



Repo Census

Software Dependency Analysis
with Graph Databases

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Agenda

Software Dependency Management

Repo Census: Use Cases and Demo

Graph Model for Software Dependencies

Queries and Cypher



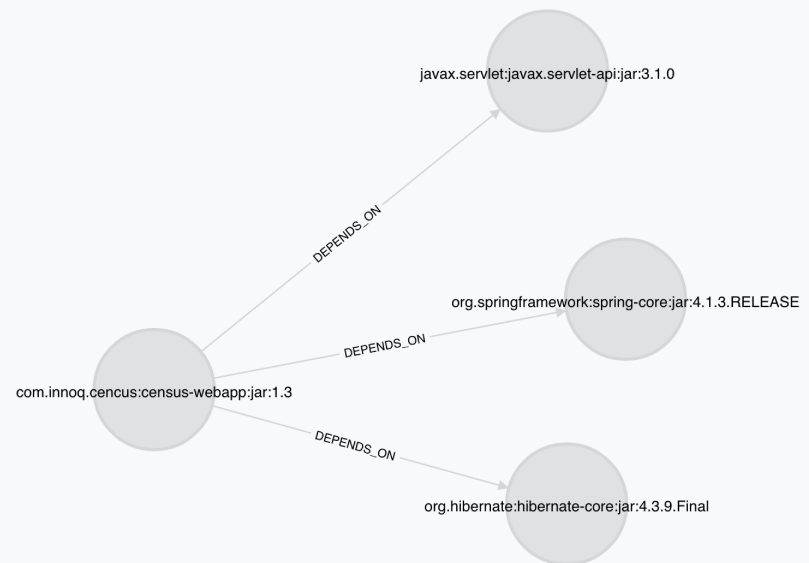
Software Dependencies



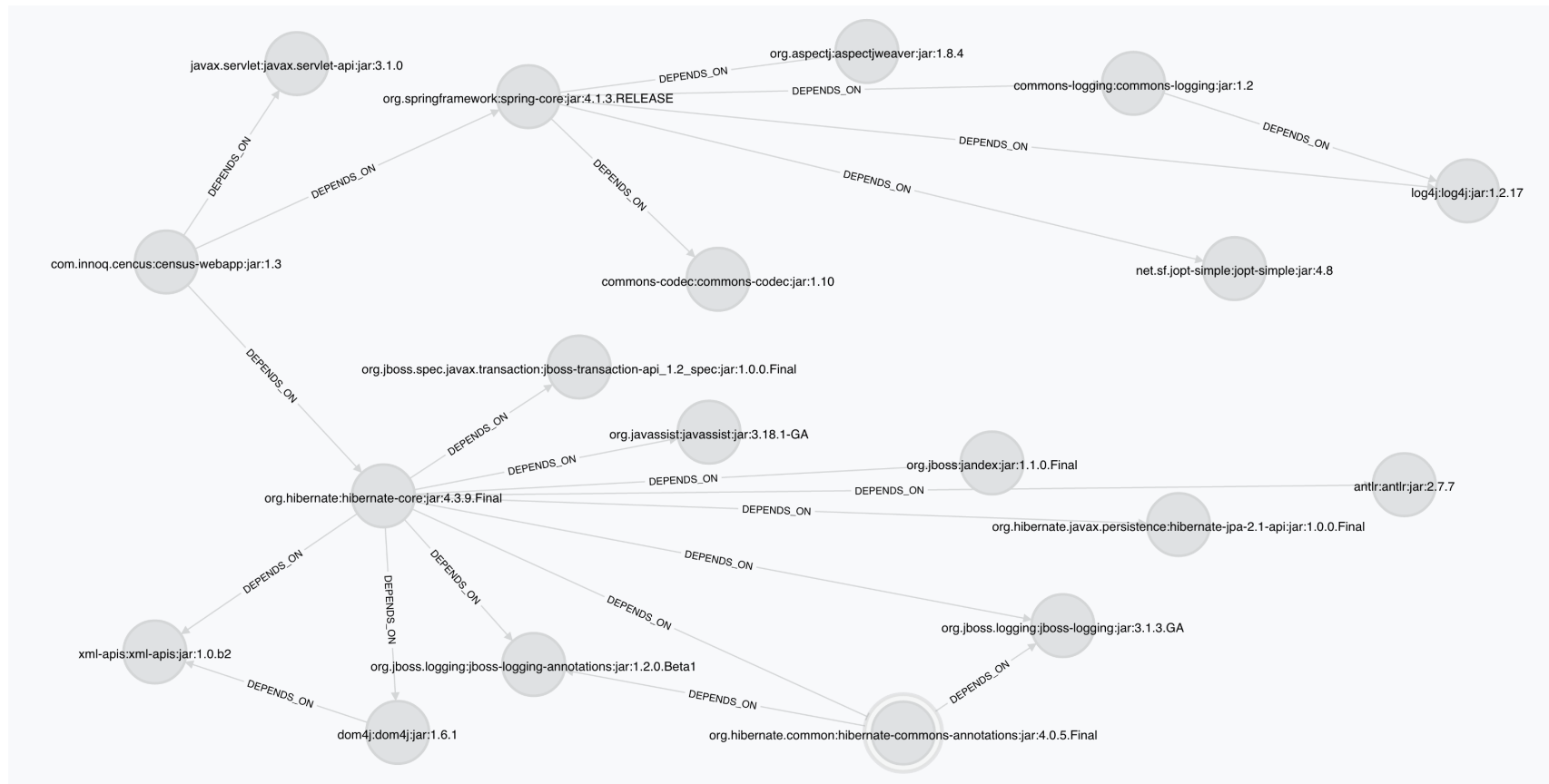
Declaration of Dependencies

```
<project>
  <modelVersion>4.0.0</modelVersion>
  <groupId>com.innoq.census</groupId>
  <artifactId>census-webapp</artifactId>
  <version>1.0</version>
  <name>repo-census-webapp</name>

  <dependencies>
    <dependency>
      <groupId>javax.servlet</groupId>
      <artifactId>javax.servlet-api</artifactId>
      <version>3.1.0</version>
    </dependency>
    <dependency>
      <groupId>org.springframework</groupId>
      <artifactId>org.springframework</artifactId>
      <version>4.1.3.RELEASE</version>
    </dependency>
    <dependency>
      <groupId>org.hibernate</groupId>
      <artifactId>hibernate-core</artifactId>
      <version>4.3.9.Final</version>
    </dependency>
  </dependencies>
</project>
```



