# An Overview of

# ModeShape

*September 2010*

modeshape.org

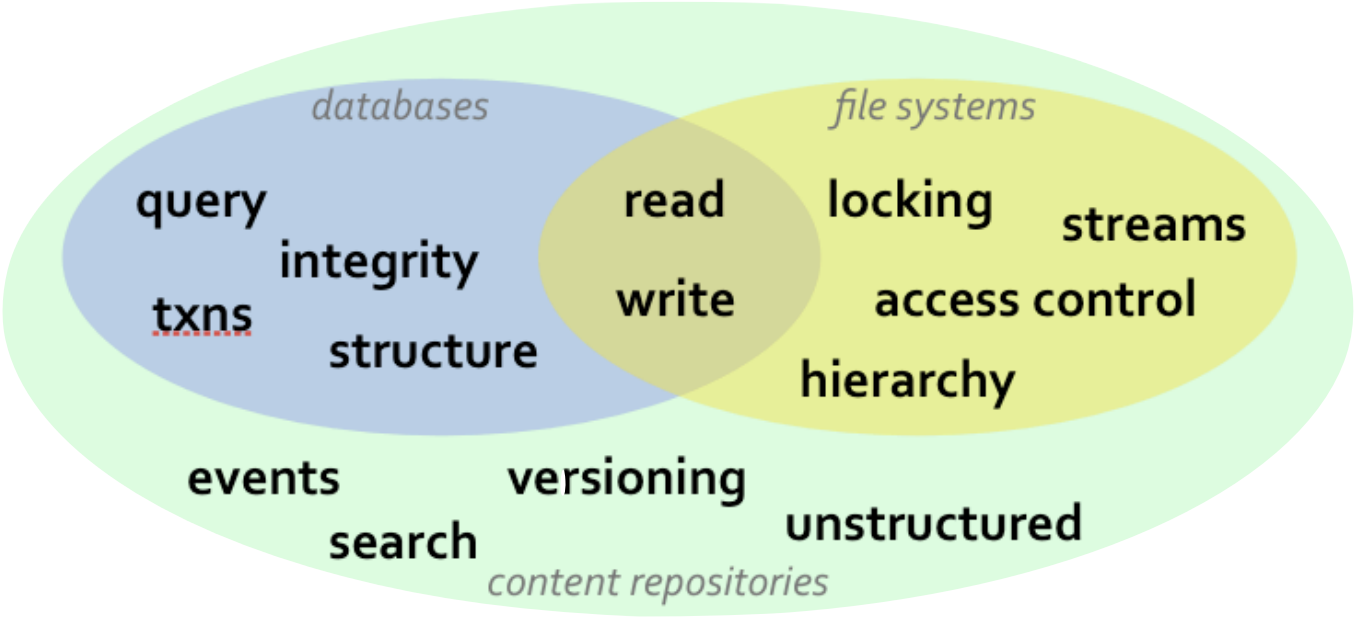
# Topics

- Why use JCR?
- Why use ModeShape?
- Productization

# What is JCR?

## JSR-170 and JSR-283

- Standard programmatic API: `javax.jcr`
- Abstracts where/how the content is stored
- Best features from databases and file systems



