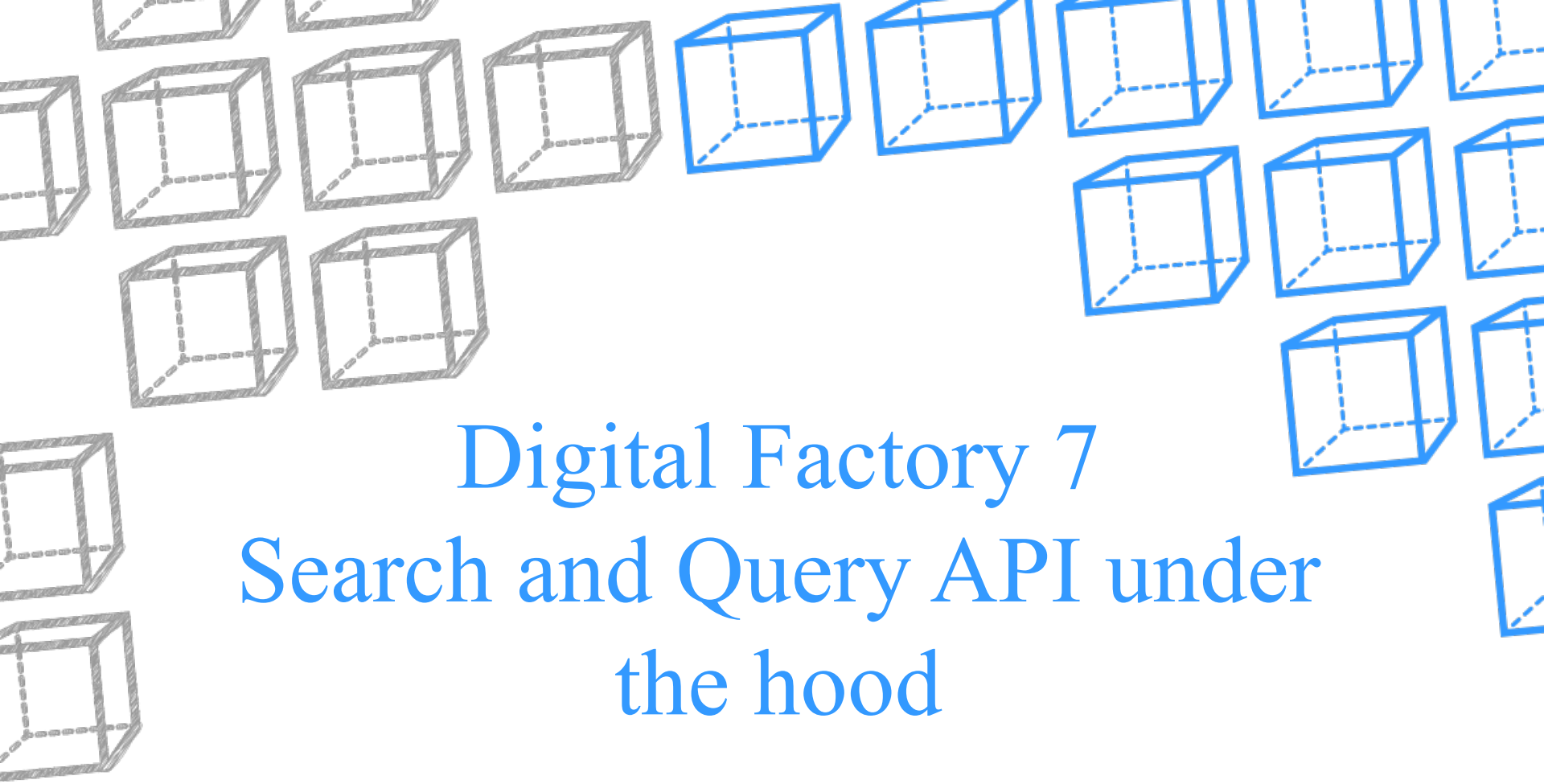

Digital Factory 7
Search and Query API under the hood

#jahiaone

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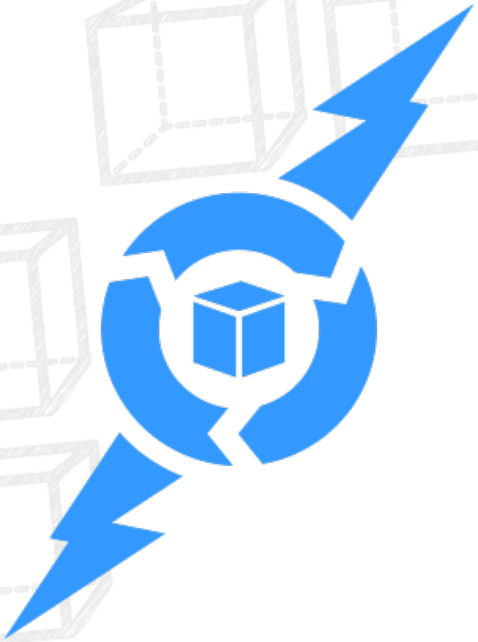
Search and Query API under the hood

- Overview on used search engine frameworks and API
- Jahia's extensions to the Jackrabbit search engine
- Maintenance tools and utilities
- What's new in Digital Factory 7
- Query tuning and general tips
- Questions?



Digital Factory: Search&query API under the hood

Overview on used search engine frameworks and API

Jackrabbit extends Lucene

- Improve performance for frequent index updates
- Parse SQL-2, Xpath, QOM to create Lucene syntax queries
- Support hierarchical queries
- Support joins
- Configure index rules, aggregates, analyzers…

Search and query tags / API in Digital Factory

Search tags / API

- Site, document repository and subsection search using full text and simple metadata constraints
- Returns list of hit objects (URL, excerpt, content node, score, references) sorted by score
- HTML form creation via JSP tags. Predefined search result snippet.
- OpenSearch and spellcheck support

Query tags / API

