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# Chapter 1

## Searcher

### 1.1 Operations

#### 1.1.1 Sign comparison

- Available signs:  $>$ ,  $<$ ,  $\geq$ ,  $\leq$ ,  $=$ .
- Syntax for inclusion: “in” followed by an interval declaration:  $[, ]$ ,  $(, )$ .

Examples

```
interval: [a, b] where a, b are natural numbers, a < b  
file: size >= 500  
file: size in (400, 2000]
```

#### 1.1.2 Natural language comparison

- Available operators: moreThan, lessThan, atMost, atLeast, exactly
- Syntax for inclusion: “between” followed by an interval declaration.

Examples

```
file: has moreThan 50 commits  
file: has between [20, 30) developers
```

### 1.1.3 Time restrictions

- Available operators: after, before, since, until.
- Syntax for inclusion: between date1, date2.
- Date format YYYY, YYYY-MM, YYYY-M, YYYY-MM-DD, YYYY-MM-D, YYYY-M-DD, YYYY-M-D

Examples

```
file: has changes after 2018
file: has moreThan 10 commits since 2017-07-28
file: has developers >= 19 between 2011, 2015-09-30
```

### 1.1.4 Inclusion

This verifies that the property/entity is included in a given set. The set can be given as a list of values: ["value1", "value2", "etc"], another query: {query goes here} or a saved query: {{savedQueryName}}

Examples

```
file: owner in ["John", "Mike"]
file: owner in {author: name contains "son"}
file: owner in {{RetiredAuthorsWithBigKnowledge}}
```

### 1.1.5 File Restrictions

- Keywords: changes, commits, churn
- Operators: madeBy, any, everyOne

Examples

```
file: has changes madeBy "John"
file: has changes madeBy everyOne in ["John", "Mike"]
file: has changes madeBy any in {{
ActiveAuthorsWithBigKnowledge}}
file: has changes since 2015 madeBy moreThan 2 in {author:
name startsWith "Mi"}
```

## 1.1.6 Author Restrictions

- Keywords: changes, commits, churn
- Operators: on, any, every

### Examples

```
author: has moreThan 50 changes between 2013, 2014 on "  
KafkaClient.java"  
author: has churn > 10 on any in ["KafkaAdminClient.java",  
"KafkaConsumer.java"]  
author: has changes on every in { file: name endsWith ".java"  
"  
"  
author: has commits on moreThan 5 in { file: name startsWith  
"Kafka" }
```

## 1.2 Simple queries

### 1.2.1 Files

Name and path

```
file: name has "Main"
file: path contains "Impl"
file: name startsWith "Kaf"
file: path endsWith any in [".java", ".scala"]
file: name in ["Sender.java", "KafkaProducer.java"]
```

Size

```
file: size > 500
file: size in (300, 1000]
```

Creation and change Dates

```
file: created between 2015-03-10, 2015-03-22
file: lastChanged before 2017
```

Owner

```
file: owner "John"
file: owner in ["Josh", "Hope"]
file: owner in {author: name endsWith "son"}
file: owner in {{PassiveAuthorsWithBigKnowledge}}
```

Code

```
file: code contains "main"
file: code contains "if" moreThan 10
file: code contains "static" < 5
```

Relations with authors and components

```
file: belongsTo "John"
file: belongsTo #component.subTag
file: belongsTo any in [#component.subTag, #component.
otherSubTag.*]
file: belongsTo every in [#component.subTag, #component.
otherSubTag]
file: belongsTo exactly 1 in [#component.subTag, #component
.otherSubTag]

file: isRelatedTo "John"
file: hasRelationTo in ["Mike", "Josh"]
file: isRelatedTo in {file: name contains "Impl"}
file: hasRelationTo in {{FilesWithSizeBiggerThan700}}
```

### Library usages

```
file: uses #library.subLibrary
file: uses any in [#library.subLibrary, #language.*]
file: uses every in [#library.subLibrary, #library.
otherSubLibrary]
file: uses exactly 1 in [#language.subLibrary, #library.
otherSubLibrary]
```

## 1.2.2 Authors

### Name

```
author: name contains "son"
author: name startsWith "Jo"
author: name in ["John", "Mike"]
```

### Status

```
author: is ACTIVE
author: is PASSIVE
author: is RETIRED
```

### Knowledge score

```
author: hasPKS > 5%
author: hasPKS <= 57.89%
author: hasPKS = 23.5%
```

### Commit dates

```
author: started between 2015-03-01, 2015-04-01
author: lastCommitted before 2017
```

## 1.3 Queries about evolution

### 1.3.1 Files

#### Changes and evolution metrics

```
file: has moreThan 10 changes since 2015-03-16
file: has changes after 2017
file: has moreThan 15 changes
file: has changes >= 22 before 2018-11-21
file: has changes < 50
file: has changes until 2018-12
```

```

file: changed moreThan 10 since 2018
file: changed exactly 12
file: changed before 2017-05-12

file: has moreThan 10 commits since 2015-03-16
file: has tasks after 2017
file: has moreThan 15 developers
file: has growth >= 200 before 2018-11-21
file: has commits < 50
file: grew moreThan 100 since 2018

file: has moreThan 10 changes since 2015-03 madeBy "John"
file: has commits after 2017 madeBy any in {author: name
startsWith "Mi"}
file: has churn > 200 madeBy any in ["Mike", "Kristen"]
file: has commits >= 5 before 2018-11-21 madeBy everyOne in
{{ActiveAuthorsWithBigKnowledge}}
file: has churn < 500 madeBy any
file: has changes until 2018 madeBy moreThan 2 in ["John",
"Mike", "Kristen"]

```

## 1.3.2 Authors

### Simple relations

#### Files

```

author: modified "Sender.java"
author: workedOn "Sender.java" after 2017-10-18
author: modified moreThan 10 files since 2018
author: workedOn lessThan 20 files in {file: name endsWith
".java"}

```

#### Components

```

author: workedOn moreThan 3 components
author: modified exactly 2 components since 2018

```

#### Tasks

```

author: workedOn moreThan 4 tasks
author: workedOn lessThan 7 tasks since 2018-03-01

```

#### Smart commits

```

author: has moreThan 4 smartCommits
author: has exactly 3 smartCommits after 2018-03-01

```



## Activity

Work status

**author:** worked between 2017-01-01, 2017-03-01

**author:** wasActive after 2018-09-11

Work dynamic

**author:** has changes

**author:** has moreThan 5 commits

**author:** has exactly 10 commits after 2018

**author:** has churn > 50 since 2017-01-17

## Complex queries

**author:** has changes on "Sender.java"

**author:** has changes since 2018 on every in {file: name  
startsWith "Ka"}

**author:** has moreThan 5 commits on any in {file: name  
endsWith ".java"}

**author:** has exactly 10 commits after 2018-10-07 on every in  
{FilesWithManyChanges}

**author:** has churn >= 100 since 2017-01-17 on moreThan 3 in  
{file: size >= 650}

**author:** has churn = 70 on any

## 1.4 Tags

**file:** has #numeTag

**author:** has #numeTag > 2

**file:** has anyTag in [#numeTag, #altNumeTag]

**author:** has everyTag in [#numeTag, #altNumeTag]

**file:** has moreThan 2 tags in [#tag1, #tag2, #tag3]

## 1.5 Linking and negating queries

**file:** name contains "Impl" AND size > 250

**file:** name contains "Impl" OR size > 250

**file:** name endsWith ".java" AND NOT size > 500

**file:** NOT name endsWith ".java"