Transitive Dependencies



Repo Census



Use Cases

Keep overview and be aware of changes

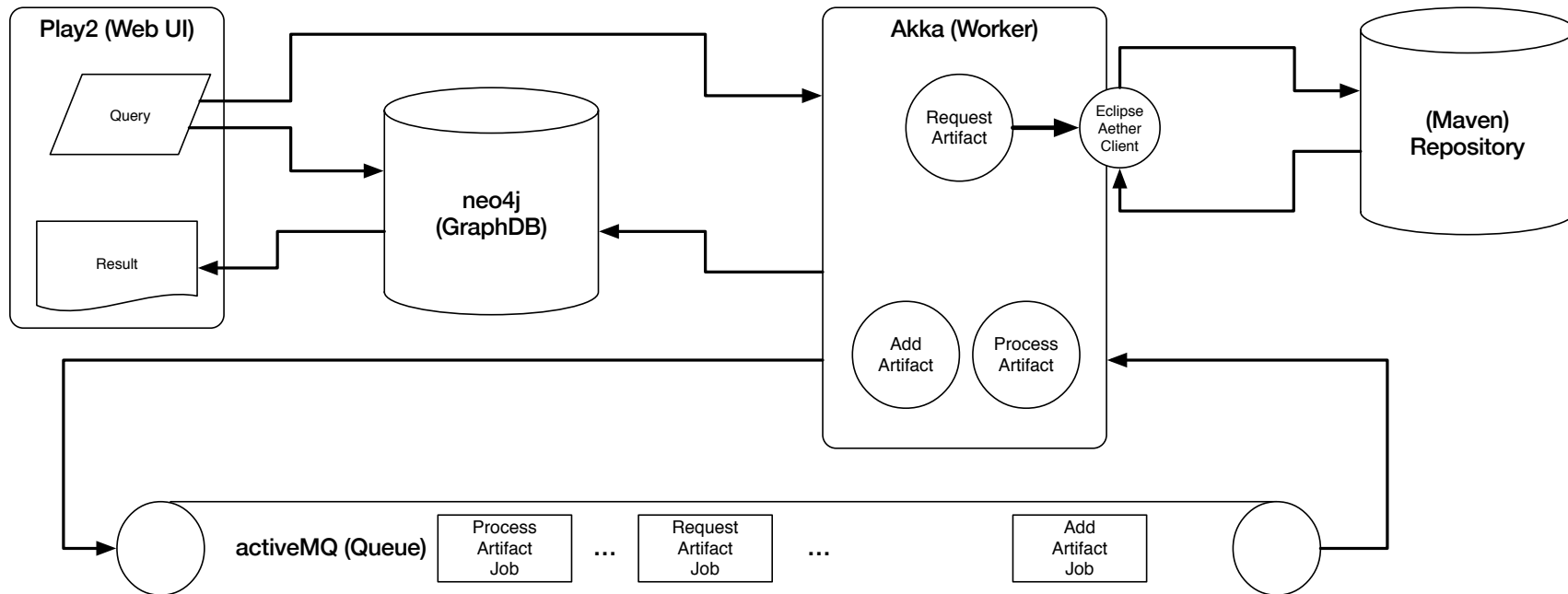
Estimate impacts of software updates

License issues

Security issues



System Architecture



Demo

Short introduction of the web app

Goto to [Maven Census](#)



Graph Model



Transfer to Neo4j Node

Elements to handle:

Dependencies

License

Version

GroupId

ArtifactId



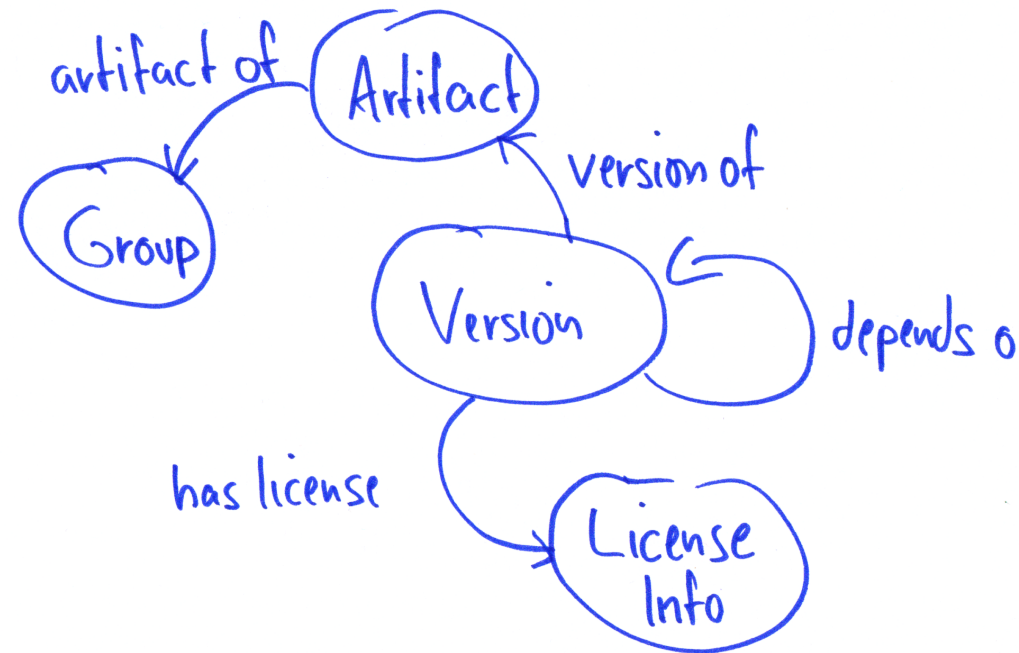
Conceptual model

```
<project>
  <parent>
    <groupId>com.explodingpixels</groupId>
    <artifactId>macwidgets-maven-modul</artifactId>
    <version>0.9.6-SNAPSHOT</version>
  </parent>

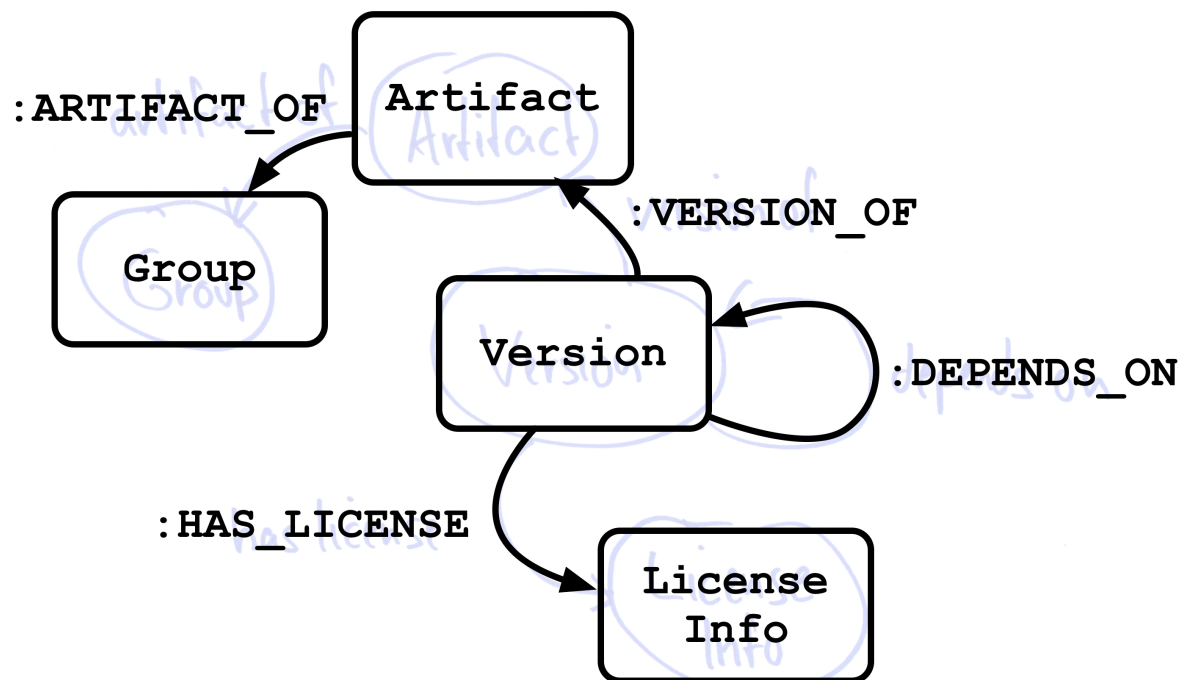
  <modelVersion>4.0.0</modelVersion>
  <groupId>com.explodingpixels</groupId>
  <artifactId>macwidgets-demo</artifactId>
