APACHE SLING & FRIENDS TECH MEETUP

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APACHE JACKRABBIT: BASIC CONCEPTS

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About the speakers

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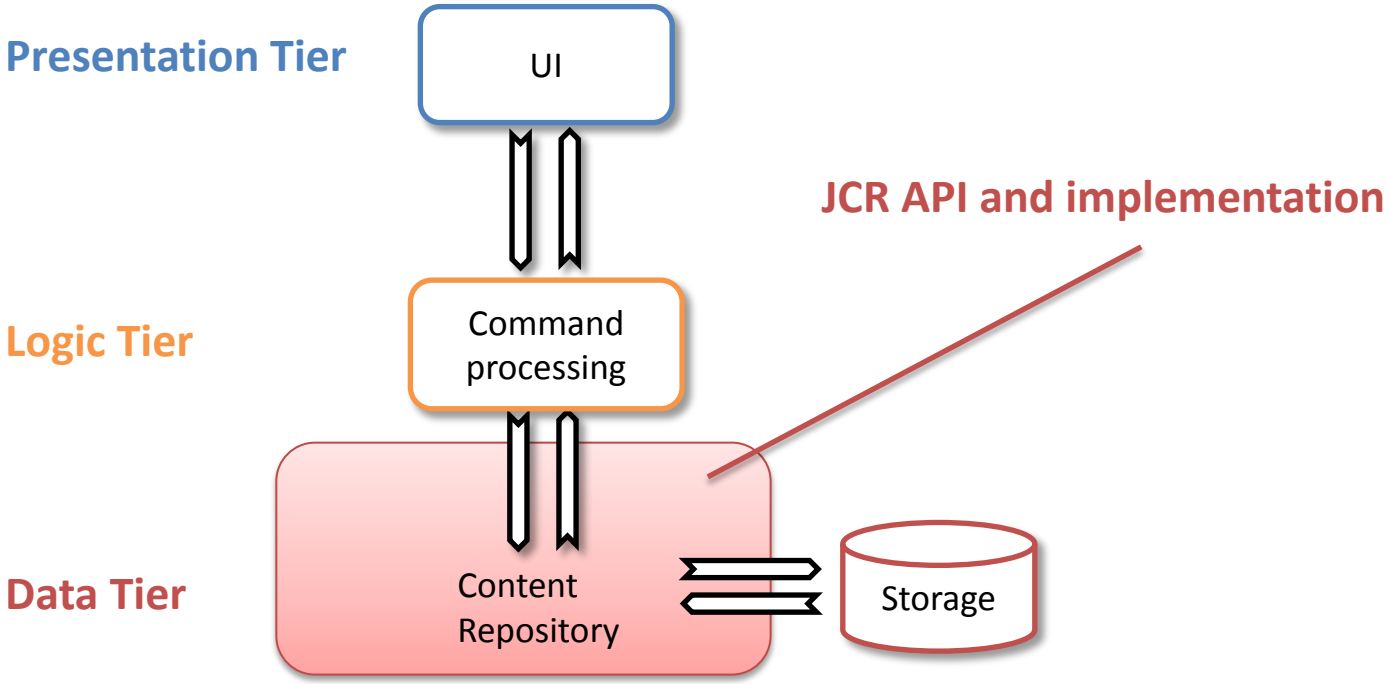
Spezialized on Adobe CQ and it‘s technology stack since 2003

Agenda

- Introduction
- What is Content?
- Content Repositories
- JCR vs. RDBMS
- JCR API Objectives
- JCR Artifacts
- Apache Jackrabbit
- Code Examples

Introduction – The big picture

- It's about the data layer
- It's about a special type of data: content



What is content?

- The JCR mantra: Everything is content
  - Application domain specific content (Articles, blog posts, comments, assets, …)
  - Structured data (e.g. an address record in a database)
  - Unstructured / Inherently structured data (binary documents like invoices, product description etc.)
  - Workflow definitions
  - Access Control Lists
  - Code
  - etc.

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What is content?

