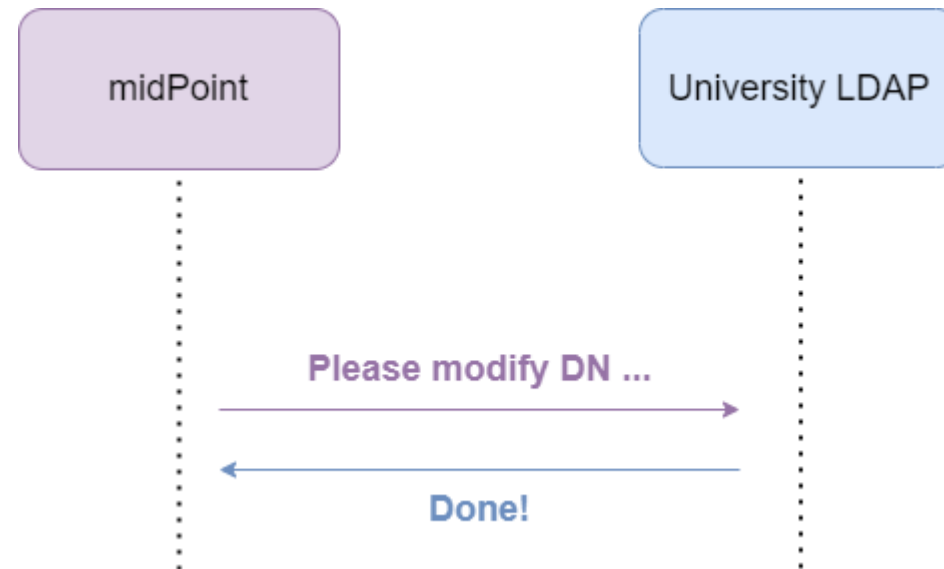
Live Sync



Source Side: Asynchronous Updates

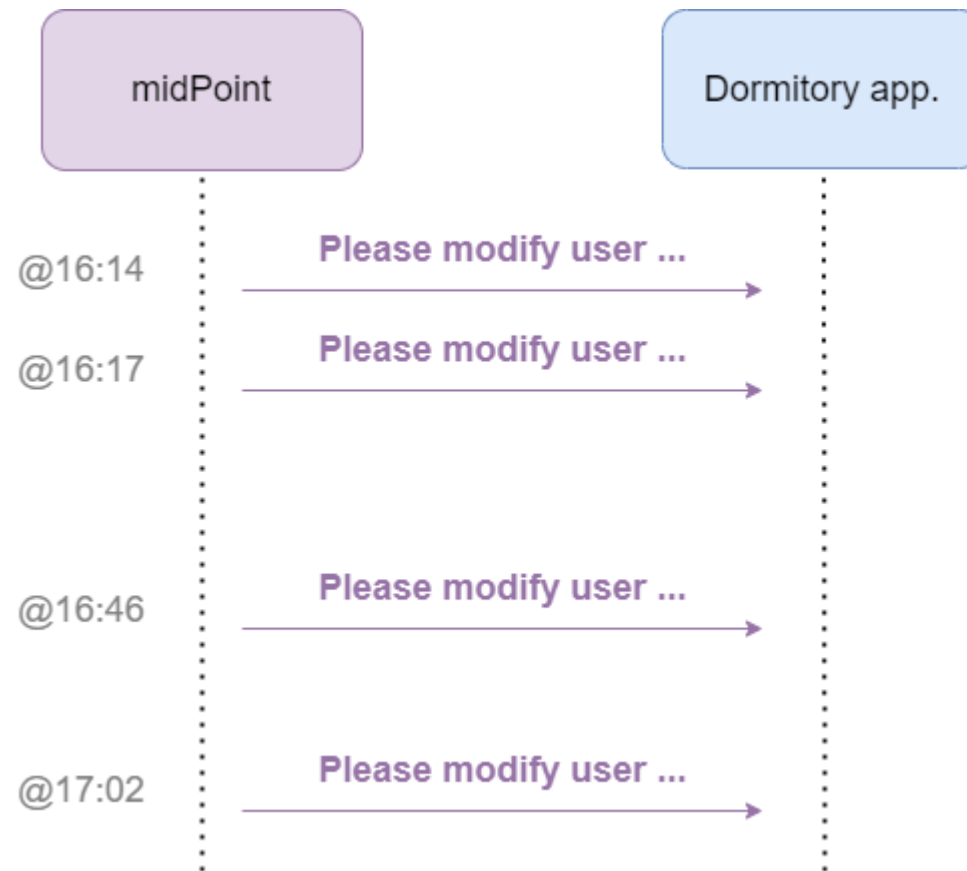


| Target Side: Standard Provisioning



The synchronous nature of communication enables immediate reaction to unexpected situations.

