



RESTO

restful semantic search tool for geospatial

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What is it ?

RESTo provides a **semantic search** service on Earth Observation data

Standard

RESTo implements OpenSearch [OGC13-026](#) -
OpenSearch Extension for Earth Observation

OpenSource

RESto is written in PHP and uses PostgreSQL + PostGIS

RESTful

RESTo follows a RESTful approach to manage resources

RESTful

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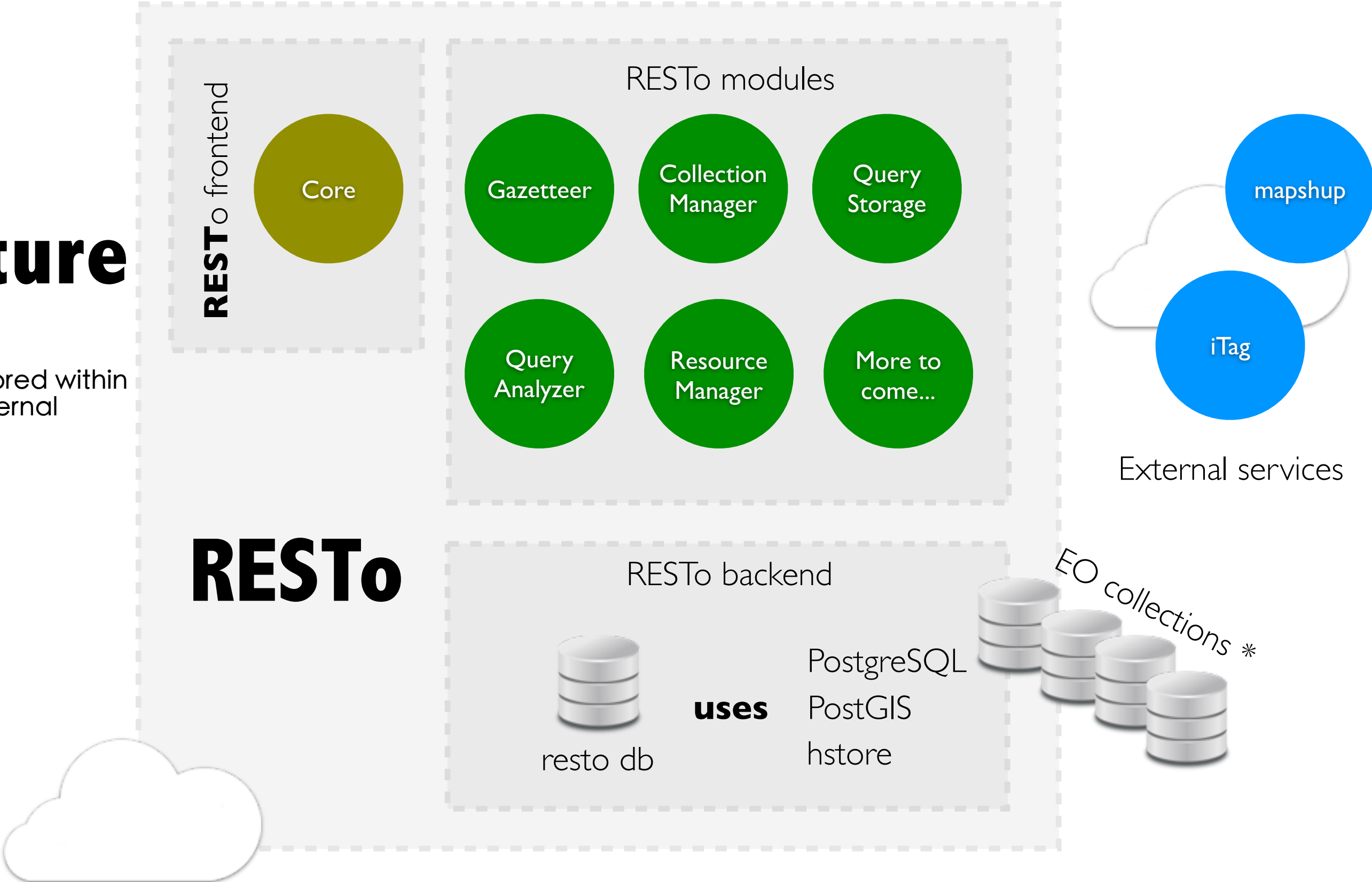
`http://localhost/resto/collection/identifier/`