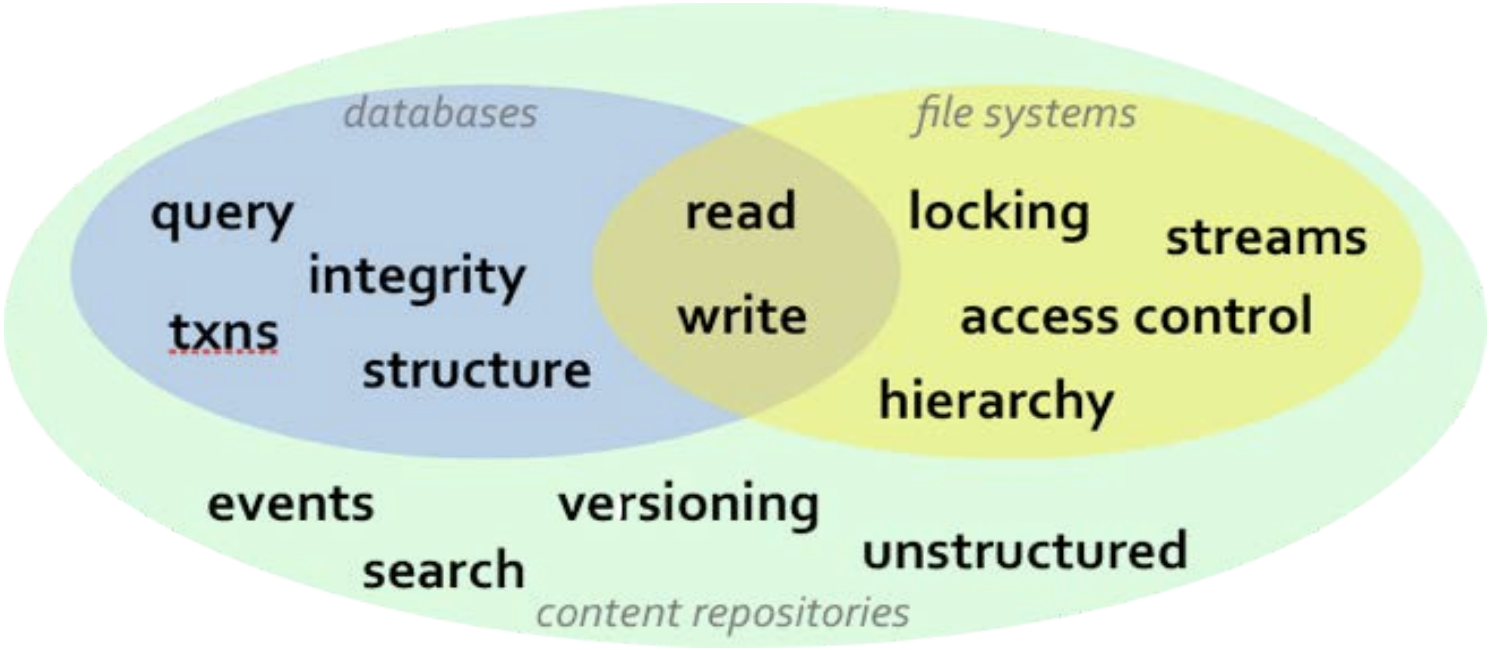
- Attributes that distinguish *content* from *data*
  - Shall provide information for an audience (=> finding and accessing this information should be easy)
  - Is always embedded inside a (hierarchical) context (=> this supports accessing and finding information)
  - Created and edited by (different) authors (=> locking and versioning necessary)
  - Managed within a publishing workflow (=> eventing functionality has to be applicable)

Content repository (1)

- Single repository for all types of content
- Support (multi-)hierarchical structure (=> *Findability*)
- Provide flexibility: Permit and simplify change of structure and metadata
- Assist query and search
- Provide access control
- Provide state control (by lock and version management and indicating the publication state)
- Assure data integrity

Content repository (2)

- Combines attributes of file systems and databases and adds other features



JCR vs. RDBMS

	JCR	RDBMS
Structure	Unstructured, semi-unstructured, structured	Structured
Navigation	Navigation API, Traversal access, direct access, write access	Not supported
Access control	Record level	Table and column level
Version control	Supported	Not supported
Code complexity	Simple for navigation Complex for operations	Complex for navigation Simple for operations
Changeability	More agile Decoupled from the application	More rigid Coupled with the application

JCR vs. RDBMS

- It is
  - NOT an issue of better or worse
  - but of what best suits the scenario and requirements
- JCR
  - does not replace the RDBMS
  - provides an alternative data model for specific requirements encountered in content management and collaborative applications
- Requirements and best possible fit for problem solving should dictate the choice of technology