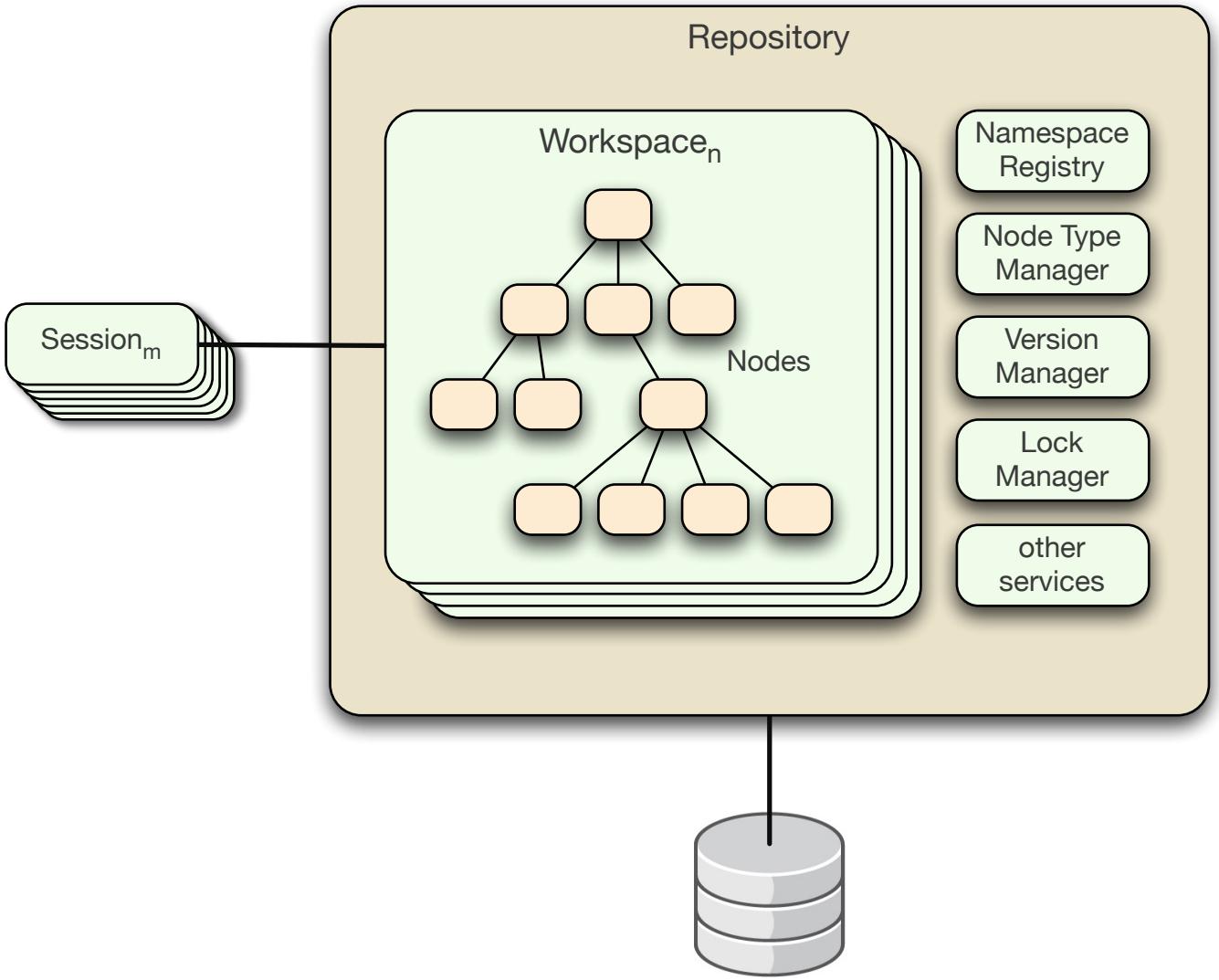
# Typical uses of JCR

- Content management systems
- Portals *(e.g., GateIn)*
- Knowledge bases
- Test management systems
- Artifact repositories *(e.g., BRMS, EDS, ...)*

# Why use a JCR repository?

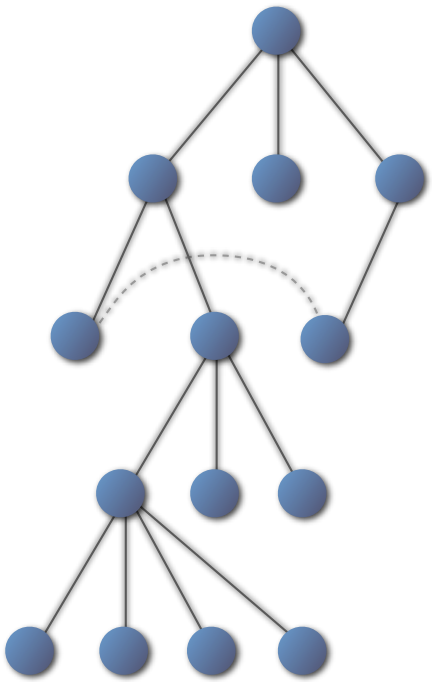
- Flexible data structure
  - because your data will change
- Hierarchical graph-based storage
  - natural organization
  - flexible schema
  - handles wide variety of content
- Search & query
- Versioning, events, access control, referential integrity, locking
- Standard API

# Fundamental elements of JCR



Why use JCR?

# Hierarchical organization

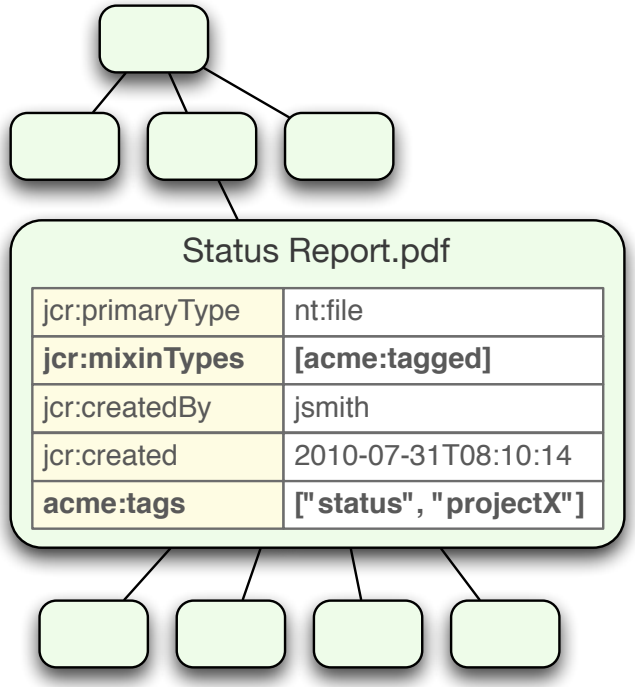


- Great for natural hierarchies
  - URLs and file systems
  - Dates
  - Composition
  - Catalogs
  - ... many others
- Examples
  - Files and folders (artifacts)
  - Database schemas
  - Web services
  - XML, YAML, JSON, etc.