e.g. `http://localhost/resto/Spirit/SPI_11005/`

URI	HTTP method	Action
http://localhost/resto/	GET	List all collections
http://localhost/resto/	POST	Create a new collection
http://localhost/resto/collection/_describe	GET	Describe collection OpenSearch service
http://localhost/resto/collection	GET	Search collection
http://localhost/resto/collection	POST	Insert a resource within collection
http://localhost/resto/collection	DELETE	Delete collection
http://localhost/resto/collection	PUT	Update collection
http://localhost/resto/collection/identifier	GET	Show resource metadata
http://localhost/resto/collection/identifier/download	GET	Download resource product

Architecture

(*) Collections can be stored within RESTo database or in external databases



RESTo

in action

List all collections

```
$ curl -X GET http://localhost/resto/
```

Create a collection

```
$ curl -k -X POST -F "file[]=@Spot.json" https://admin:nimda@localhost/resto/
```

Create a collection

```
$ curl -k -X POST -F "file[]=@Spot.json" https://admin:nimda@localhost/resto/
```

Case 1 : collection does not exist. Database is created within RESTo backend

e.g. https://github.com/jjrom/resto/blob/master/_examples/collections/Spot.json

Case 2 : collection exist in legacy database. Collection is referenced within resto

e.g. https://github.com/jjrom/resto/blob/master/_examples/collections/Charter.json

Delete a collection

```
$ curl -k -X DELETE https://admin:nimda@localhost/resto/Spot
```

Describe a collection

```
$ curl -X GET http://localhost/resto/Spot/_describe
```

Describe a collection

```
$ curl -X GET http://localhost/resto/Spot/_describe
```

Output formats are : **Atom**, **HTML** and **GeoJSON** (RDF to come soon !)

Insert a resource

```
$ curl -k -X POST -F "file[]=@r.json" https://admin:nimda@localhost/resto/Spot
```

e.g. https://github.com/jjrom/resto/blob/master/_examples/resources/resource_Spot.json

Insert a resource

During ingestion process , the resource is **automatically tagged** with location and land use



github.com/jjrom/itag

Search

```
$ curl -X GET http://localhost/resto/Spot?q=Toulouse&cloudCover=[0,20[&...
```

Search

```
$ curl -X GET http://localhost/resto/Spot?q=Toulouse&cloudCover=[0,20[&...
```



Here are the OpenSearch parameters

Search

RESto uses the *Query Analyzer* to translate query into a set of EO OpenSearch parameters

Search (Query Analyzer)

Query string analysis algorithm is based on simple recognition of words and pattern

Split query string
into list of unitary words

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Extract «key=value» strings

e.g. orbitNumber=4

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Extract «key=value» strings

e.g. orbitNumber=4



Extract Platforms and
Instruments

Platforms and instruments list are stored
within common dictionary

[https://github.com/jjrom/resto/blob/
master/resto/dictionaries/common.php](https://github.com/jjrom/resto/blob/master/resto/dictionaries/common.php)