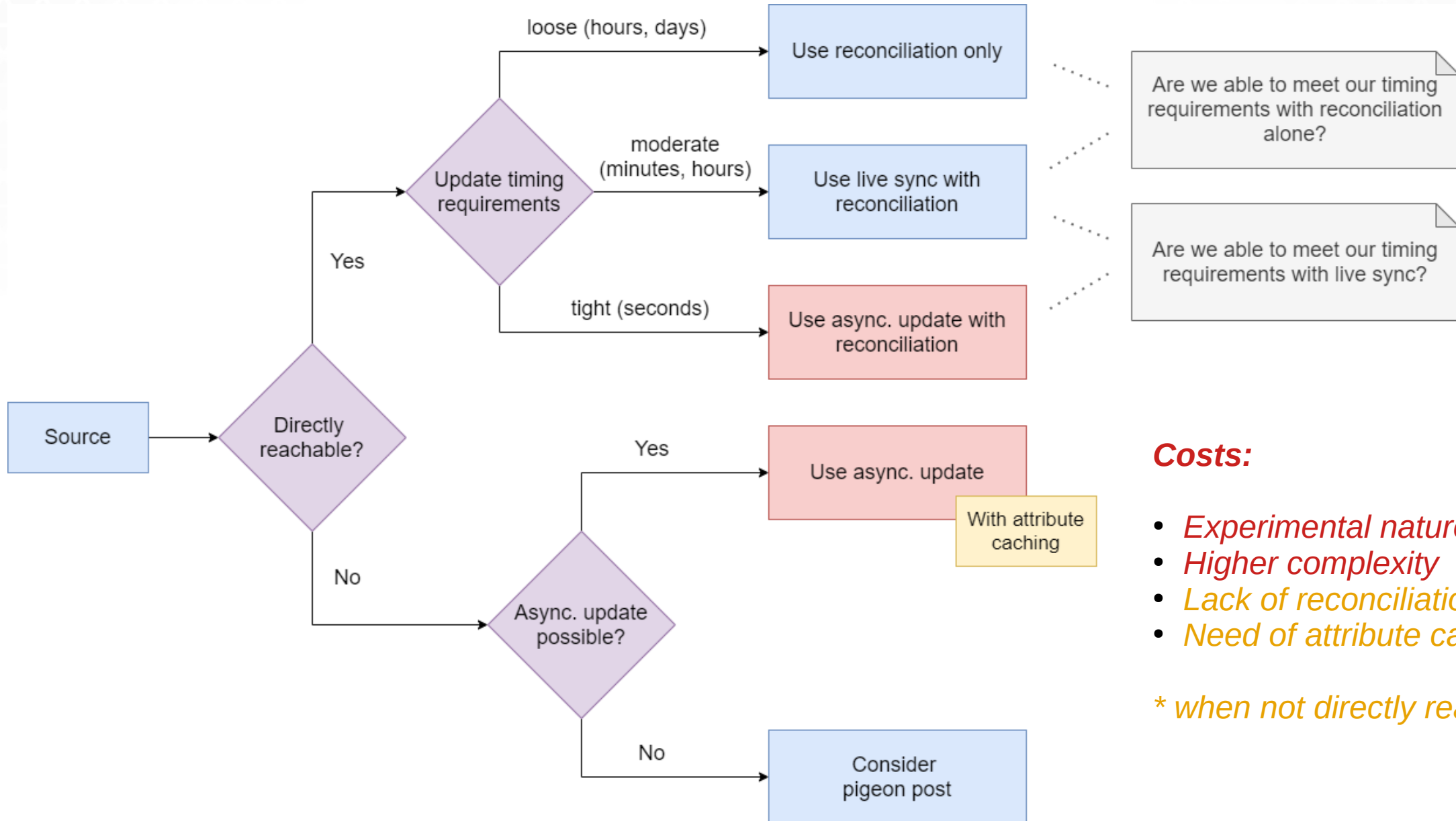
Target Side: Asynchronous Provisioning



| When