# Flexible schema (part 1)

Each JCR node has:

- Name, path, & identifier
- Properties
  - name & value(s)
  - property types
- Child nodes
  - same-name-siblings
  - may be ordered
- One or more node types
  - primary type and mixins
  - dictate whether properties and children can be added/removed
  - can be changed at any time on each node



# Flexible schema (part 2)

JCR node types:

- define the allowed properties
  - name (or unrestricted with "*")
  - type
  - number of values
  - searchability
  - mandatory
- define the allowed child nodes
  - name (or unrestricted with "*")
  - required node types
  - same-name-siblings allowed
- inheritance and mixed together

LONG, DOUBLE, DECIMAL, DATE, BOOLEAN, NAME, PATH, URI, REFERENCE, WEAK_REFERENCE, UNDEFINED

Why use JCR?

# Query languages

- XPath
- JCR-SQL

From JCR 1.0, deprecated in JCR 2.0

- JCR-SQL2
- JCR-JQOM

New in JCR 2.0

# JCR-SQL2 is based upon SQL

| JCR-SQL2 | SQL |
|---|---|
| node type | table |
| property | column |
| node | row |

Nodes appear as rows in those tables that correspond to the node's types

- a node can appear as a row in multiple tables
- often a complete picture of a node requires joining multiple tables
- other joins are possible, such as ancestors, descendants, equivalent properties

Why use JCR?

# JCR-SQL2 features

- Select
- Joins (INNER, LEFT/RIGHT OUTER)
- Property & name criteria
- Child & descendant node criteria
- Comparison operators (`=`, `<`, `<=`, `>`, `>=`, `<>`, `LIKE`)
- Logical operators (`AND`, `OR`, `NOT`)
- Full-text search criteria
- Variables

*ModeShape accepts all valid JCR-SQL2 queries*

Why use JCR?

# Sample JCR-SQL2 queries

```
SELECT * FROM [car:Car] WHERE [car:model] LIKE ‘%Toyota%’ AND [car:year] >= 2006
```

```
SELECT [jcr:primaryType],[jcr:created],[jcr:createdBy] FROM [nt:file]
WHERE NAME() LIKE $name
```

```
SELECT file.*,content.* FROM [nt:file] AS file
JOIN [nt:resource] AS content ON ISCHILDNODE(content,file)
WHERE NAME(file) LIKE 'q*.2.vdb'
```

Why use JCR?

# Other benefits

- Versioning
- Notification (events)
- Access control
- Referential integrity
- Locking
- Standard API

# Using JCR 2.0 repositories

- Uses JCR 2.0 API & Java SE ServiceLoader
- No implementation dependencies

*Java code:*

```
Properties parameters = new Properties();
parameters.load(...);           // load from a file
Repository repository = null;
for (RepositoryFactory factory : ServiceLoader.load(RepositoryFactory.class)) {
    repository = factory.getRepository(parameters);
    if (repository != null) break;
}
```

*Properties for ModeShape:*

```
org.modeshape.jcr.URL = file:path/to/configRepository.xml?repositoryName=MyRepository
```