- More flexible, supports all JCR 2.0 query functions (SQL-2, QOM, Xpath)
- Returns iterator through found content nodes or row objects
- No form creation. Provides some edit mode components.

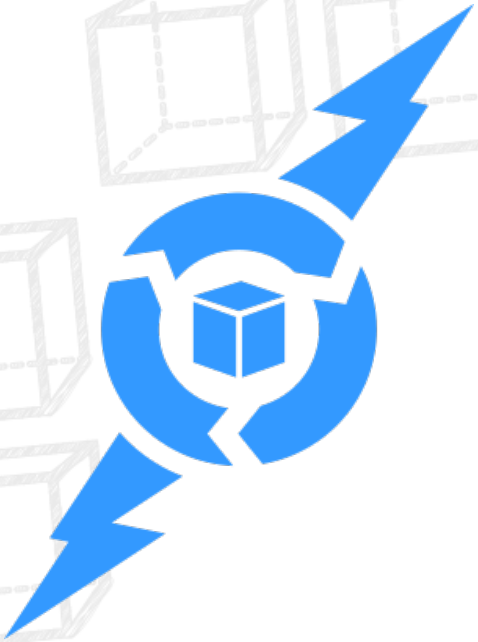
Query tags and API

SQL-2, QOM based

- Automatically handles multilingual content specifics
- Supports faceting
- No support for retrieving excerpts and spellcheck suggestions

Xpath based

- No automatic multilingual content handling
- No support for faceting
- Support for retrieving excerpts (with result highlighting) and spellcheck suggestions



Digital Factory: Search&query API under the hood

Jahia‘s extensions to the Jackrabbit search engine

Handle multilingual content

- Jahia's datamodel stores i18n properties in j:translation_* subnodes

```
[mix:title] mixin
  - jcr:title (STRING) i18n boost=2.0

[jnt:event] > jnt:content, mix:title
 - startDate (date) facetable
 - endDate (date) facetable
 - location (string) i18n facetable
 - eventsType (string) facetable
 - body (string, richtext) i18n
```

This implementation choice is not visible from looking at CND or using Content manager/picker and Jahia JCR API.
Should also not influence queries!