JCR API Specification Objectives

- Provide API to access content repositories in a uniform manner
- Abstract where and how the content is stored
- Leave the dirty details for handling the underlying storage system (file system, RDBMS etc.) to the API implementation vendors
- … but allow for relatively easy implementation on top of a wide variety of existing content repositories as possible

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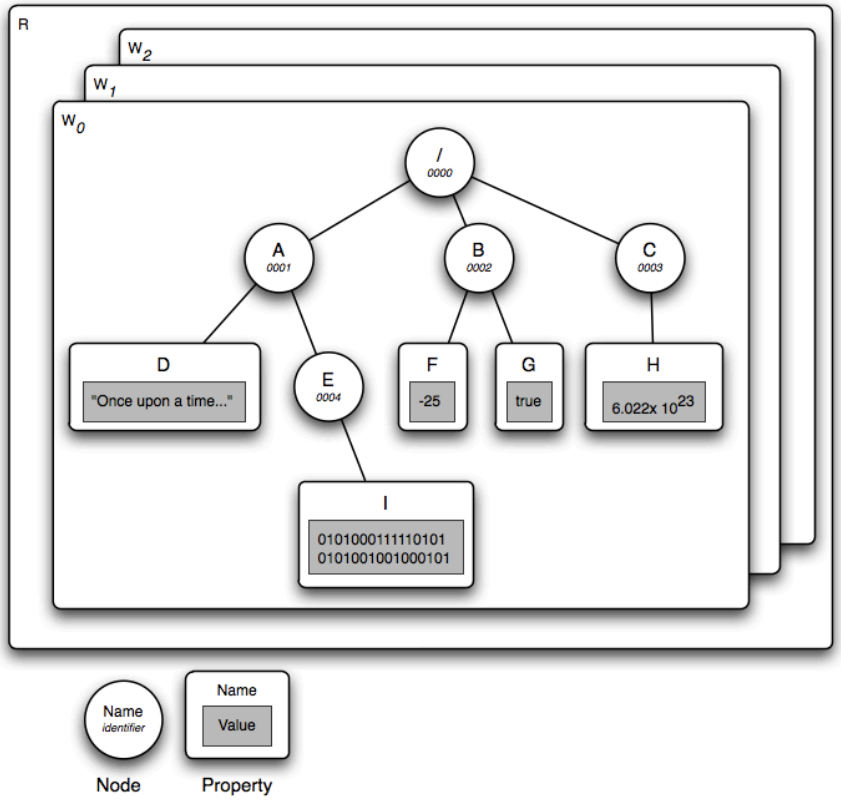
JCR – The Standards

- JCR 1.0 (JSR-170; final version released in 2005):
  - Level 1: defines a read-only repository, including introspection of content-type definitions, export of content to XML and searching
  - Level 2: writing content, assignment of types to content, reference tracking and integrity and importing content from XML
- JCR.2.0 (JSR-283; final version released in 2009):
  - Query extensions: Abstract Query Model, Java Query Object Model, SQL (Xpath queries deprecated)
  - Shareable nodes
  - All features implemented in Apache Jackrabbit (August 2009)
- JCR 2.1 (JSR-333; not final yet):
  - Small API improvements
  - PHPCR

The JCR repository model (1)

- Repository
  - consists of one or more workspaces
  - provides access to the workspaces through sessions
- Workspace
  - is a directed acyclic graph of items
  - is identified by a unique name
  - holds at least one item, which is a root node



