Apache CXF, Tika and Lucene

The power of search the JAX-RS way

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About myself

- Passionate Software Developer since 1999
- On Java since 2006
- Currently employed by **AppDirect** in Montreal
- Contributing to **Apache CXF** project since 2013

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What this talk is about …

- REST web APIs are everywhere
- JSR-339 / JAX-RS 2.0 is a standard way to build RESTful web services on JVM
- Search/Filtering capabilities in one form or another are required by most of web APIs out there
- So why not to bundle search/filtering into REST apps in generic, easy to use way?

Meet Apache CXF

- Apache CXF is very popular open source framework to develop services and web APIs on JVM platform
- The latest **3.0** release is (as complete as possible) JAX-RS 2.0 compliant implementation
- Vibrant community, complete documentation and plenty of examples make it a great choice

Apache CXF Search Extension (I)

- Very simple concept build around customizable **_s / _search** query parameter
- At the moment, supports Feed Item Query Language (FIQL) expressions and OData 2.0 URI filter expressions

http://my.host:9000/api/people?_search=

"firstName eq 'Bob' and age gt 35"

FIQL

- The Feed Item Query Language
- IETF draft submitted by M. Nottingham on December 12, 2007 https://tools.ietf.org/html/draft-nottingham-atompub-fiql-00
- Fully supported by Apache CXF

_search=firstName==Bob;age=gt=35

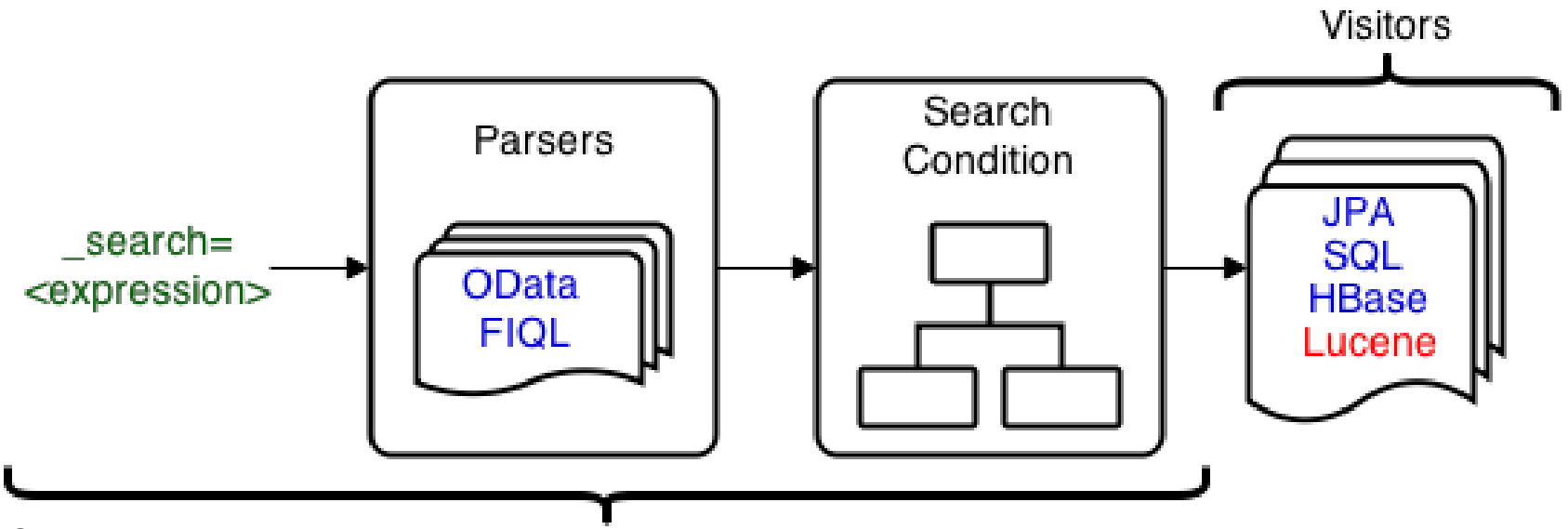
OData 2.0

- Uses OData URI **$filter** system query option http://www.odata.org/documentation/odata-version-2-0/uri-conventions
- Built on top of **Apache Olingo** and its **FilterParser** implementation
- Only **subset** of the operators is supported (matching the **FIQL** expressions set)