  <name>macwidgets-demo</name>

  <licenses>
    <license>
      <name>GNU Lesser General Public License</name>
      <url>http://www.gnu.org/licenses/lgpl.html</url>
    </license>
  </licenses>

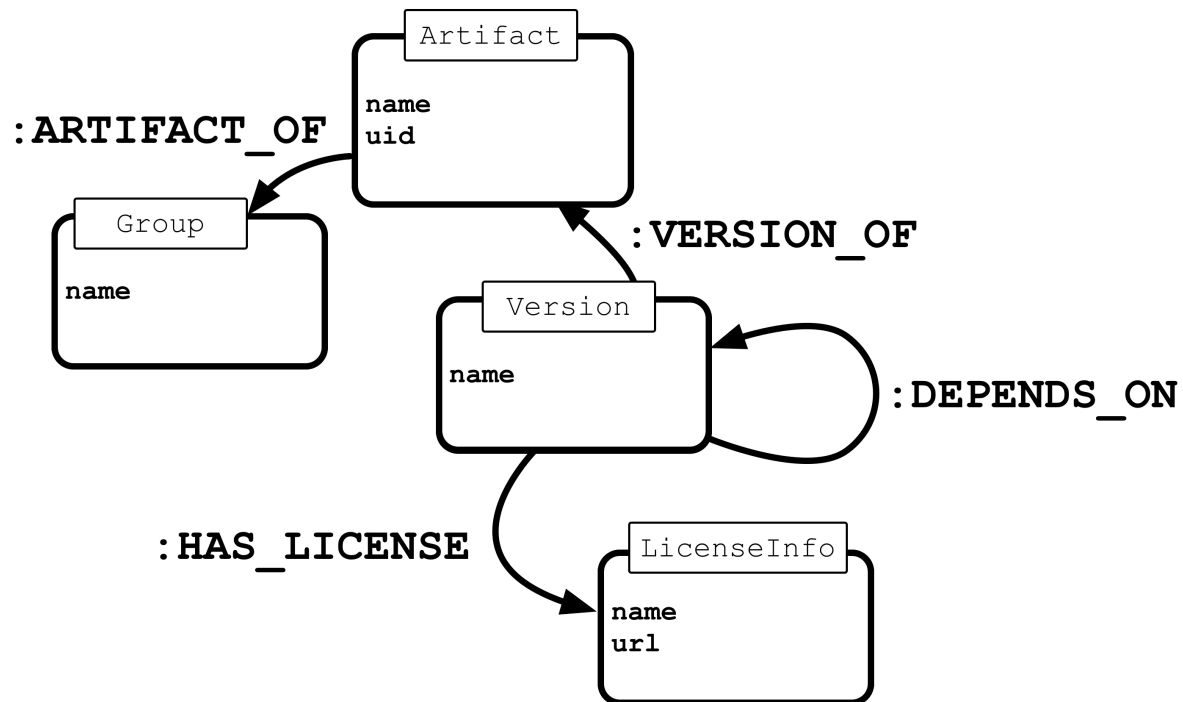
  <dependencies>
    <dependency>
      <groupId>com.explodingpixels</groupId>
      <artifactId>macwidgets</artifactId>
      <version>0.9.6-SNAPSHOT</version>
    </dependency>
  </dependencies>
</project>
```