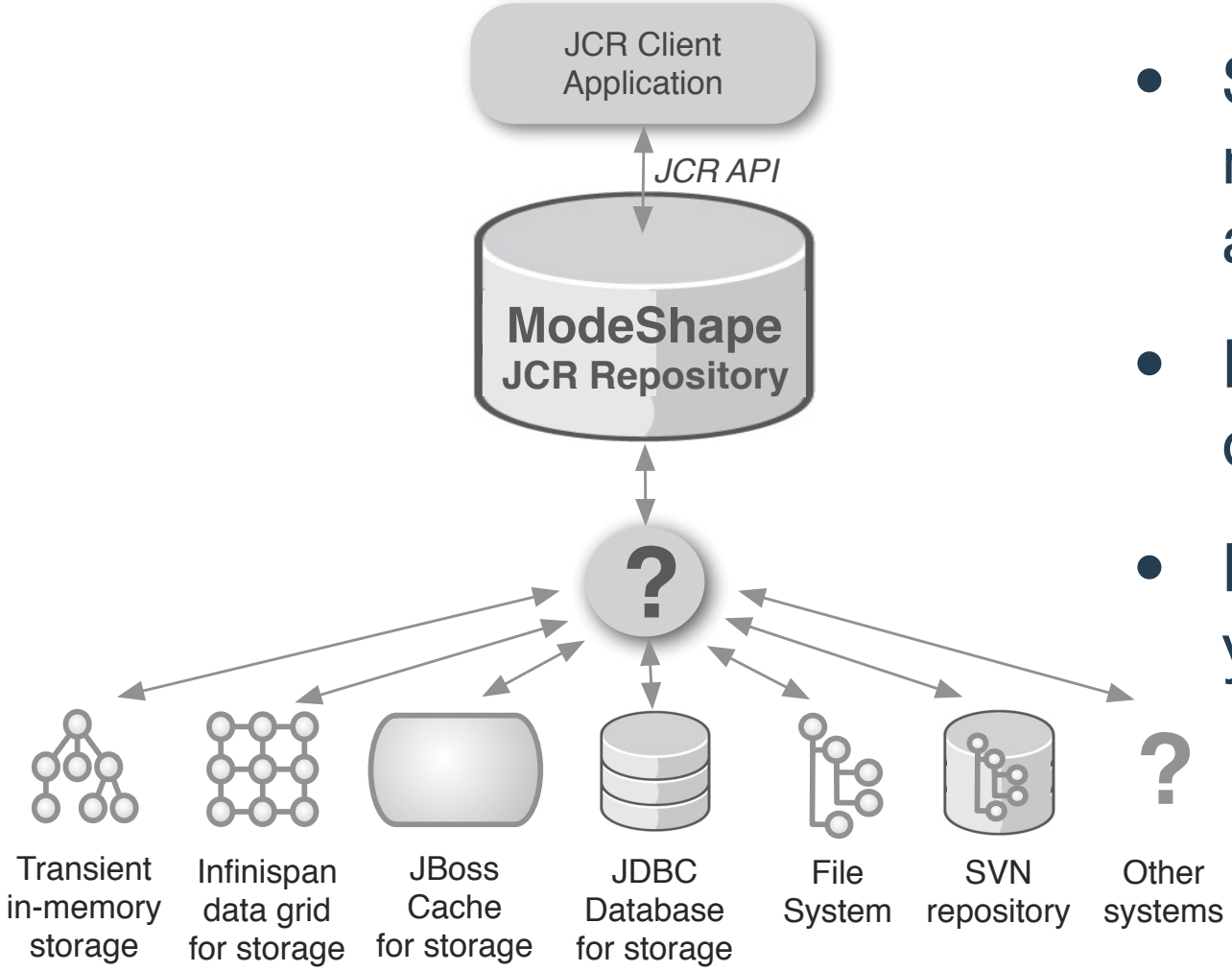
*or*

```
org.modeshape.jcr.URL = jndi:/jcr/local?repositoryName=MyRepository
```

# Why use ModeShape?

- Supports JCR 2.0
- Storage options
- Access existing content thru JCR
- Unified repository via federation
- Automatically derives content
- Lightweight, embeddable & clusterable
- Plays well with JBoss AS

# Storage options

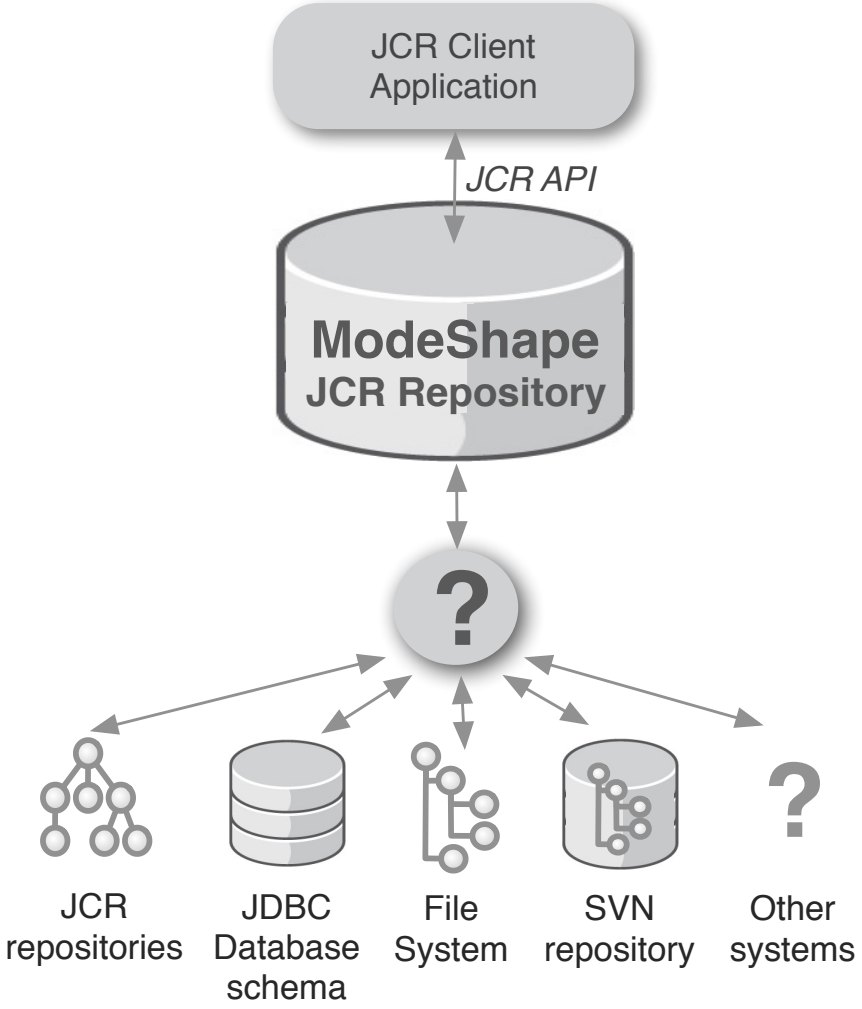



- Store content where it makes sense for your application
- Multiple connectors out-of-the-box
- Easy enough to write your own