When To Use Asynchronous Resources?

Deciding at the Source Side

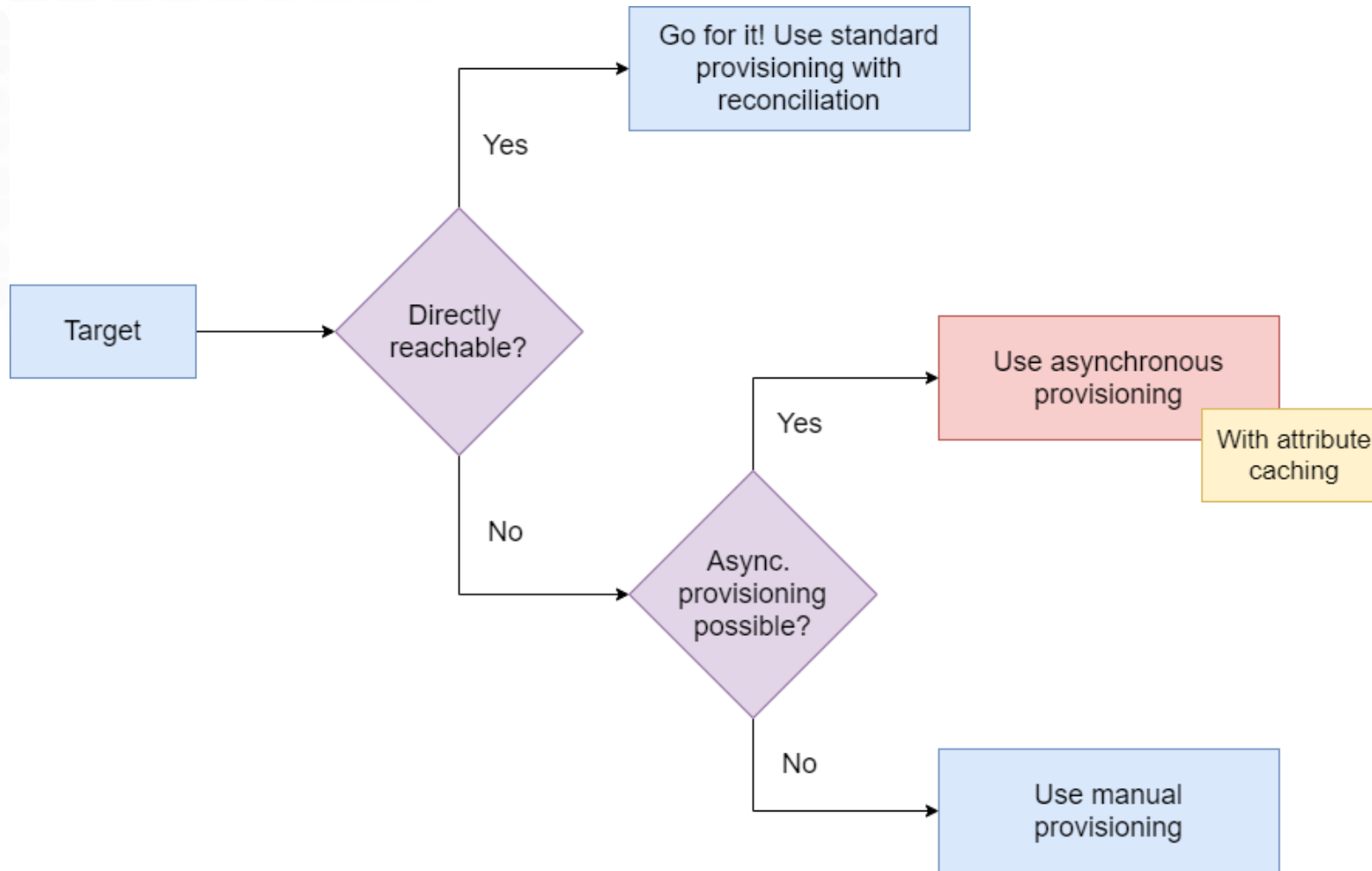


Costs:

- *Experimental nature*
- *Higher complexity*
- *Lack of reconciliation**
- *Need of attribute caching**

** when not directly reachable*

Deciding at the Target Side



Costs:

- *Cannot immediately react to exceptional situations*
- *Experimental nature*
- *Higher complexity*
- *Need of attribute caching**
- *Lack of reconciliation**

** currently*

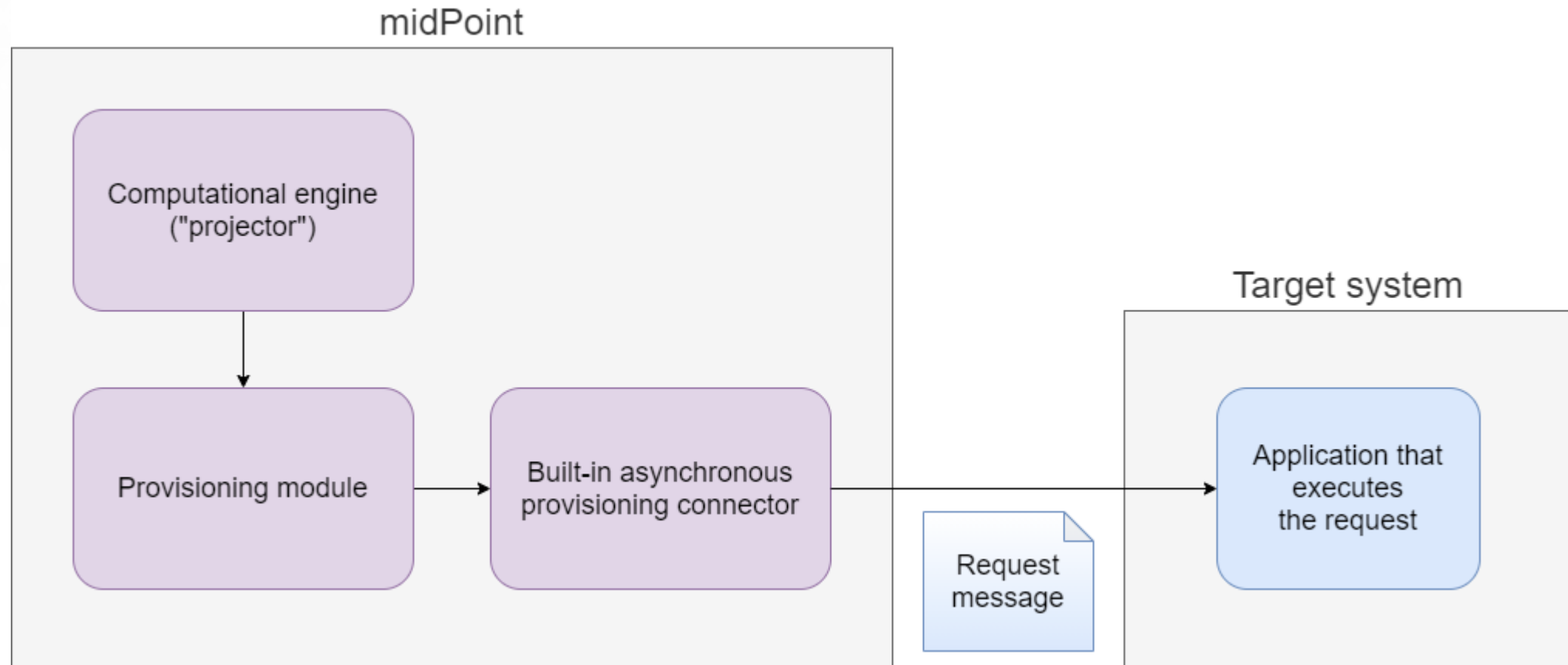
Note: A special case could be a resource with very slow responses. Here the asynchronous provisioning could make sense as well (in the future).