_search="firstName eq 'Bob' and age gt 35"

Apache CXF Search Extension (II)

- Under the hood …




```
@GET
@Produces( { MediaType.APPLICATION_JSON  } )
public Response search(@Context SearchContext context) {
    ...
}
```

Apache Lucene In Nutshell

- Leading, battle-tested, high-performance, full-featured text search engine
- Written purely in Java
- Foundation of many specialized and general-purpose search solutions (including Solr and Elastic Search)
- Current major release branch is **5.x**

Apache CXF Search Extension (III)

- **LuceneQueryVisitor** maps the search/filter expression into Apache Lucene query
- Uses **QueryBuilder** and is analyzer-aware (means stemming, stop words, lower case, … apply if configured)
- Apache Lucene **4.7+** is required (**4.9**+ recommended)
- **Subset** of Apache Lucene queries is supported (many improvements in upcoming **3.1** release)

Lucene Query Visitor

- Search conditions are type-safe but also support key/value map (aka **`SearchBean`**)

```
@GET
@Produces( { MediaType.APPLICATION_JSON  } )
public Response search(@Context SearchContext context) {
    final LuceneQueryVisitor< SearchBean > visitor =
        new LuceneQueryVisitor< SearchBean >(analyzer);
    visitor.visit(context.getCondition(SearchBean.class));

    final IndexReader reader = ...;
    final IndexSearcher searcher = new IndexSearcher(reader);
    final Query query = visitor.getQuery();

    final TopDocs topDocs = searcher.search(query, 10);
    ...
}
```

Supported Lucene Queries

- **TermQuery**
- **PhraseQuery**
- **WildcardQuery**
- **NumericRangeQuery** (int / long / double / float)
- **TermRangeQuery** (date)
- **BooleanQuery** (or / and)

TermQuery Example

FIQL

_search=firstName==Bob

OData

_search="firstName eq 'Bob'"

firstName:bob

* the term is **lower-cased** (analyzer dependent)

PhraseQuery Example

FIQL **_search=content=='Lucene in Action'**

OData **_search="content eq 'Lucene in Action'"**

content:"lucene ? action"

* **in** is typically a stopword and is replaced by **?**

WildcardQuery Example

FIQL

_search=firstName==Bo*

OData

_search="firstName eq 'Bo*'"

firstName:Bo*

NumericRangeQuery Example

FIQL

_search=age=gt=35

OData

_search= "age gt 35"

age:{35 TO *}

* the type of **age** property should be numeric

```
visitor.setPrimitiveFieldTypeMap(singletonMap("age", Integer.class))
```

TermRangeQuery Example

FIQL **_search=modified=lt=2015-10-25**

OData **_search= "modified lt '2015-10-25'"**

modified:{* TO 20151025040000000}

* the type of **modified** property should be date

```
visitor.setPrimitiveFieldTypeMap(singletonMap(“modified", Date.class))
```