Maven Graph Model



Maven Graph Model



See model in action

Goto to [Neo console](#)



Cypher Queries



Search

Find by unique version ID

```
MATCH (v:Version {uId: 'com.innoq.census:census-webapp:jar:1.0'})  
RETURN v.uId as UID, v:ToDo AS todo, v:Processing AS processing
```

Search with regular expression

```
MATCH (v:Version)  
WHERE v.uId =~ 'com.innoq.*'  
RETURN v.uId as UID
```

Get license info

```
MATCH (v:Version {uId: {0}})-[:HAS_LICENSE]->(l:LicenseInfo)
RETURN l.name AS lic_name, l.url AS url
ORDER BY lic_name
```

Show other versions

```
MATCH (v:Version)-[:VERSION_OF]->(ae:ArtifactElement)
      <-[:VERSION_OF]-(o:Version)
WHERE v.uId = {0}
RETURN o.uId AS id
ORDER BY id
```


Show direct dependencies

MATCH (v:Version {uId: {0}})

OPTIONAL MATCH v-[dr:DEPENDS_ON]->other

RETURN other.uId **AS** dep, dr.scope **AS** scope

ORDER BY dep

dep	scope	optional
javax.servlet:javax.servlet-api:jar:3.1.0	compile	false
junit:junit:jar:4.12	test	false
org.hibernate:hibernate-core:jar:4.3.9.Final	compile	false
org.springframework:spring-core:jar:4.1.3.RELEASE	compile	false
org.springframework:spring-webmvc:4.1.6.RELEASE	test	false

Show transitive dependencies

```
MATCH (v:Version)
WHERE v.uId =~ 'com.innoq.*1.0'
OPTIONAL MATCH (v)-[r:DEPENDS_ON_COMPILE|DEPENDS_ON_RUNTIME*1..10]->o
WITH distinct other as deps
RETURN deps.uId
```

deps

javax.servlet:javax.servlet-api:jar:3.1.0

org.springframework:spring-core:jar:4.1.3.RELEASE

commons-codec:commons-codec:jar:1.10

commons-logging:commons-logging:jar:1.2

avalon-framework:avalon-framework:jar:4.1.5

log4j:log4j:jar:1.2.17

javax.activation:activation:jar:1.1

javax.mail:mail:jar:1.4.3

org.apache.geronimo.specs:geronimo-jms_1.1_spec:jar:1.0

Transitive dependency paths

```
MATCH (v:Version)
WHERE v.uId =~ 'com.innoq.*1.0'
OPTIONAL MATCH p = (v-[r:DEPENDS_ON_COMPILE|DEPENDS_ON_RUNTIME*1..10]-)
WITH tail ( extract (d IN nodes(p) | d.uId) ) as deps
RETURN deps
```