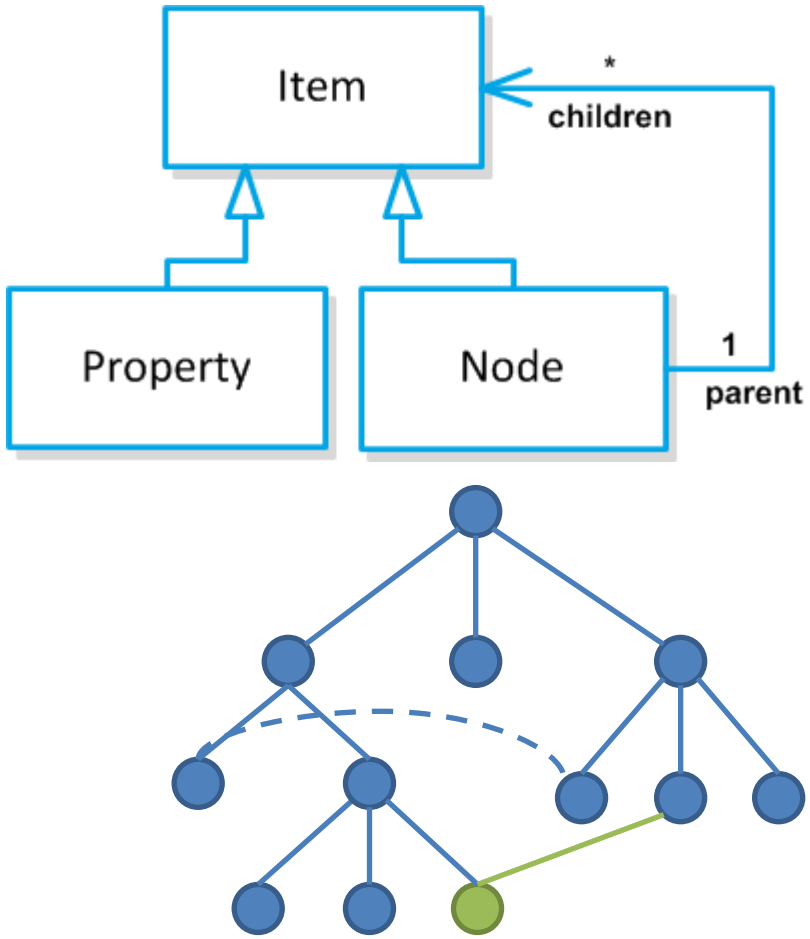
- R = Repository
- $W_{0..2}$ = Workspaces

The JCR repository model (2)

- Session
  - Binds the user to the exactly one requested Workspace
  - Workspace can be bound to multiple sessions
  - Defines the level of authorization based on the users credentials
  - Provides CRUD operations on the nodes of the bound workspace

The JCR repository model (3)

- Item
  - is an abstraction level model
  - can be a node or a property
- Nodes
  - form the structure of the data
  - may have zero or more properties
  - always have a parent node, except for the root node
  - always have one primary node type
  - may have zero or more mixin types
- Properties
  - hold the actual data
  - can be single or multi-valued
  - have one of 12 possible types (string, boolean, data, reference, etc.)



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The JCR repository model (4) – Node types

- Node types
  - enforce structural restrictions on the node and its properties
  - can be declared as mixins, which is a boolean flag on the node type definition
- Primary node types
  - define the core characteristics of a node
- Mixin types
  - add additional characteristics, related to specific functions or metadata

The JCR repository model (5) – Example node

contact

jcr:primaryType	nt:unstructured
name	Max Mustermann
position	Manager
department	Human Resources
jcr:created	2014-03-11T11:03:11

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Versioning

- History of content's changes
- Version – saved state of content
- The process of saving a certain state of content is called "checkin"
  - The node has a mixin "mix:versionable"
  - The node was previously "checked out"
- Version of a node includes the node's children

Observation

- Notification of persistent changes to a workspace
- Asynchronous observation
  - respond to changes made in a workspace as they occur
- Journaled observation
  - report of changes that have occurred since some specified point in the past
- Event driven
  - NODE_ADDED
  - NODE_MOVED
  - NODE_REMOVED
  - PROPERTY_ADDED
  - PROPERTY_REMOVED
  - PROPERTY_CHANGED

Security

- Access Control Management
  - Privilege discovery
  - Assigning access control policies
- Privilege
  - Set of operations on a node
  - JCR API defines standard privileges
- Access Control Policies
  - Grant privileges to users
  - Semantics are implementation specific

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Search

- Query for content that meets user-defined criteria
- JCR 2.0 enables support for multiple query languages
  - specifies JCR-SQL2 and JCR-QOM
- JCR 1.0 specified
  - XPATH
  - JCR-SQL
- Provides Query API to perform all query operations