Path: /sites/ACME-SPACE/home/events/events/event_12	
jcr:uuid	97455502-b94f-49e9-a675-28a083151514
jcr:primaryType	jnt:event
startDate	2012-07-07 00:00:00
endDate	2012-07-08 00:00:00
eventsType	show

Path: /sites/ACME-SPACE/home/events/events/event_12/j:translation_en	
jcr:uuid	26896702-d44d-47d2-a8ab-2ac0afbf506c
jcr:primaryType	jnt:translation
jcr:language	En
jcr:title	Launch of a new satellite
body	[raw: length=1318] Lorem ipsum...
location	Cap canaveral

Handle multilingual content

- Indexing modifications
  - Non-i18n properties are copied down to fields of all translation node's Lucene documents
    - Some properties are excluded (`j:locktoken`, `jcr:lockIsDeep`, `jcr:lockOwner`, `jcr:language`, `jcr:created`, `jcr:createdBy`, `jcr:lastModified`, `jcr:lastModifiedBy`, `j:lastPublished`, `j:lastPublishedBy`, `j:published`)
    - Primary nodetype and mixin types of main node are also copied
  - Special fields in document: `_:TRANSLATION_LANGUAGE` and `_:TRANSLATED_PARENT` (`_:PARENT` field of translated node document points to grand-parent)
  - A change in the main node state automatically triggers re-indexing of translation nodes