deps

javax.servlet:javax.servlet-api:jar:3.1.0

org.springframework:spring-core:jar:4.1.3.RELEASE

org.springframework:spring-core:jar:4.1.3.RELEASE, commons-codec:commons-codec:jar:1.10

org.springframework:spring-core:jar:4.1.3.RELEASE, commons-logging:commons-logging:jar:1.2

org.springframework:spring-core:jar:4.1.3.RELEASE, commons-logging:commons-logging:jar:1.2, avalon-framework:avalon-framework:jar:4.1.5

org.springframework:spring-core:jar:4.1.3.RELEASE, commons-logging:commons-logging:jar:1.2, log4j:log4j:jar:1.2.17

org.springframework:spring-core:jar:4.1.3.RELEASE, commons-logging:commons-logging:jar:1.2, log4j:log4j:jar:1.2.17, javax.activation:activation:jar:1.1

org.springframework:spring-core:jar:4.1.3.RELEASE, commons-logging:commons-logging:jar:1.2, log4j:log4j:jar:1.2.17, javax.mail:mail:jar:1.4.3

License overview of all deps

```
MATCH (v:Version)
WHERE v.uId =~ 'com.innoq.*1.0'
OPTIONAL MATCH v-[r:DEPENDS_ON_COMPILE|DEPENDS_ON_RUNTIME*1..5]->othe:
    -[:HAS_LICENSE]->(l:LicenseInfo)
RETURN DISTINCT l.name as License, l.url as URL
ORDER BY l.name
```

License	URL
AL 2.0	http://www.apache.org/licenses/LICENSE-2.0.txt
Apache License 2.0	http://www.apache.org/licenses/
Apache License, Version 2.0	http://www.apache.org/licenses/LICENSE-2.0.txt
Apache License, version 2.0	http://www.apache.org/licenses/LICENSE-2.0.txt
BSD License	http://wwwantlr.org/license.html
CDDL	http://www.sun.com/cddl
CDDL + GPLv2 with classpath exception	https://glassfish.dev.java.net/nonav/public/CDDL+GPL.html
Common Development and Distribution License	http://repository.jboss.org/licenses/cddl.txt
Common Development and Distribution License (CDDL) v1.0	https://glassfish.dev.java.net/public/CDDLv1.0.html
Eclipse Distribution License (EDL), Version 1.0	http://www.eclipse.org/org/documents/edl-v10.php

Changes between versions

```
MATCH (orig:Version {uId: {0}}), (other:Version {uId: {1}})
OPTIONAL MATCH (orig)-[:DEPENDS_ON]->(common:Version)<-[:DEPENDS_ON]-(other)
WITH orig, other, collect(DISTINCT common.uId) AS common
```