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e.g. orbitNumber=4

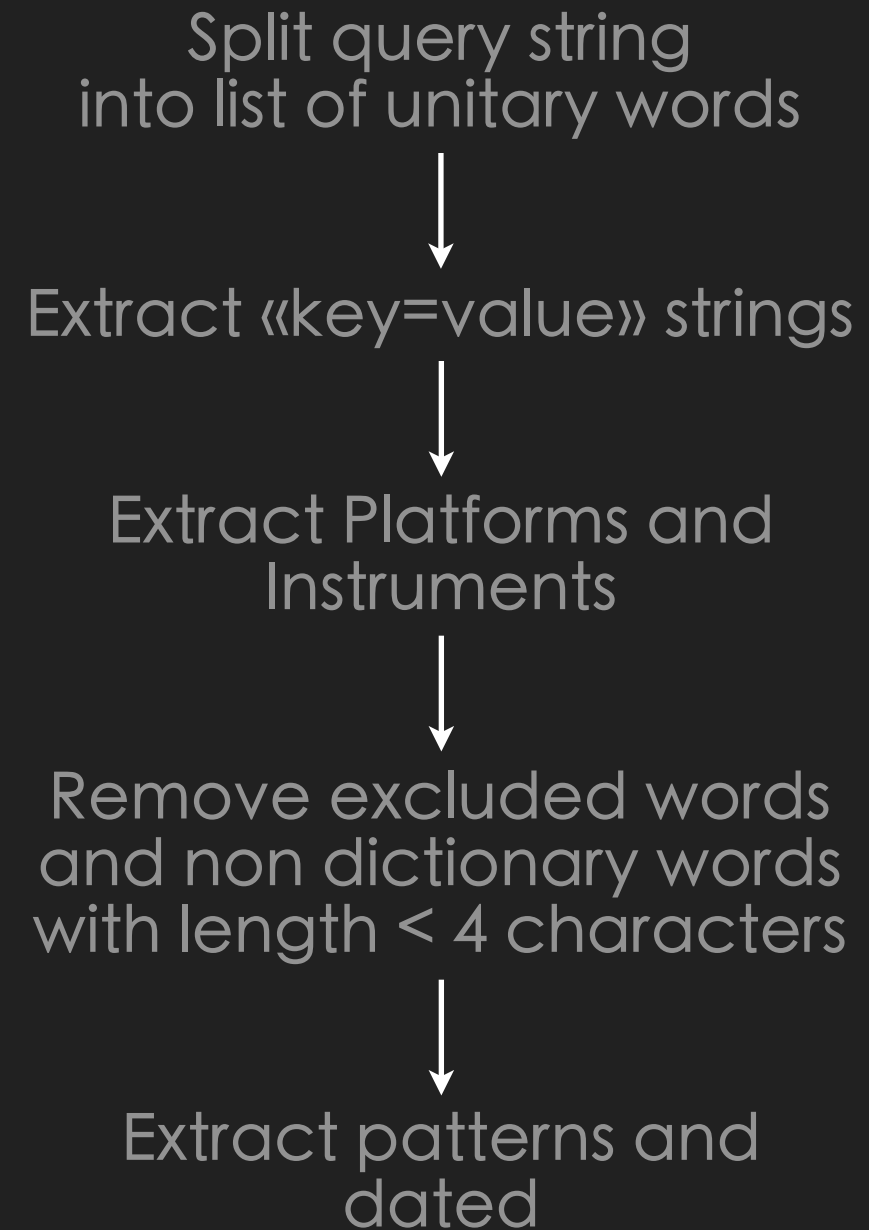
Platforms and instruments list are stored within common dictionary

<https://github.com/jjrom/resto/blob/master/resto/dictionaries/common.php>

e.g. «~~area~~ of Mexico in 2012»

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Platforms and instruments list are stored within common dictionary