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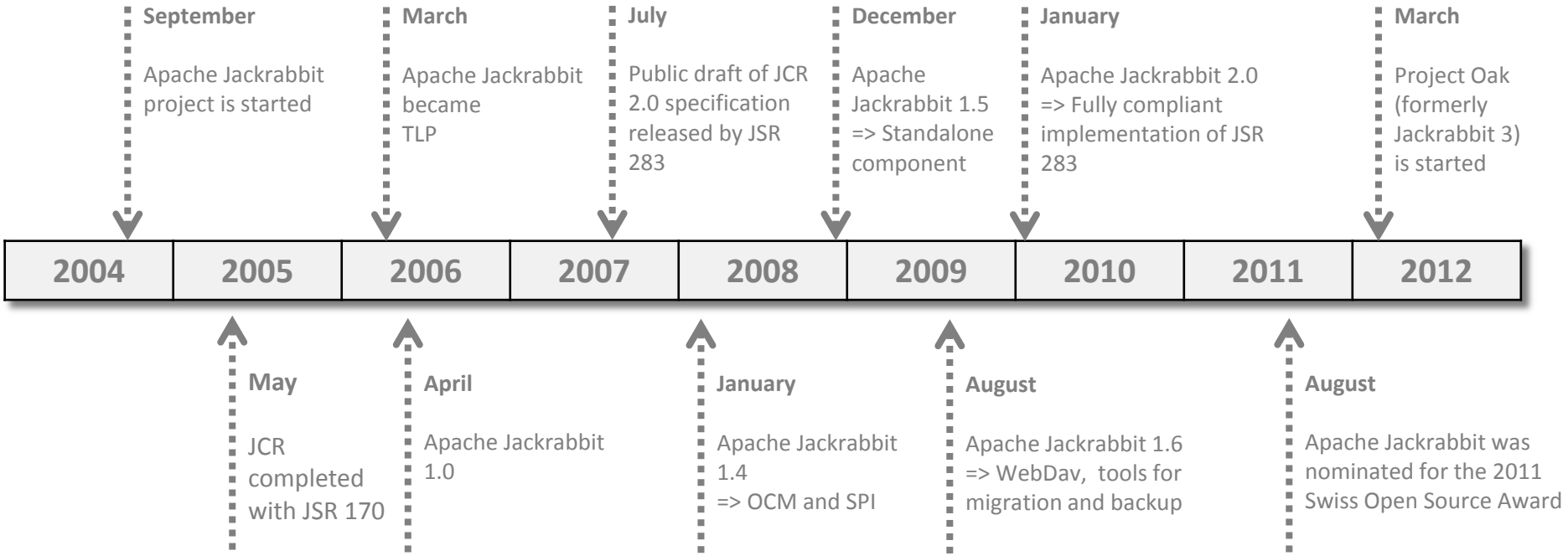
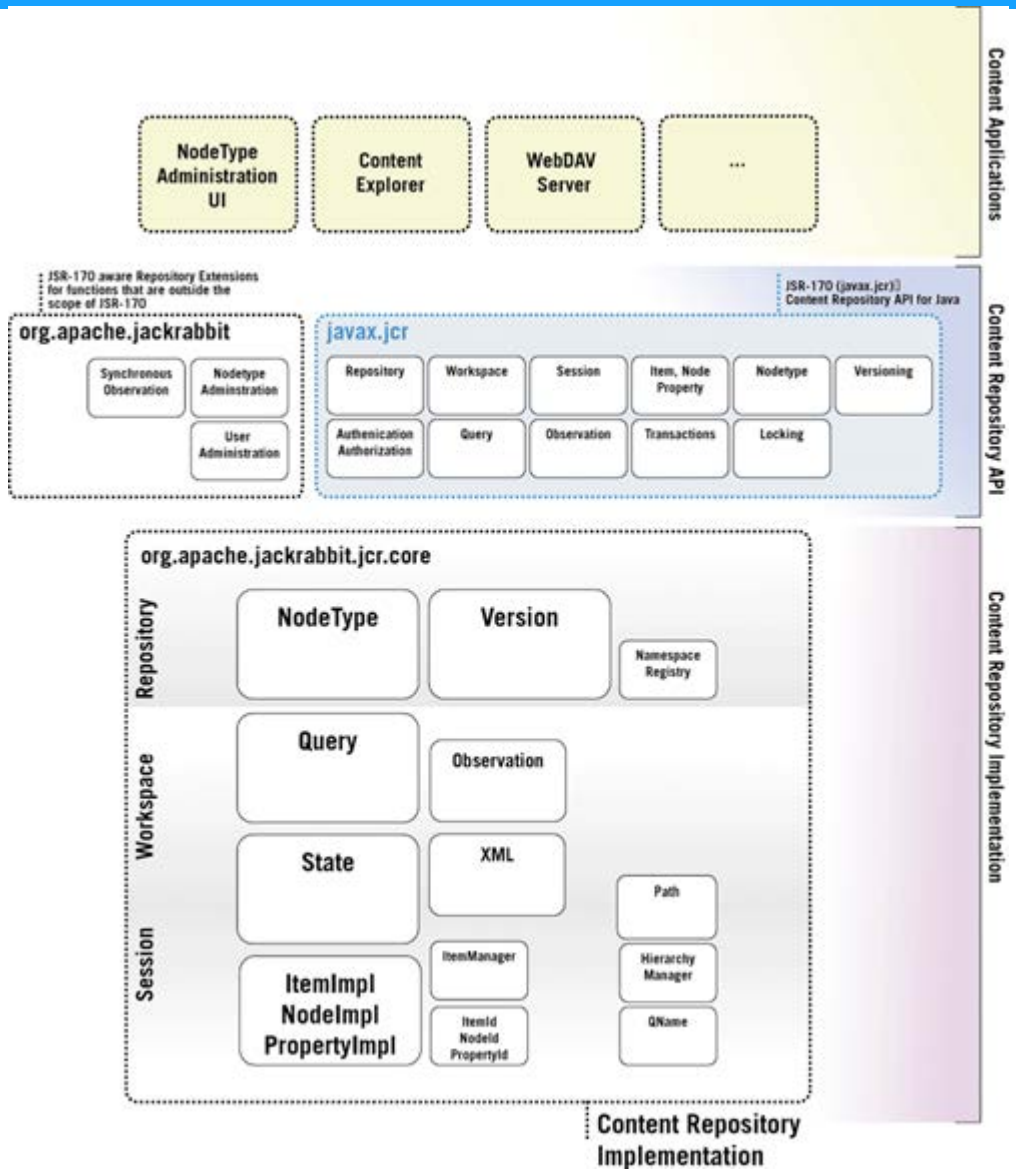
What is Apache Jackrabbit