| How

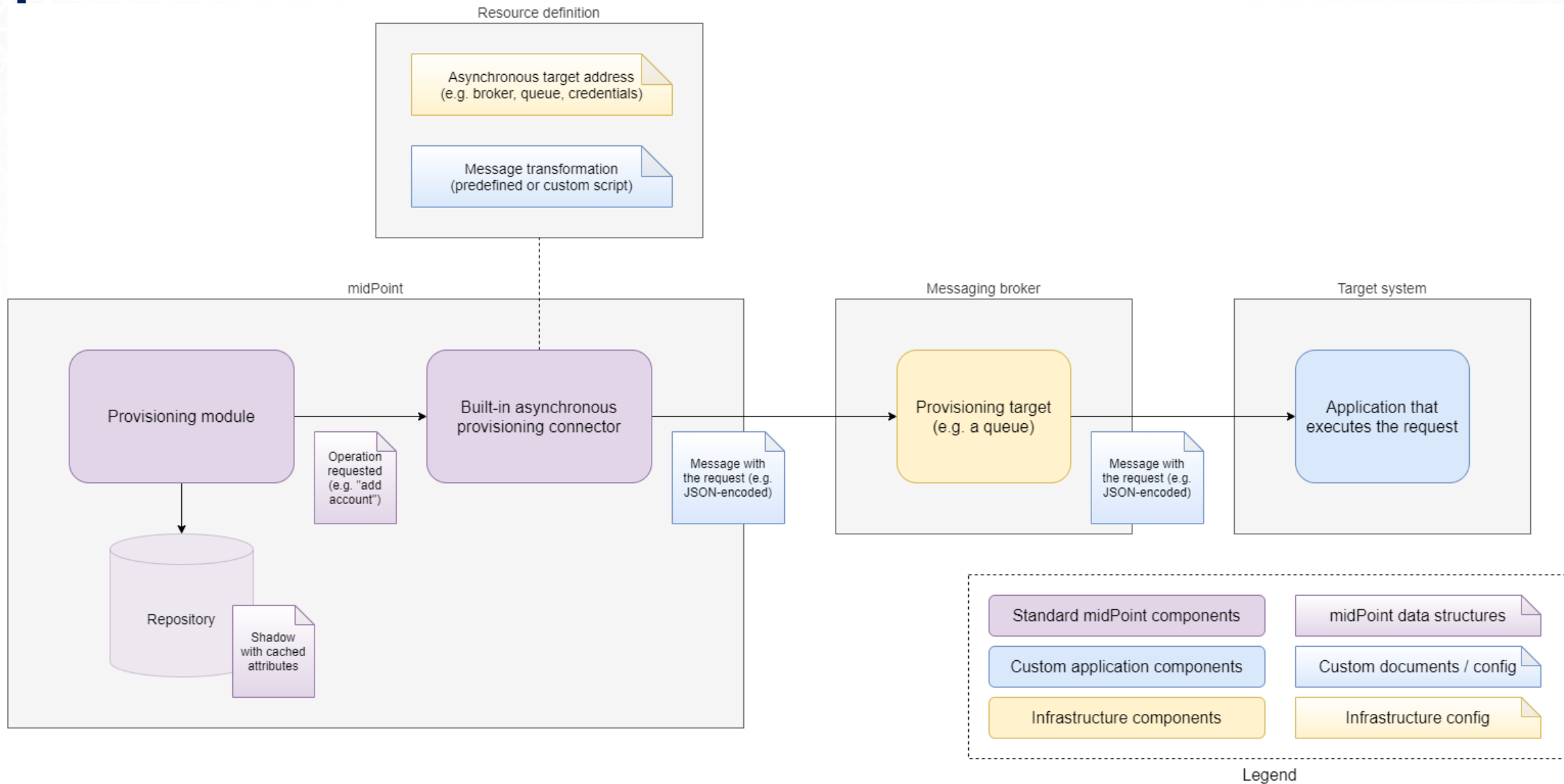
How To Use Asynchronous Provisioning?