# Storage examples

- Store in RDBMS using Hibernate
  - Conventional and well-understood
- Store in Infinispan
  - Scalability, fault tolerance and speed of a data grid
- Store artifacts on file system
  - Images, documents, downloads, static pages, etc.
  - Serve files via file system, bypassing JCR altogether
  - Manipulate content through JCR (e.g., CMS)
- Transient in-memory
  - Lightweight and fast for embedded uses
  - Often used with imported data

# Accessing other data



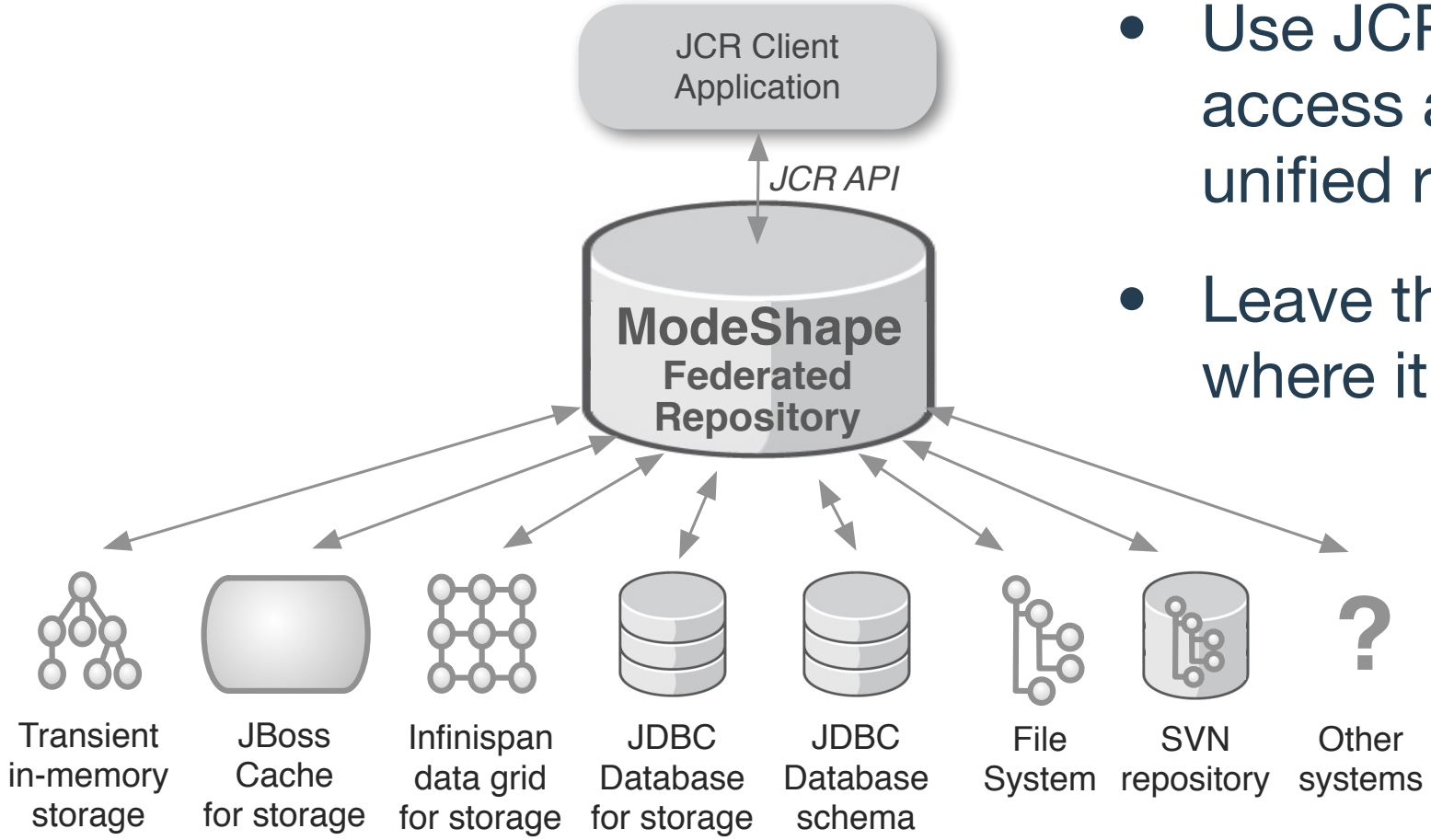

- Use JCR API to access data from other systems
- Leave the data where it is
- Just another connector

# Access examples

- Access files already stored on file system
  - Use the JCR API within your application
  - Use search and query
- Access database metadata (live)
  - Leverage session-based caching
  - Consistent model
- Access (& manipulate) content in other JCRs
  - Got data already in another JCR system?
  - Makes most sense with federation ...