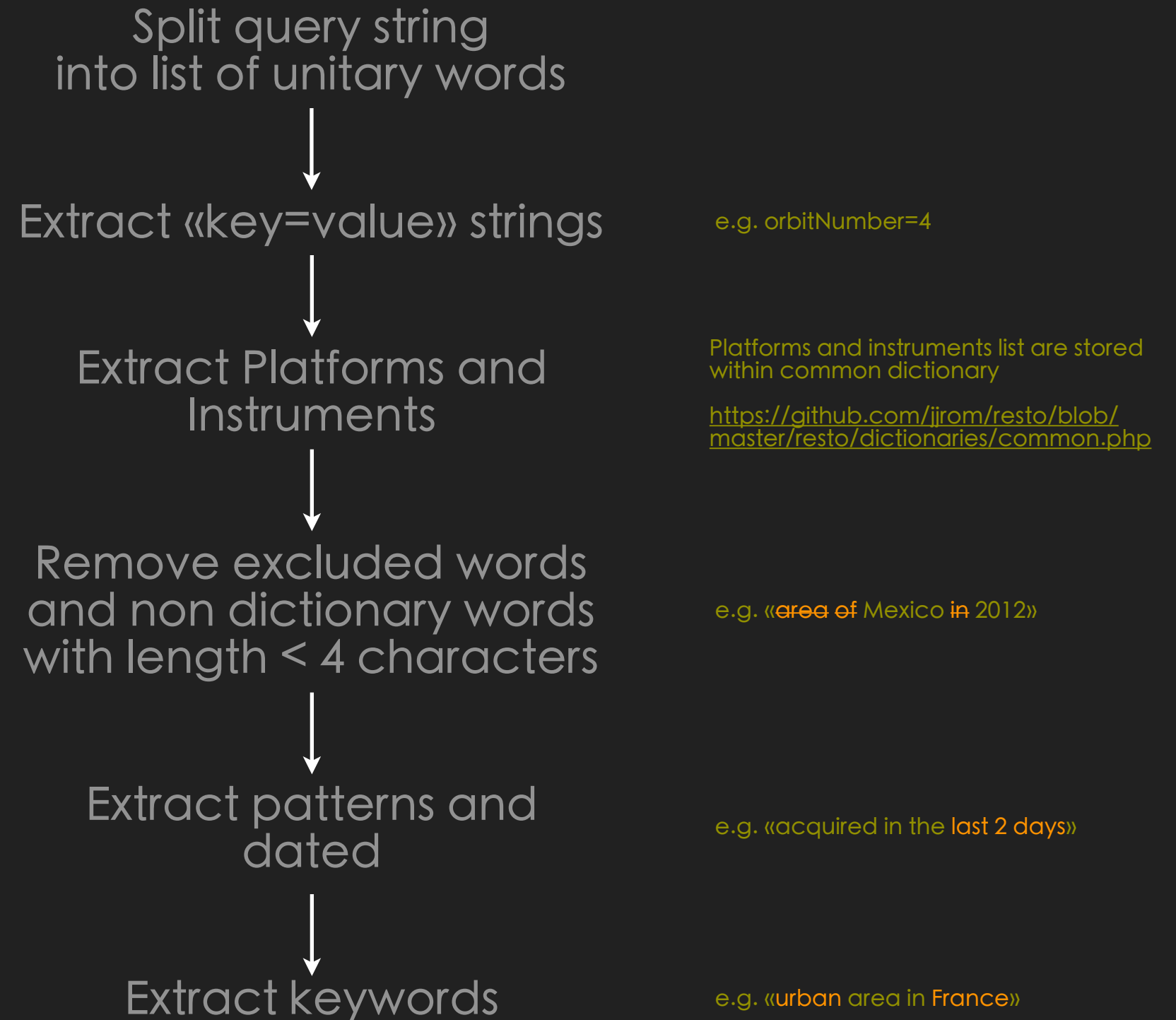
<https://github.com/jjrom/resto/blob/master/resto/dictionaries/common.php>

e.g. «~~area~~ of Mexico in 2012»

e.g. «acquired in the last 2 days»