BooleanQuery Example

FIQL **_search=firstName==Bob;age=gt=35**

OData **_search= "firstName eq 'Bob' and age gt 35"**

+firstName:bob +age:{35 TO *}

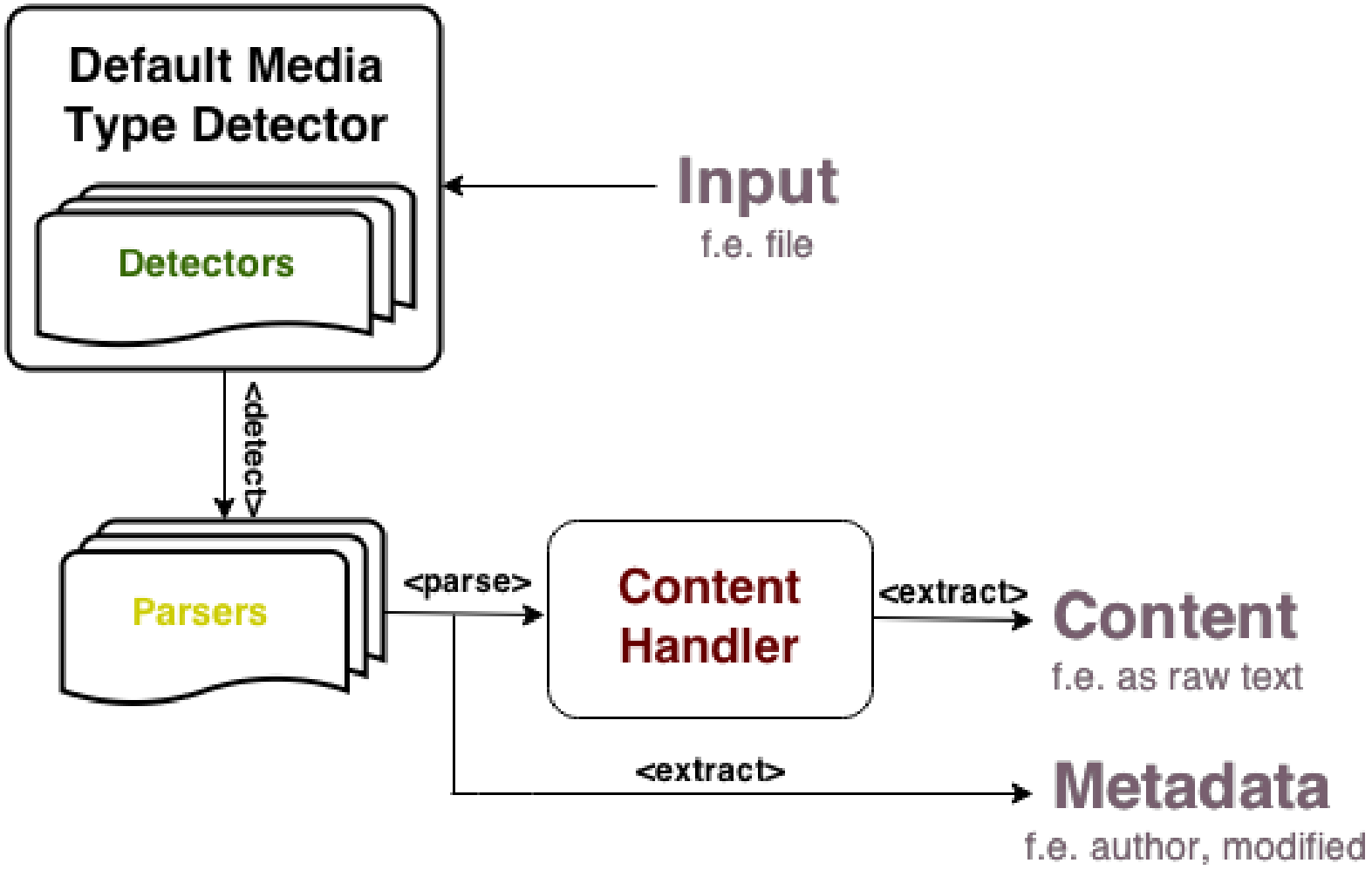
From “How …” to “What …”

- Files are still the most widespread source of valuable data
- However, most of file formats are either binary **(*.pdf, *.doc, …)** or use some kind of markup **(*.html, *.xml, *.md, …)**
- It makes the search a difficult problem as the raw text has to be extracted and only then indexed / searched against

Apache Tika

- **Metadata** and **text** extraction engine
- Supports myriad of different file formats
- Pluggable modules (parsers), include only what you really need
- Extremely easy to ramp up and use
- Current release branch is **1.7**

Apache Tika in Nutshell



Text Extraction in Apache CXF

- Provides generic **TikaContentExtractor**

```
public class TikaContentExtractor {
    public TikaContent extract(final InputStream in) {
        ...
    }
}
```

- Also has specialization for Apache Lucene, **TikaLuceneContentExtractor**

```
public class TikaLuceneContentExtractor {
    public Document extract(final InputStream in) {
        ...
    }
}
```