Note: Details about asynchronous update (source side) are not in the scope of this webinar.

Overall Schema Simplified



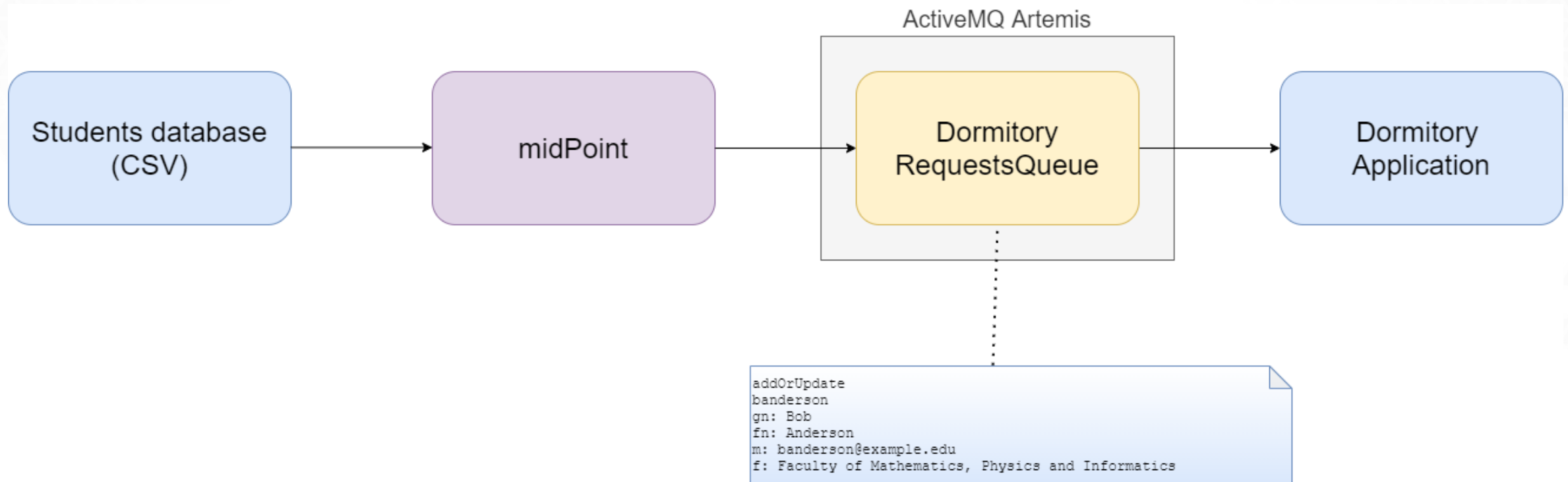
Overall Schema Details



| Practical Example

Asynchronous Provisioning to Fictitious Dormitory Application via ActiveMQ

Schema of the Example



Implementation: Resource Definition

```
<name>Dormitory Test (async)</name>
<connectorRef type="ConnectorType">
```

(1) connector type

```
  <filter>
    <q:equal>
      <q:path>connectorType</q:path>
      <q:value>AsyncProvisioningConnector</q:value>
    </q:equal>
  </filter>
</connectorRef>
```

(2) where to send messages to

```
<connectorConfiguration>
  <conf:targets>
    <jms>
      <connectionFactory>localhostConnectionFactory</connectionFactory>
      <username>admin</username>
      <password>admin123</password>
      <destination>TestQueue</destination>
    </jms>
  </conf:targets>
```

(3) physical message format

```
  <conf:predefinedTransformation>simplifiedJson</conf:predefinedTransformation>
</connectorConfiguration>

<capabilities>
  <configured xmlns:cap="http://midpoint.evolveum.com/xml/ns/public/resource/capabilities">
    <cap:read>
      <cap:cachingOnly>true</cap:cachingOnly>
    </cap:read>
  </configured>
</capabilities>
```