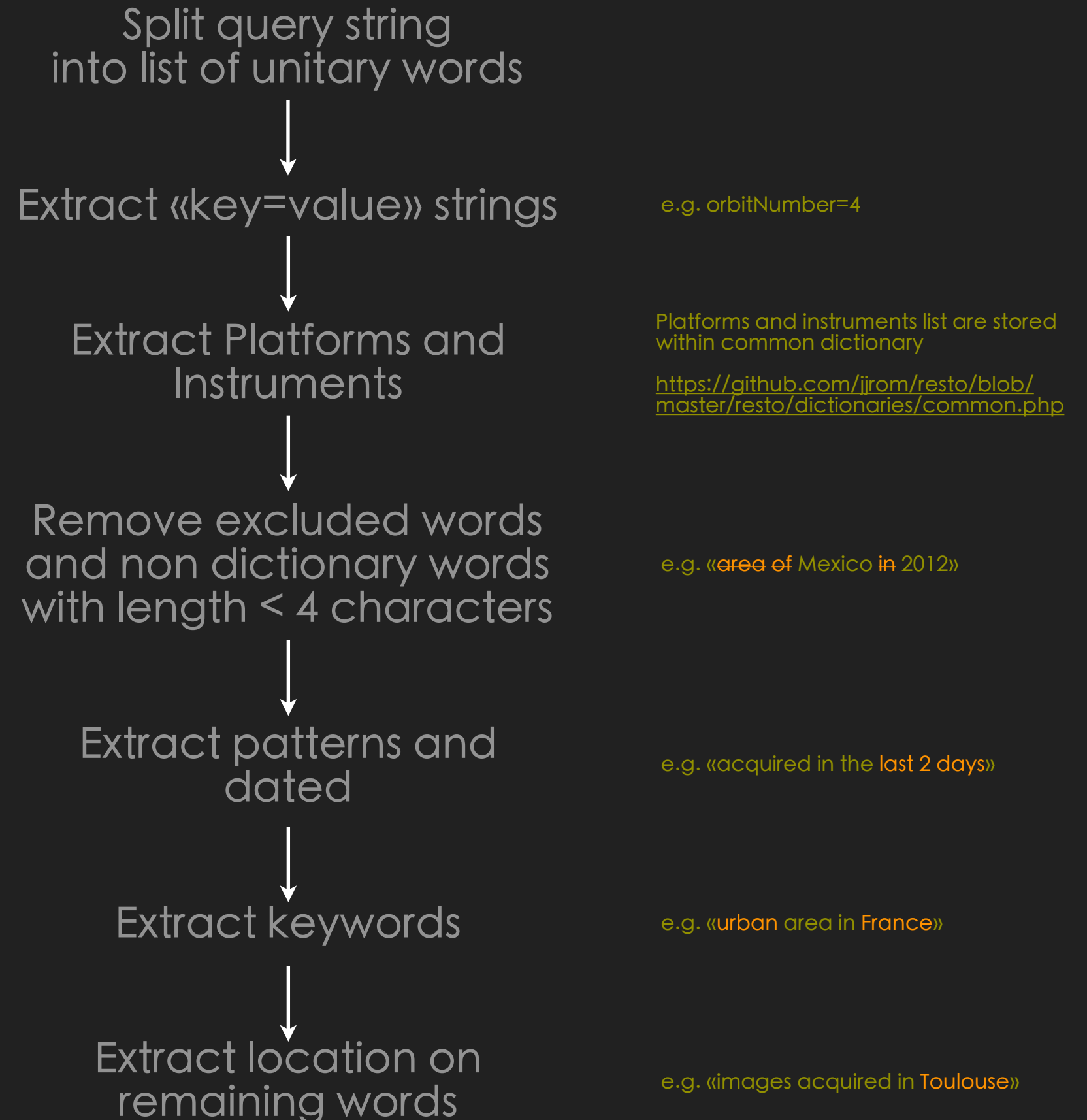
Search (Query Analyzer)

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Search (Query Analyzer)