And finally, indexing …

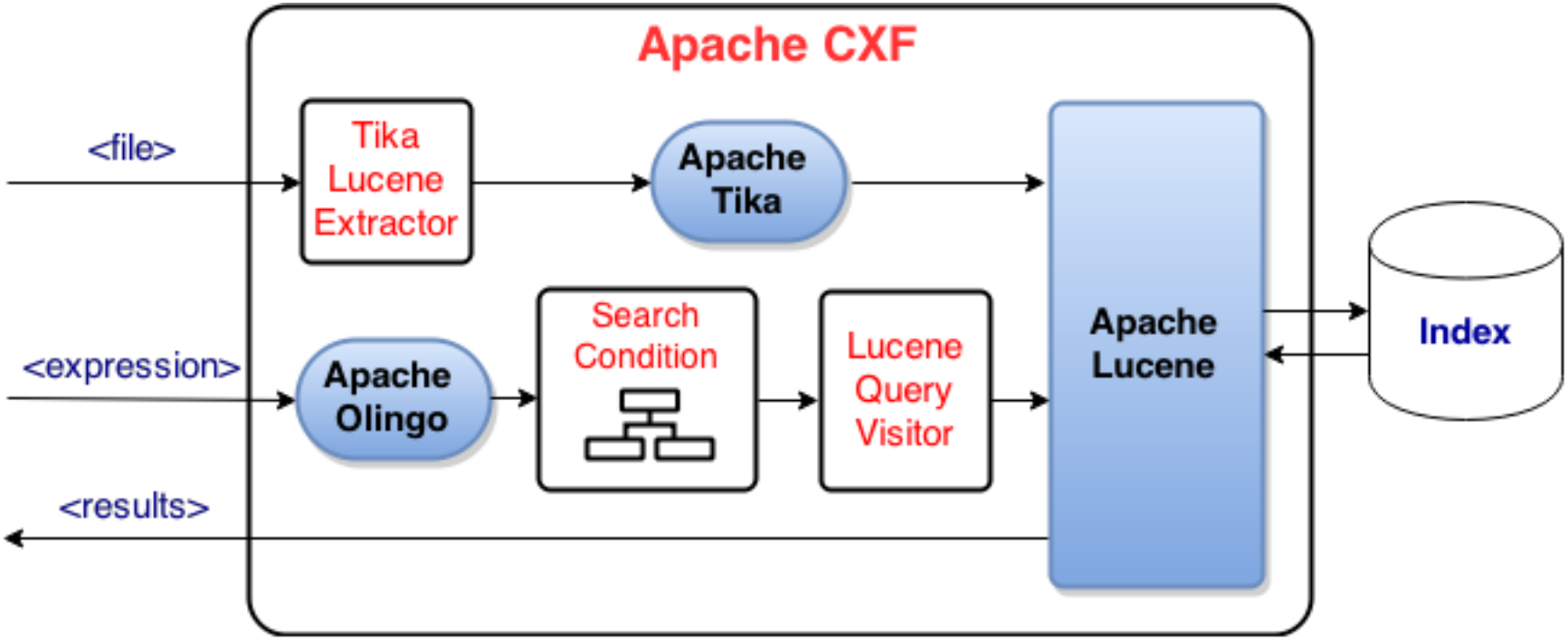
- The **text** and **metadata** extracted from the file could be added straight to Lucene index

```
final TikaLuceneContentExtractor extractor =
    new TikaLuceneContentExtractor(new PDFParser());

final Document document = extractor.extract(in);
final IndexWriter writer = ...;

try {
    writer.addDocument(document);
    writer.commit();
} finally {
    writer.close();
}
```

Demo

https://github.com/reta/ApacheConNA2015

Demo: Gluing All Parts Together …



Apache CXF Search Extension (IV)

- Configuring expressions parser

  search.parser.class=ODataParser

  search.parser=new ODataParser()
- Configuring query parameter name

  search.query.parameter.name=$filter
- Configuring date format

  search.date-format=yyyy/MM/dd

Alternatives

- **ElasticSearch**: is a highly scalable open-source full-text search and analytics engine (http://www.elastic.co/)
- **Apache Solr**: highly reliable, scalable and fault tolerant open-source enterprise search platform (http://lucene.apache.org/solr/)

These are dedicated, best in class solutions for solving difficult search problems.

Useful links

- http://cxf.apache.org/docs/jax-rs-search.html
- http://lucene.apache.org/
- http://tika.apache.org/
- http://olingo.apache.org/

- http://aredko.blogspot.ca/2014/12/beyond-jax-rs-spec-apache-cxf-search.html

Thank you!

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