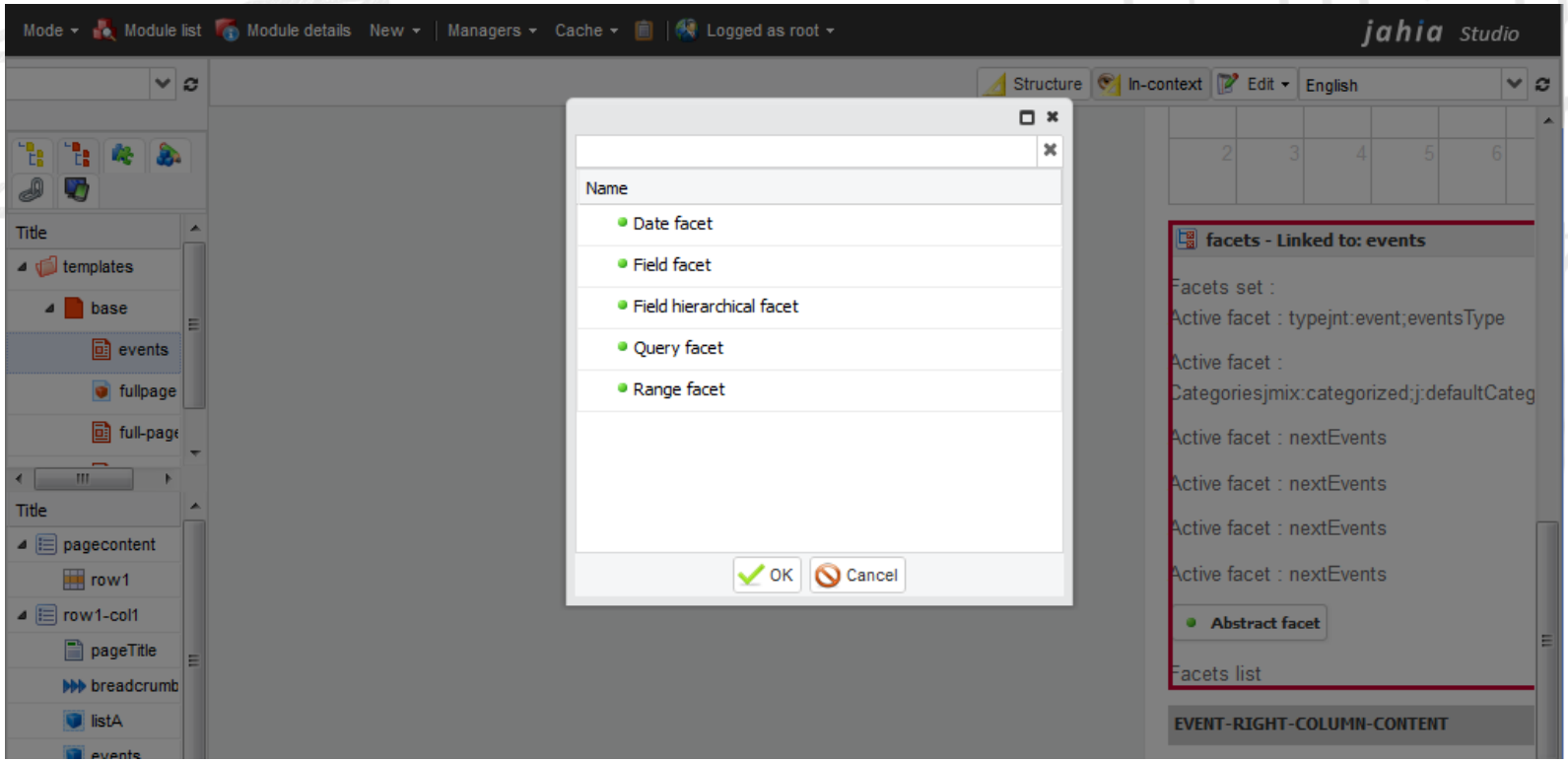
Handle multilingual content

- Query modifications
  - Adding current language constraint into queries (SQL-2, QOM)
  - Excluding translation nodes from child- or descendant-node queries
  - In SameNode or ChildNode join comparisons main and translation nodes are treated as they would be the same nodes (UUID)
  - In search results we filter out multiple results per node (due to translation node)
  - When sorting results, the position of the translation node overrules the position of the main node

Faceting support (SQL-2,QOM)

- Integrate Apache Solr
  - `SimpleJahiaJcrFacets` based on Solr's `SimpleFacets` class
  - Reuse solr-common module and use exactly same facet query syntax and result objects as Solr does
- `facetable` fields (set in CND) are prefixed with `FACET:` in Lucene document
  - Analyzed with `KeywordAnalyzer`
  - Date values are indexed with a Solr internal representation
- For `hierarchical` fields (set in CND) we additionally add a `_:FACET_HIERARCHY` field with setting all the parent UUID nodes (implemented for categories, could be used for other hierarchies)

Faceting support



Facets can be added in Studio or Edit mode or even used programmatically

Count support

- JCR specification does not support „select count“
- In JCR there is just RangeIterator.getSize()
  - returns -1 when precise information is not available
  - Performance/memory overhead as all result objects are created and access rights checked

- Digital Factory introduces a rep:count() function:

```
select count AS
    [rep:count(skipChecks=1;approxCountLimit=1000)]
  from [jnt:file]
  where isdescendantnode('/sites/ACME-SPACE')
```

`skipChecks` to skip ACL and visibility checks
`approxCountLimit` to get an approximate count

Query performance improvements

- Access control checks
- Visibility rule checks
- Publication status check
  - Added special fields to index (`_:ACL_UUID`, `_:CHECK_VISIBILITY`, `_:PUBLISHED`)
  - Possible lazy loading of JCR nodes
  - Same read rights and visibility rules are resolved only once

Improved text extraction

- Text extraction from documents is done asynchronously triggered by Quartz scheduler
- Extracted text is stored as property in jnt:content node
  - Prevent recurring text extraction on re-indexing, publication, mark for deletion,…
- Extract text from richtext field using Apache Tika (remove HTML markup)

Indexing related keywords in content definition (CND)

Keyword	Description
`nofulltext`	property should be excluded from full text search
`indexed="no"`	property should not be indexed at all as queries are never done on it
`scoreboost=2.0`	allows specifying the boost factor or "weight" for the property value

- Jackrabbit otherwise only controls these indexing settings via indexing_configuration.xml
  - with the ability to use some rules
  - better to use that configuration when you want to override our default property definitions
  - Check: http://wiki.apache.org/jackrabbit/IndexingConfiguration

Digital Factory Query JSP tags

- jcr:sql

```
<jcr:sql var="result"
  sql="select * from [jnt:virtualsite] as site
       where isdescendantnode(site,'/sites')"/>

<c:forEach items="${result.nodes}" var="node">
```

- jcr:xpath

```
<jcr:xpath var="result"
xpath="/jcr:root/sites/${functions:xpathPathEncode(renderConte
xt.site.name)}/${functions:xpathPathEncode(descendantNode)}//e
lement(*, jnt:file)[not(@jcr:language)] order by
@jcr:lastModified descending"/>

<c:forEach items="${result.nodes}" var="node">
```

Digital Factory Query JSP tags

- jcr:qom

```
<jcr:jqom var="result" scope="request">
  <query:selector nodeTypeName="nt:base"/>
  <query:descendantNode
      path="${renderContext.mainResource.node.path}"/>
  <query:column propertyName="j:tags"
      columnName="rep:facet(nodetype=jmix:tagged
                  &key=j:tags&facet.sort=true)"/>
</jcr:jqom>

<c:forEach items="${result.nodes}" var="node">
```