(1) attribute caching

```
<xsd:sequence>
  <xsd:element name="login" type="xsd:string" minOccurs="0"/>
  <xsd:element name="givenName" type="xsd:string" minOccurs="0"/>
  <xsd:element name="familyName" type="xsd:string" minOccurs="0"/>
  <xsd:element name="email" type="xsd:string" minOccurs="0"/>
  <xsd:element name="faculty" type="xsd:string" minOccurs="0"/>
</xsd:sequence>
```

(3) logical message format (schema)

```
{
  "operation" : "add",
  "objectClass" : "AccountObjectClass",
  "attributes" : {
    java.naming.factory.initial=org.apache.activemq.artemis.jndi.ActiveMQInitialContextFactory
    connectionFactory=localhostConnectionFactory=tcp://localhost:61616
    queue.TestQueue=TestQueue
    queue.DormitoryRequestsQueue=DormitoryRequestsQueue
  }
}
```

```
{
  "operation" : "modify",
  "objectClass" : "AccountObjectClass",
  "primaryIdentifiers" : {
    "login" : [ "banderson" ]
  },
  "secondaryIdentifiers" : { },
  "changes" : {
    "givenName" : {
      "replace" : [ "BOB" ]
    }
  }
}
```

```
{
  "operation" : "delete",
  "objectClass" : "AccountObjectClass",
  "primaryIdentifiers" : {
    "login" : [ "banderson" ]
  },
  "secondaryIdentifiers" : { }
}
```

Custom Request Message Transformation

```
<conf:transformExpression>
  <script>
    <language>http://midpoint.evolveum.com/xml/ns/public/expression/language#velocity</language>
    <code>#set ( $request = $requestFormatter.changeMapAsAttributes().identifiersAsAttributes().createRequest() )
#set ( $attrs = $request.attributesSimplified )
#if ( $request.isDelete() )
  delete
  $!attrs["login"]
#else
  addOrUpdate
  $!attrs["login"]
  gn: $!attrs["givenName"]
  fn: $!attrs["familyName"]
  m: $!attrs["email"]
  f: $!attrs["faculty"]
#end</code>
  </script>
</conf:transformExpression>
```

```
addOrUpdate
banderson
gn: Bob
fn: Anderson
m: banderson@example.edu
f: Faculty of Mathematics, Physics and Informatics
```

(1) account addition

```
addOrUpdate
banderson
gn: BOB
fn: Anderson
m: banderson@example.edu
f: Faculty of Mathematics, Physics and Informatics
```

(2) account modification

```
delete
banderson
```

(3) account deletion

<https://docs.evolveum.com/midpoint/reference/resources/asynchronous/outbound/configuration/#using-custom-transformation>

Live Demo

- `d:\mp-home\apache-artemis-2.17.0\bin\artemis.cmd create d:\tmp\broker --user admin --password admin123 --require-login`
- paste queue definitions to `d:\tmp\broker\etc\broker.xml` (addresses)
- `d:\tmp\broker\bin\artemis run`
- `git clone https://github.com/mederly/webinar-async-provisioning-2021-05`
- `mvn clean install`
- `mvn exec:java`
- `mkdir d:\tmp\midpoint-4.3.1\var\lib`
- `copy d:\tmp\webinar-async-provisioning-2021-05\target*jndi.jar d:\tmp\midpoint-4.3.1\var\lib`
- `d:\tmp\midpoint-4.3.1\bin\start`

<https://github.com/mederly/webinar-async-provisioning-2021-05>

Summary

- Asynchronous resources are experimentally supported (both ways)
- Main reasons to use:
 - When there is no direct access (source & target)
 - When we need immediate updates from a source
 - When a provisioning target is too slow (in the future)
- Main things to consider:
 - No direct access → no guarantees of long-term consistency
 - Async provisioning → no direct feedback (limited/slower adaptation to the real state)
 - Higher complexity
 - The current support is experimental

Feel free to experiment, and let us know about your experiences.

| Discussion

Questions?
Comments?

*For more information please visit
<https://docs.evolveum.com/midpoint/reference/resources/asynchronous/outbound/>*

Thank you for your attention

If any questions occur, feel free to ask at sales@evolveum.com

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