- Top-level project of the Apache Software Foundation
- Current release: Apache Jackrabbit 2.5 (June 2nd, 2012)
  - Jackrabbit OAK
- Open Source Content Repository
- Supports storing, accessing and managing content
- Supports structured and unstructured content
- Fulfills both level of JCR compliance
- Reference Implementation of JCR
- http://jackrabbit.apache.org/

Timeline

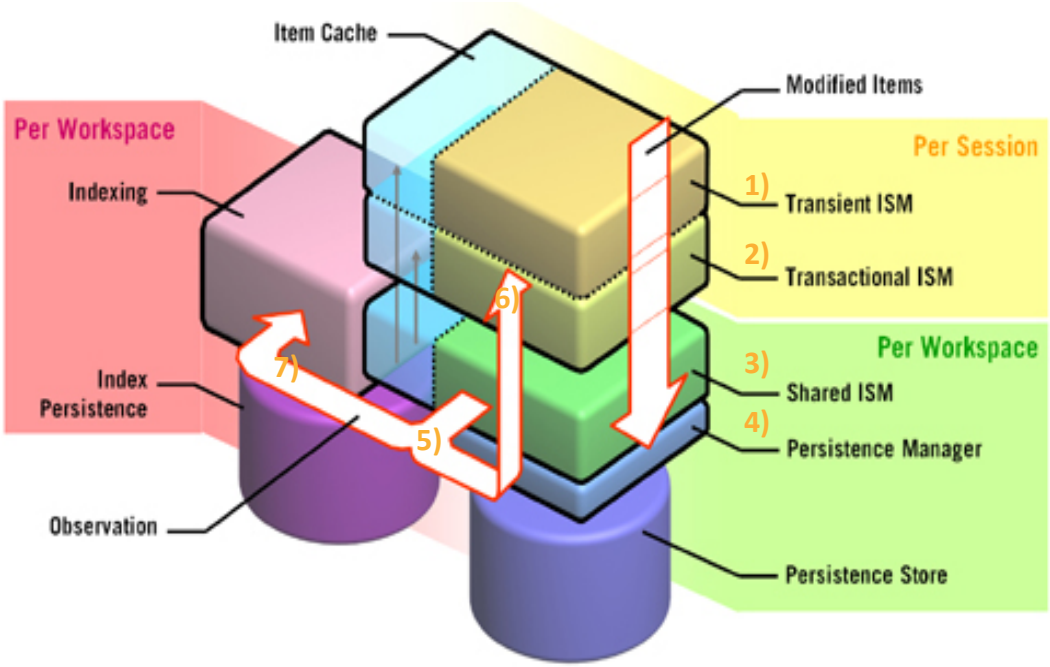

September
Apache Jackrabbit project is started
March
Apache Jackrabbit became TLP
July
Public draft of JCR 2.0 specification released by JSR 283
December
Apache Jackrabbit 1.5 => Standalone component
January
Apache Jackrabbit 2.0 => Fully compliant implementation of JSR 283
March
Project Oak (formerly Jackrabbit 3) is started