Recognized patterns

```
<with> "keyword"  
<without> "keyword"  
  
"quantity" <lesser> (than) "numeric" "unit"  
"quantity" <greater> (than) "numeric" "unit"  
"quantity" <equal> (to) "numeric" "unit"  
<lesser> (than) "numeric" "unit" (of) "quantity"  
<greater> (than) "numeric" "unit" (of) "quantity"  
<equal> (to) "numeric" "unit" (of) "quantity"  
"quantity" <between> "numeric" <and> "numeric" ("unit")  
<between> "numeric" <and> "numeric" "unit" (of) "quantity"  
  
<today>  
<yesterday>  
<before> "date"  
<after> "date"  
<between> "date" <and> "date"  
"numeric" "(year|day|month)" <ago>  
<last> "(year|day|month)"  
<last> "numeric" "(year|day|month)"  
"numeric" <last> "(year|day|month)"  
"(year|day|month)" <last>  
<since> "numeric" "(year|day|month)"  
<since> "month" "year"  
<since> "date"  
<since> "numeric" <last> "(year|day|month)"  
<since> <last> "numeric" "(year|day|month)"  
<since> <last> "(year|day|month)"  
<since> "(year|day|month)" <last>
```

Search (Query Analyzer)

Detectable words are stored within a dictionary

```
$dictionary = array(  
    'excluded' => array(  
        'than',  
        'over',  
        ...  
    ),  
    'modifiers' => array(  
        'ago' => 'ago',  
        'before' => 'before',  
        'after' => 'after',  
        ...  
    ),  
    'units' => array(  
        'm' => 'm',  
        'meter' => 'm',  
        'days' => 'days',  
        ...  
    ),  
    'numbers' => array(  
        'one' => '1',  
        ...  
    ),  
    'months' => array(  
        'january' => '01',  
        ...  
    ),  
    'quantities' => array(  
        'resolution' => 'resolution',  
        ...  
    ),  
    'keywords' => array(  
        'continent' => array(  
            'europe' => 'europe',  
            ...  
        )  
    )  
)
```

Search (Query Analyzer)

Detectable words are stored within a dictionary

Multilingual - current languages are EN, FR, IT and DE

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        ...  
    ),  
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        'before' => 'before',  
        'after' => 'after',  
        ...  
    ),  
    'units' => array(  
        'm' => 'm',  
        'meter' => 'm',  
        'days' => 'days',  
        ...  
    ),  
    'numbers' => array(  
        'one' => '1',  
        ...  
    ),  
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Synonyms supported (e.g. unit «m» is «m», «meter» or «meters»)

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Each **collection** can define its own **dedicated keywords**

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    ),  
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        'after' => 'after',  
        ...  
    ),  
    'units' => array(  
        'm' => 'm',  
        'meter' => 'm',  
        'days' => 'days',  
        ...  
    ),  
    'numbers' => array(  
        'one' => '1',  
        ...  
    ),  
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Each **collection** can define its own **dedicated keywords**

Automatic **typing** error **correction** using similarity function

```
$dictionary = array(  
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        ...  
    ),  
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        'ago' => 'ago',  
        'before' => 'before',  
        'after' => 'after',  
        ...  
    ),  
    'units' => array(  
        'm' => 'm',  
        'meter' => 'm',  
        'days' => 'days',  
        ...  
    ),  
    'numbers' => array(  
        'one' => '1',  
        ...  
    ),  
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        'january' => '01',  
        ...  
    ),  
    'quantities' => array(  
        'resolution' => 'resolution',  
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        'continent' => array(  
            'europe' => 'europe',  
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        )  
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)
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Synonyms supported (e.g. unit «m» is «m», «meter» or «meters»)

Each **collection** can define its own **dedicated keywords**

Automatic **typing** error **correction** using similarity function

e.g. https://github.com/jjrom/resto/blob/master/resto/dictionaries/dictionary_en.php