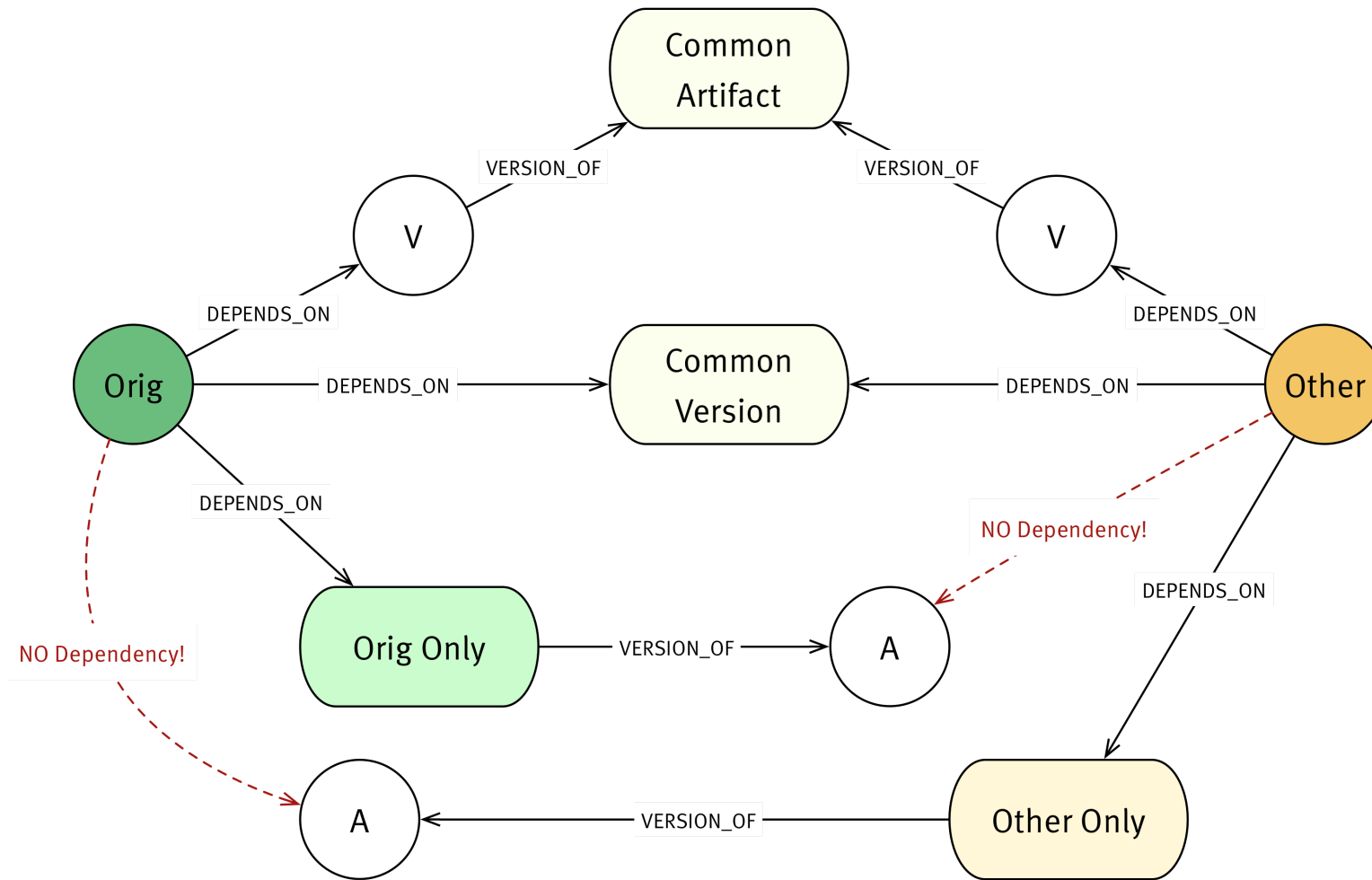
OPTIONAL MATCH

```
    (orig)-[:DEPENDS_ON]->(origVersion:Version)-[:VERSION_OF]->(commonArtifact:ArtifactElement),
    (other)-[:DEPENDS_ON]->(otherVersion:Version)-[:VERSION_OF]->(commonArtifact)
WITH orig, other, common,
    collect({origVersion: origVersion.uId, otherVersion: otherVersion.uId}) AS commonArtifacts
```

```
OPTIONAL MATCH (orig)-[:DEPENDS_ON]->(origOnly:Version)-[:VERSION_OF]->(a:ArtifactElement)
WHERE NOT (other)-[:DEPENDS_ON]->(:Version)-[:VERSION_OF]->(a)
WITH orig, other, common, commonArtifacts, collect(DISTINCT origOnly.uId) AS origOnly
```

```
OPTIONAL MATCH (other)-[:DEPENDS_ON]->(otherOnly:Version)-[:VERSION_OF]->(a:ArtifactElement)
WHERE NOT (orig)-[:DEPENDS_ON]->(:Version)-[:VERSION_OF]->(a)
RETURN common, commonArtifacts, origOnly, collect(DISTINCT otherOnly.uId) AS otherOnly
```

Changes between versions



Project Status



Limits

Early Stage

Quantity structures

Limits of the System



Outlook



Planned features

Support for Multiple Repositories

Additional Attributes:

Organization, Developers, Properties,
Repositories, Plugins

Support for (Multi-)User

Project Upload (Pom)

Social Login (Github/Twitter/...)



Integration & Cooperation

Support other Repositories: Gems, RPMs, NPMs,
...

Integration in build process

Integration of jQAssistant



Availability

Project Page

How to get, test and contribute

SaaS

Appliance (OVA)



Q&A



Thank you!

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