2004
2005
2006
2007
2008
2009
2010
2011
2012
May
JCR completed with JSR 170
April
Apache Jackrabbit 1.0
January
Apache Jackrabbit 1.4 => OCM and SPI
August
Apache Jackrabbit 1.6 => WebDav, tools for migration and backup
August
Apache Jackrabbit was nominated for the 2011 Swiss Open Source Award

Jackrabbit architecture (1)



Jackrabbit architecture (2)

1. Modified items cached
2. Saved items promoted
3. Committed items notified
4. Committed items persisted
5. Observation triggered
6. Applications subscribe changes
7. New/Modified Items indexed



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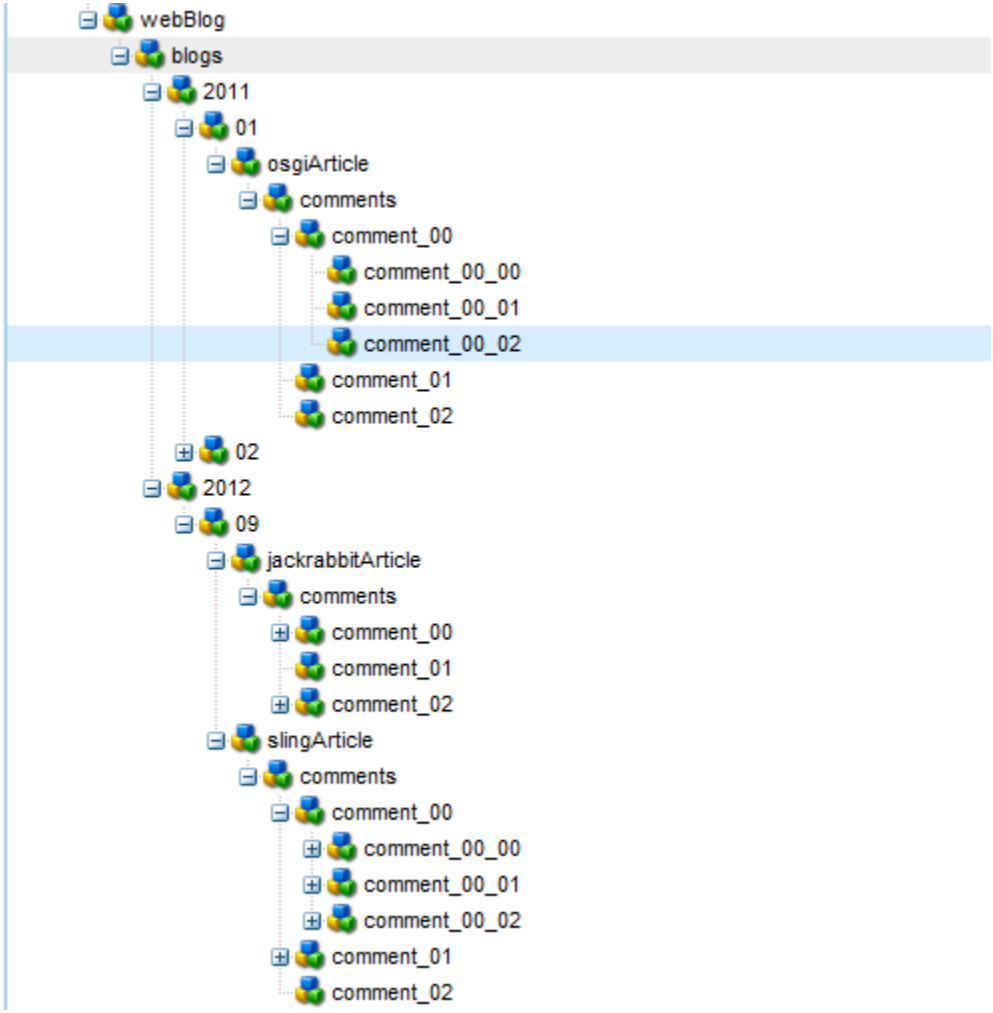
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Thank you for your attention!

Any questions?