Digital Factory Query REST API

- Find servlet

`http://www.jahia.com/community/documentation/jahia-modules/rest.html#Find`

- OpenSearch integration

`http://www.jahia.com/community/documentation/jahia-modules/search/openSearch.html`

Digital Factory Search JSP tags

```
<%@ taglib prefix="s" uri="http://www.jahia.org/tags/search" %>
…
<c:url value='${url.base}${currentNode.properties.result.node.path}.html'
       var="searchUrl"/>
<s:form method="post" class="simplesearchform" action="${searchUrl}">
    <s:site value="${renderContext.site.name}" display="false"/>
    <s:pagePath value="${searchPath}" display="false" includeChildren="true"/>
    <s:nodeType value="${searchType}" display="false" />
    <s:language value="${renderContext.mainResource.locale}" display="false" />
    <s:term id="searchCustomTerm" class="text-input" value="Search…"
         match="all_words" searchIn="siteContent,tags"
         onfocus="if(this.value==this.defaultValue)this.value='';"
         onblur="if(this.value=='')this.value=this.defaultValue;"/>
    <s:nodeProperty nodeType="jmix:categorized" name="j:defaultCategory"
                    id="searchCategories"/>
    <input type="submit" title="Submit" value=""/>
</s:form>
```

- Default search results (can be overridden):

`modules\search\src\main\resources\jnt_searchResults\html\searchResults.jsp`

Digital Factory Search API

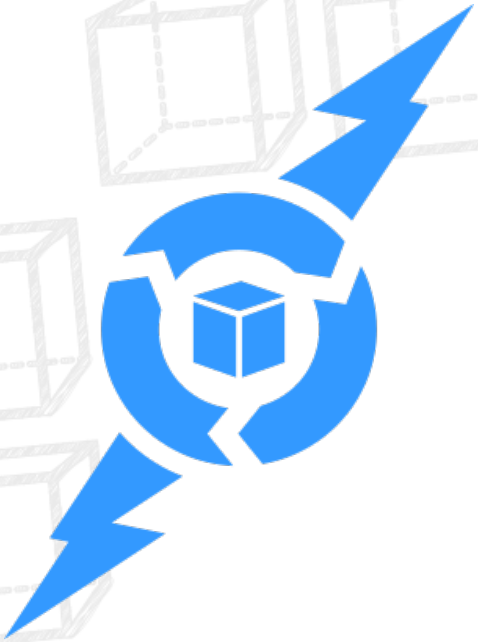
```
RenderContext context = getContext();

CommaSeparatedMultipleValue oneSite =
    new CommaSeparatedMultipleValue();
oneSite.setValue(“mySite”);
CommaSeparatedMultipleValue frenchLang =
    new CommaSeparatedMultipleValue();
frenchLang.setValue("fr");

SearchCriteria criteria = new SearchCriteria();
criteria.setSites(oneSite);
criteria.setLanguages(frenchLang);
criteria.getTerms().get(0).setTerm("ACME");
criteria.getTerms().get(0).getFields().setSiteContent(true);
List<Hit<?>> hits = searchService.search(criteria,
context).getResults();
```

Digital Factory Search API

- Custom search result excerpts
  - Custom display (CSS class)
  - Custom excerpt if search term found in tags, category

```
<param name="excerptProviderClass“
        value="org.jahia.services.search.jcr.HTMLExcerpt"/>
```

- Spellchecker (Did you mean)
  - Creates dictionary per site and language
  - Used to suggest terms if current search produces too few results.
  - Spellchecker is able to return more than one suggestion (configurable)
  - Limitation if multiple search terms are used and multiple have more than one suggestion, then only one suggestion is returned