# Why use ModeShape?

# Federation




- Use JCR API to access a virtual, unified repository
- Leave the data where it is

Why use ModeShape?

# Federation examples

- Own some content, access other data
  - Use the JCR API consistently throughout your application
  - Single virtual and unified repository
  - Leverage JCR's flexible schema
  - Use search and query across all data
  - Leave existing data where it lives
- Use the best data store for each kind of data
  - Use the JCR API consistently throughout your application
  - Single virtual and unified repository
  - Match access and capabilities with requirements

Why use ModeShape?

# Query languages

- XPath
- JCR-SQL

**From JCR 1.0, deprecated in JCR 2.0**

- JCR-SQL2
- JCR-JQOM

**New in JCR 2.0**

- Full-text search

**Like web search engines, based on JCR-SQL2's full-text search expression grammar**

*Separate parsers, but all use the same canonical AST, planner, optimizer, and processor*

# Enhanced JCR-SQL2

ModeShape accepts all valid JCR-SQL2 queries, plus:

- Additional joins (`FULL OUTER`, `CROSS`)
- Subqueries in criteria
- `SELECT [DISTINCT]`
- `UNION/INTERSECT/EXCEPT [ALL]`
- `LIMIT` and `OFFSET`
- `DEPTH` and `PATH` criteria
- `REFERENCE` criteria
- `IN` and `NOT IN`
- `BETWEEN val1 [EXCLUSIVE] AND val2 [EXCLUSIVE]`
- Arithmetic expressions in criteria

# Sample enhanced JCR-SQL2 queries

```
SELECT * FROM [car:Car] WHERE [car:model] LIKE '%Toyota%' AND [car:year] >= 2006
```

```
SELECT [jcr:primaryType],[jcr:created],[jcr:createdBy] FROM [nt:file]
WHERE PATH() LIKE $path
```

```
SELECT file.*,content.* FROM [nt:file] AS file
JOIN [nt:resource] AS content ON ISCHILDNODE(content,file)
WHERE PATH(file) LIKE '/files/q*.2.vdb'
```

```
SELECT [jcr:primaryType],[jcr:created],[jcr:createdBy] FROM [nt:file]
WHERE PATH() IN (
    SELECT [vdb:originalFile] FROM [vdb:virtualDatabase]
    WHERE [vdb:version] <= $maxVersion
    AND CONTAINS([vdb:description],'xml OR xml maybe')
)
```