```
$dictionary = array(
    'excluded' => array(
        'than',
        'over',
        ...
    ),
    'modifiers' => array(
        'ago' => 'ago',
        'before' => 'before',
        'after' => 'after',
        ...
    ),
    'units' => array(
        'm' => 'm',
        'meter' => 'm',
        'days' => 'days',
        ...
    ),
    'numbers' => array(
        'one' => '1',
        ...
    ),
    'months' => array(
        'january' => '01',
        ...
    ),
    'quantities' => array(
        'resolution' => 'resolution',
        ...
    ),
    'keywords' => array(
        'continent' => array(
            'europe' => 'europe',
            ...
        )
    )
)
```

Search (Gazetteer)

RESto embeds a Gazetteer service to detect location

Search (Gazetteer)

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Based on [geonames](#) database

Search (Gazetteer)

RESto embeds a Gazetteer service to detect location

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More than 9 000 000 toponyms

Search (Gazetteer)

RESto embeds a Gazetteer service to detect location

Based on [geonames](#) database
More than 9 000 000 toponyms
[Multilingual](#)

Search (example)

« Pleiades images of urban area in France acquired in 2013 with less than 25 % of cloud cover »

Search (example)

« Pleiades images of urban area in France acquired in 2013 with less than 25 % of cloud cover »

platform

keyword

location

date

acquisition parameter

Search (result)

unique unambiguous url



The screenshot shows a web browser window with the URL `mapshup.info/resto/Charter/?format=html&lang=en&q=indonesia`. The page title is "RESToFramework" and the main heading is "International Charter Space and Major Disasters". Below the heading is a search bar containing the text "indonesia" and language selection buttons for EN, FR, IT, and DE. A "View on map" button is visible, along with "137 results" and a "Next >>" link. The search results include a satellite image of Indonesia, a map of Indonesia with a highlighted region, and a metadata block for "LANDSAT7/ETM+ acquired on". The metadata block contains the following information: "Identifier : USGS:LANDSAT:L71127062_06220101015_MTL", "View metadata in HTML | ATOM | GeoJSON", and a set of tags: "LANDSAT7", "ETM+", "asia", "indonesia", "cyclone", and "collid=338". An arrow points to the "asia" tag.

keywords are links

Search (result)

Each search result has a **unique url** i.e. can be indexed by web crawler (i.e. google robots)

unique unambiguous url



mapshup.info/resto/Charter/?format=html&lang=en&q=indonesia

RESToFramework

International Charter Space and Major Disasters

The International Charter aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users. Each member agency has committed resources to support the provisions of the Charter and thus is helping to mitigate the effects of disasters on human life and property

indonesia

EN FR IT DE

Search filters - searchTerms indonesia | lang en

View on map | 137 results | 1 to 50 Next >>

LANDSAT7/ETM+ acquired on
Identifier: USGS:LANDSAT:L71127062_06220101015_MTL
View metadata in HTML | ATOM | GeoJSON

LANDSAT7 ETM+ asia indonesia cyclone callid=338

keywords are links

Search (result)

Each search result has a **unique url** i.e. can be indexed by web crawler (i.e. google robots)

Resource associated keywords are presented as **search links** on each **keyword**.

unique unambiguous url



mapshup.info/resto/Charter/?format=html&lang=en&q=indonesia

RESToFramework

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indonesia

EN FR IT DE

Search filters - searchTerms indonesia | lang en

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LANDSAT7 ETM+ asia indonesia collid=338
cyclone

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Each search result has a **unique url** i.e. can be indexed by web crawler (i.e. google robots)

Resource associated keywords are presented as **search links** on each **keyword**.

Thus they can be indexed by web crawler...and so on.

unique unambiguous url



mapshup.info/resto/Charter/?format=html&lang=en&q=indonesia

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indonesia

EN FR IT DE

Search filters - searchTerms indonesia | lang en

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LANDSAT7 ETM+ asia indonesia collid=338
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keywords are links

Search (result)

Each search result has a **unique url** i.e. can be indexed by web crawler (i.e. google robots)

Resource associated keywords are presented as **search links** on each **keyword**.

Thus they can be indexed by web crawler...and so on.

Theoretically the whole database could be indexed by web crawlers

unique unambiguous url



mapshup.info/resto/Charter/?format=html&lang=en&q=indonesia

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cyclone

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Demo

<http://mapshup.info/resto>



github.com/jjrom/resto