Digital Factory: Search&query API under the hood

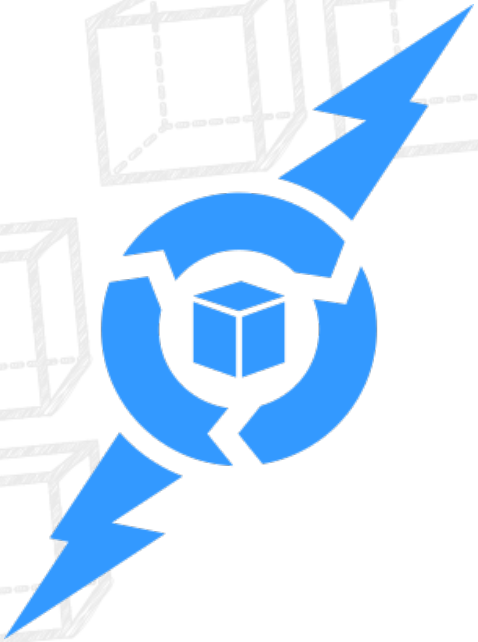
Maintenance tools and utilities

Maintenance tools

- In the Digital Factory tools area there are some query/search related tools
  - JCR Query tool
    - Very useful to test queries and measure there performance
    - Possibility to run actions on the results (deletion, purge unused versions)
  - Search engine management
    - Check index consistency or trigger re-indexing
  - Document text extractor
    - Extract and show content from uploaded documents

Other query/search utilities

- Auto-completion
  - Service offers auto-completion suggestions for typing in fields with short property values (users, categories, tags,…)
- Auto-tagging
  - Simple solution used in Wise (parse document and automatically assign tags from an uploaded dictionary of tags)
- Soon on the forge
  - Apache Stanbol integration (for entity extraction, auto-tagging)
  - Digital Factory Crawler (using Nutch)
  - Similarity search, MoreLikeThis module
  - Synonym search module



Digital Factory: Search&query API under the hood

What‘s new in Digital Factory 7

Framework version upgrades

- Apache Jackrabbit (from 2.2.4 to 2.4.5)
  - Query related performance improvements and bug fixes
  - Lucene native sort in SQL-2
- Apache Lucene (from 2.4.1 to 3.0.3)
  - Performance improvement
  - Less memory usage (no huge byte arrays for norms)
- Apache Solr (from 1.3.0 to 3.1.0)
  - Performance improvement
  - New range facet type (not only date, also other kind of ranges)

Language dependent analyzers

- Indexing of i18n full text properties is now done with the corresponding language specific Lucene analyzer (`org.apache.lucene.analysis.*`)
- Default analyzers can be overridden or new ones added

```
<analyzer-registry>
  <en_US class="org.apache.lucene.analysis.standard.StandardAnalyzer">
    <customizer class="org.mycomp.query.lucene.AnalyzerCustomizer">
      <foo>bar</foo>
      <foo>bar2</foo>
      <key>value</key>
    </customizer>
  </en_US>
</analyzer-registry>
```

- Same language dependent analyzers are used to analyze full text search terms in queries

External data provider

- Same query syntax and API is used to run queries on mapped external data provider
- Results from different data providers are merged
- Search also in extended external data

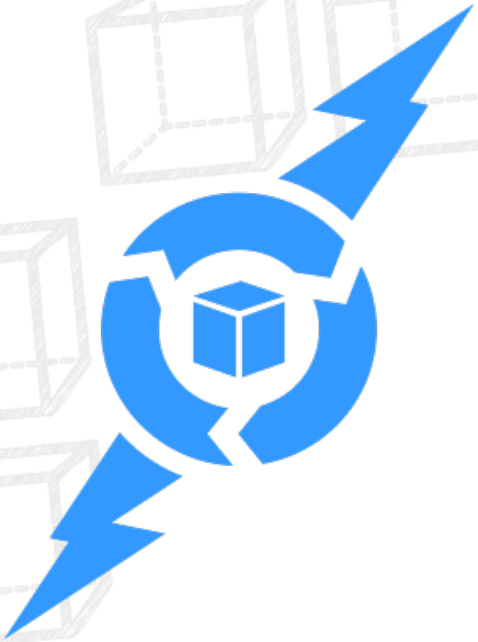
Other new features

- Limit Spellchecker dictionary creation to content of particular properties

```
<spellchecker>
   <include-property>jcr:title</include-property>
</spellchecker>
```

- Store extracted text as binary instead of String
  - Before: huge String properties were always loaded to memory, but only used for indexing

- JCR Query statistics in tools area
  - List slowest and most popular queries



Digital Factory: Search&query API under the hood

Query tuning and general tips

Ensure that queries perform

- Test duration of queries with the „JCR Query tool“ using production data or a similar test environment
- On Jahia xCM 6.6.x avoid SQL-2 queries with order by a property and a large result-set
- Xpath sometimes perform better than SQL-2
- Avoid that a query is executed too often (e.g. when using top-pager and bottom-pager we store query result in request)
- Avoid cache.expiration=0 on components with queries
- Make use of the „JCR Query statistic“ tool to identify slow or often used queries