# Use the data you already have

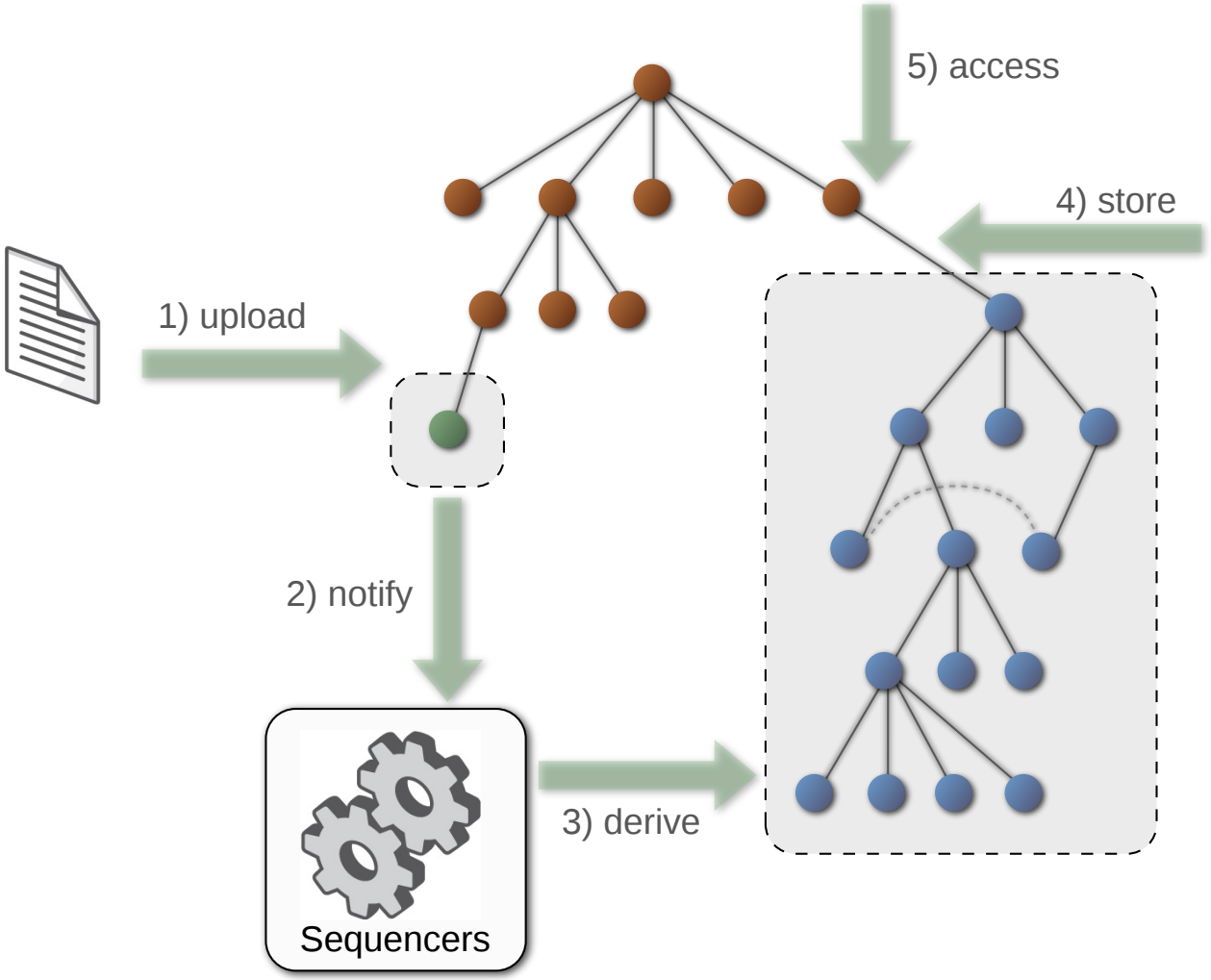
- Repositories frequently store files
  - Many of those files contain structured information
- How do you use what's inside those files?
  - Download and parse in your application?
  - Rely upon full-text search?
  - Do it whenever the files change?
- ModeShape sequencers get at that info
  - Parsers for various file formats
  - Extract the information and place into graph form using node types
  - Store derived information inside the repository
  - Access, navigate,and query

# Sequencer examples

- Web service artifacts
  - WSDL, XSD, WS Policy, ...
- Data management artifacts
  - DDL, Teiid models & VDBs, services, data sources, ...
- Software artifacts
  - JAR, WAR, EAR, POM, manifests, Java source/classfiles, ...
- Rule and process artifacts
  - Business/technical rules, functions, flows, DSLs, ...

# Why use ModeShape?

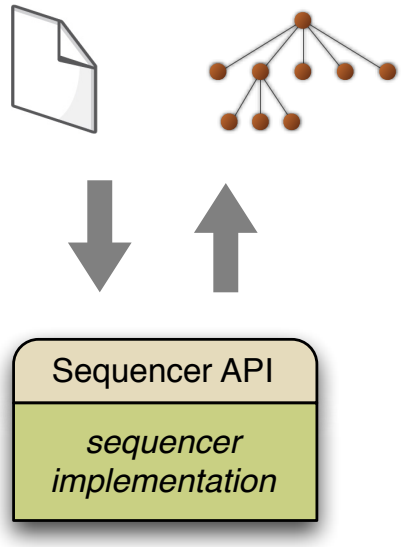
# Automatically extract content



# ModeShape sequencers

*(out-of-the-box)*

- ZIP, JAR, EAR, and WAR files
- Java class and source files
- DDL files
- Teiid Relational models and VDBs
- Text files (CSV and delimited)
- JCR Compact Node Definition files
- XML documents
- Microsoft Office® documents
- Image metadata



# ModeShape components

- JCR engine
- RESTful service
- WebDAV service
- JDBC driver
- JBoss AS 5.1 kit
- Eclipse plugin

Why use ModeShape?

# RESTful service

- Remote access to repository
- Standard HTTP methods
  - GET repositories
  - GET workspaces
  - GET, PUT, POST, DELETE nodes
  - POST queries
- JSON responses (HTML, XML planned)
- Uses RESTEasy
- Deployed as a WAR

# WebDAV service

- Remote access to repository
- Can mount as network share
- Download, upload, create or delete files
- Navigate, create and delete folders
- Deployed as a WAR

Why use ModeShape?