Use available features

- Use rep:count() instead of iterating through results

- If you need a „select distinct“ feature (which is not supported in JCR), you could use faceting programmatically:

```
select ace.[j:roles] AS [rep:facet(facet.mincount=1)]
  from [jnt:ace] as ace
  where ace.[j:aceType]='GRANT' and
    ace.[j:principal] = '"+fPrincipal+"' and
    isdescendantnode(ace, ['"+site.getPath()+"'])
```

How to enable multiple search hits per page

- Create a template for the nodetype, which should show as distinct search result

```
<news-template j:applyOn="jnt:news" j:defaultTemplate="true"
     j:priority="100" jcr:primaryType="jnt:contentTemplate">
```

- Or trigger URL modification rules

```
rule "Event search result hit"
  when
    A search result hit is present
      - the node is of type jnt:event
  then
    Append URL query-parameter "filter" with
      getEventPageFilter((JCRNodeWrapper)searchHit.getRawHit())
    Append URL query-parameter "calStartDate" with
(DateFormatUtils.format(((JCRNodeWrapper)searchHit.getRawHit())
.getProperty("startDate").getDate(), "yyyy-MM-dd"))
end
```

Escaping path and fulltext search terms

- SQL-2

```
<jcr:sql var="result"
  sql="select * from [jnt:post] as post
      where isdescendantnode(post,
            ['${functions:sqlencode(currentNode.path)}']) and
      contains(post.*, '${functions:sqlencode(searchString)}')"/>
```

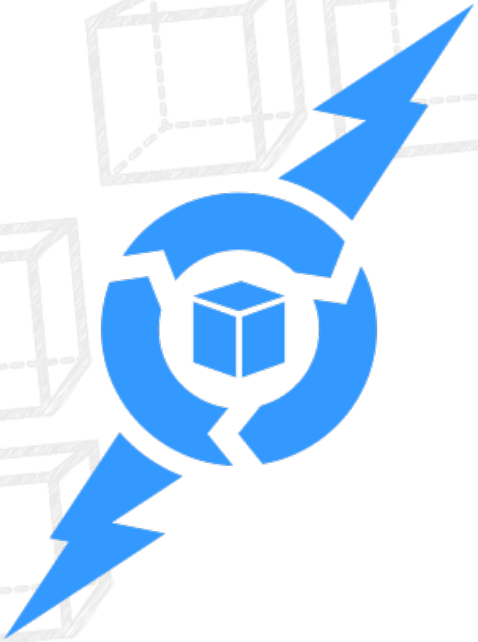
- Xpath

```
<jcr:xpath var="result"
xpath="/jcr:root/sites/${functions:xpathPathEncode(renderContext.
site.name)}/${functions:xpathPathEncode(descendantNode)}//element(
*, jnt:file)
[jcr:contains(., ${functions:xpathSearchEncode(searchString)})]"/>
```

Queries on multiple nodetypes

- Rather (define and) use a common mixin
- Use joins in SQL-2 / QOM
- Add constraints on jcr:primaryType property

```
select * from [jnt:content]
  where ([jcr:primaryType] = 'jnt:contentReference' or
         [jcr:primaryType] = 'bnt:article' …
```



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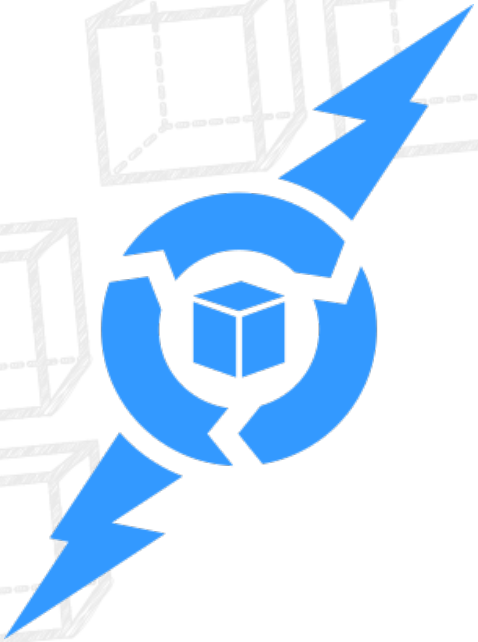
Questions?



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Stop searching, you found it

Thank you for your attention

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