# JDBC driver

- Query repository via JDBC using JCR-SQL2
- Connects to one workspace
- Can be used in same VM as ModeShape

```
jdbc:jcr:jndi:{path/in/jndi}?repositoryName={name}&user=...
```

- Or in remote VM

```
jdbc:jcr:http://{hostname}:{port}/modeshape-rest/?repositoryName={name}&user=...
```

- Supports result set metadata
- Supports database metadata

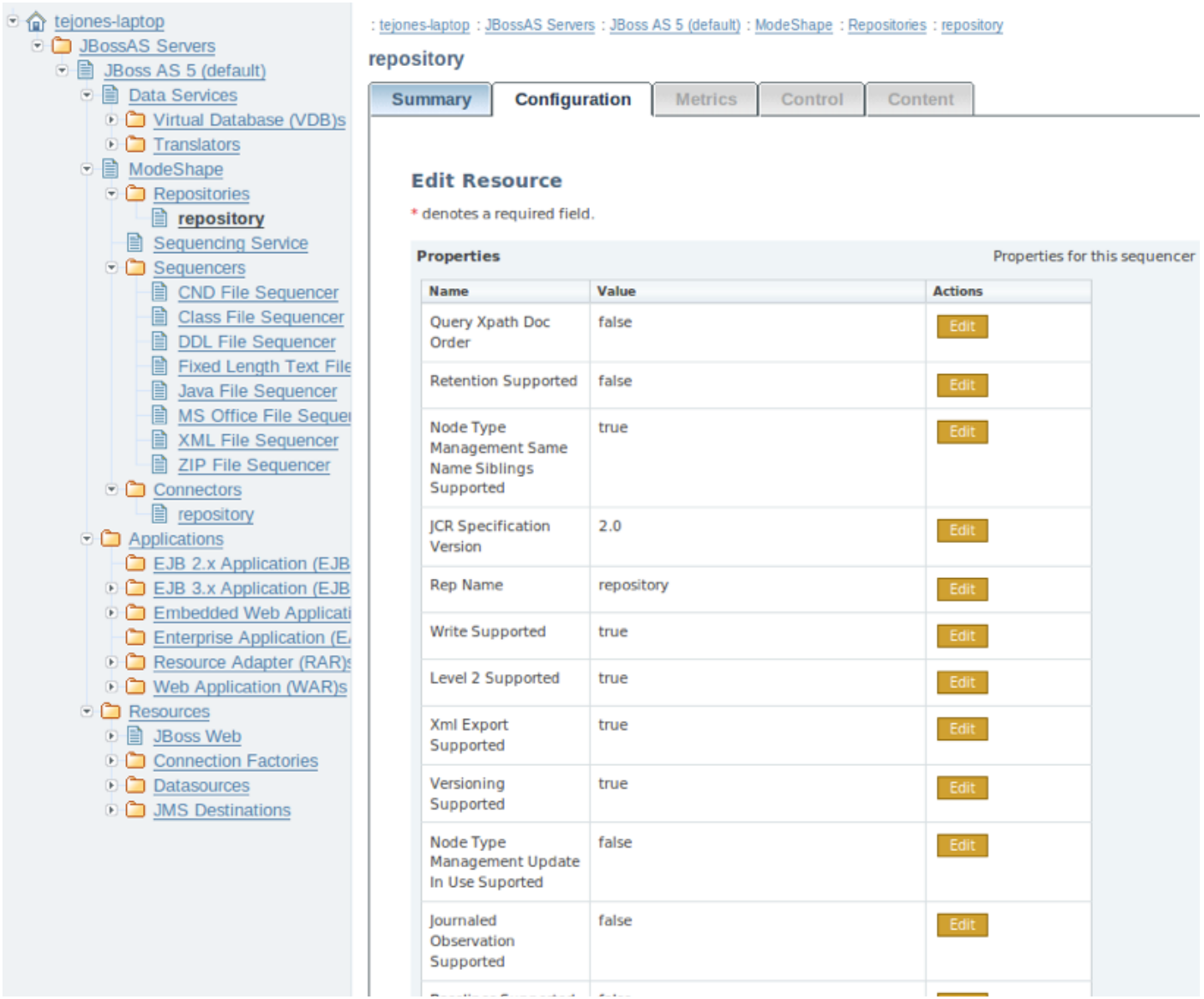
Why use ModeShape?

# JBoss AS kit

- JCR service (the engine)
- JOPR plugin for management & monitoring
- REST service (WAR)
- WebDAV service (WAR)
- JAAS authentication & authorization
- JDBC data source (1 per workspace)
- JCR API on classpath
- Sequencers
- Disk-based storage by default (HSQLDB & Lucene)
- Packaged as ZIP
- Script to install into a profile

# Why use ModeShape?

# JOPR plugin



Productization

# SOA-P 5.1 EDS

- Includes Teiid & ModeShape
- Slightly customized ModeShape JBoss AS kit
  - modified configuration and select connectors, sequencers
- Repository for data service artifacts
  - relational model files
  - virtual database (VDB) files
- Other files can be managed (but not sequenced)
  - XSD, WSDL, CSV, docs, etc.
- Publish and unpublish from JBoss Dev Studio
- Can access repository content from within VDBs

Productization

# BRMS 5.1

- Offer ModeShape as an option (in place of Jackrabbit)
- Same binaries as in SOA-P 5.1
- Enable future enhancements (if desired):
  - sequencers for rules, flows, DSLs, etc.
  - query via JDBC
  - connectors & federation
  - RESTful access

# Questions?