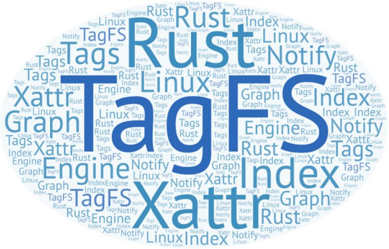
TagFS - File Labeling System with Rust

Steven Liatti

Bachelor project - Prof. Florent Glück - Hepia ITI 3rd year

September 4, 2018



hepia

Haute école du paysage, d'ingénierie
et d'architecture de Genève

Hes·so//GENÈVE

Haute Ecole Spécialisée
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Plan

1. Introduction
2. Existing solutions
3. Architecture
4. Technologies
5. Achievement
6. Discussion
7. Conclusion

Issues

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System for tagging files and directories with the possibility of searching by tags.

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- Analyze ways to index and monitor a tree of files.
- Design and implement the system (open source and on Linux) and measure its performance. Study and learn the Rust language.

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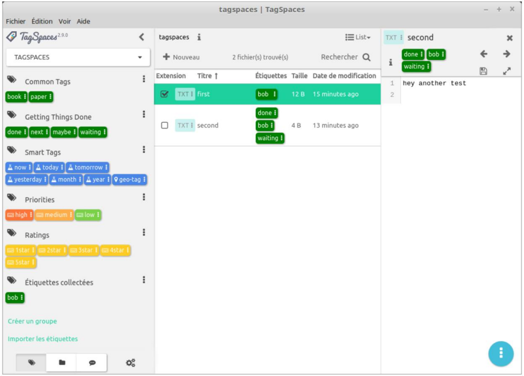

Extension	Titre	Étiquettes	Taille	Date de modification
☑ TXT	first	bob	12 B	15 minutes ago
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```
hey another test
```

Figure – Using TagSpaces

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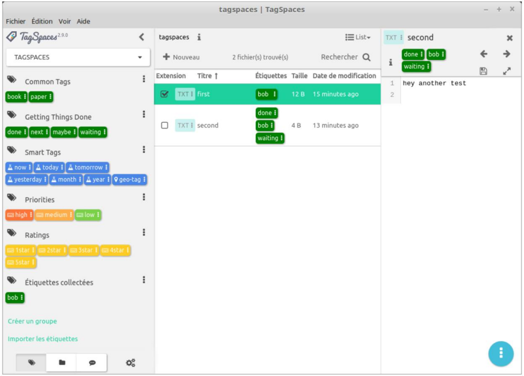
Good points	Negative points
Simple	DB dependency outer
Fast and efficient hunt	Modification and access only through the app
Open source	



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macOS

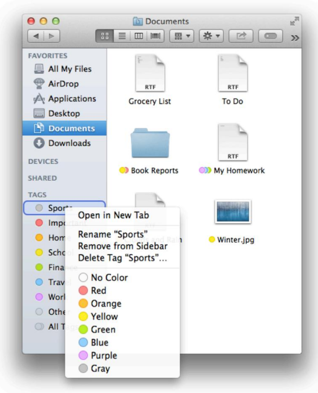
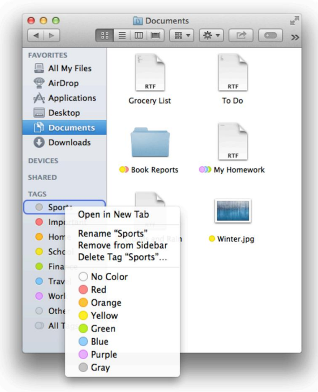


Figure - Managing a tag in the Finder - Apple

macOS



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Good points	Negative points
Tag system integrated into file explorer	Owner code
Store tags in XATTR	Only for macOS
efficient	

Tag management

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- Dedicated tag management tool (easy to use).

Indexing files and tags

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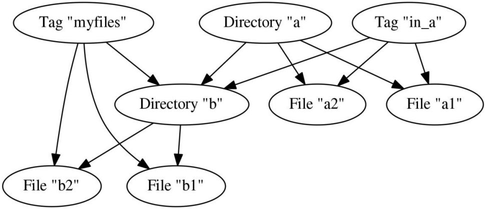
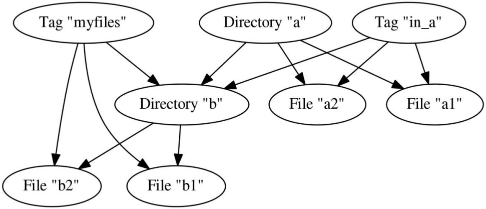


Figure – Graph of tags, files and directories

Indexing files and tags



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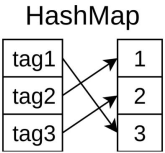

Figure – HashMap associating the name of the tag to its node

File system monitoring

Update of the graph during the following events:

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File system monitoring

Update of the graph during the following events:

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- Creation of files/directories.
- Delete files/directories.
- Moving/renaming files/directories.

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- List existing tags.
- Rename a tag.

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- Ownership, Borrowing (references).

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- Metadata as name:value pairs.
- Name = character string, value = character string or binary data.

- Existent sous ext2-3-4, XFS, Btrfs, UFS1-2, NTFS, HFS+, ZFS.
- CLI tools to easily manipulate them.

Inotify

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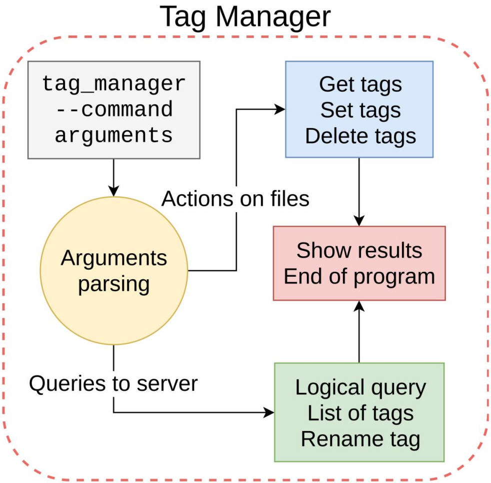
- Three system calls: initialization, adding watch on a given file path, and removing that watch.
- Reading an event with read().

Tag Manager



Tag Manager

tag_manager --command arguments

Arguments parsing

Actions on files

Get tags
Set tags
Delete tags

Show results
End of program

Queries to server

Logical query
List of tags
Rename tag

Figure – How Tag Manager works

Tag Engine

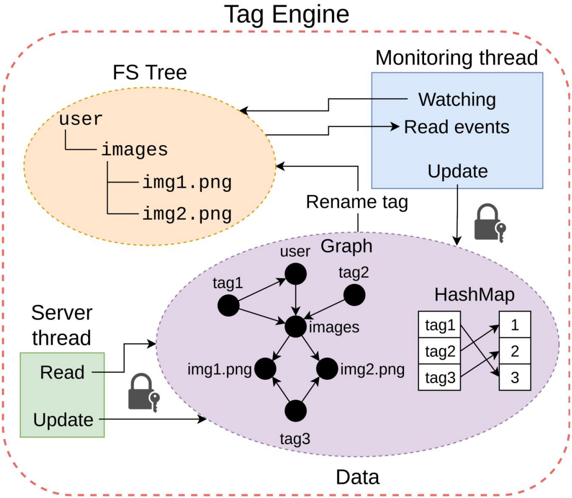


Figure – How Tag Engine works

TagFS

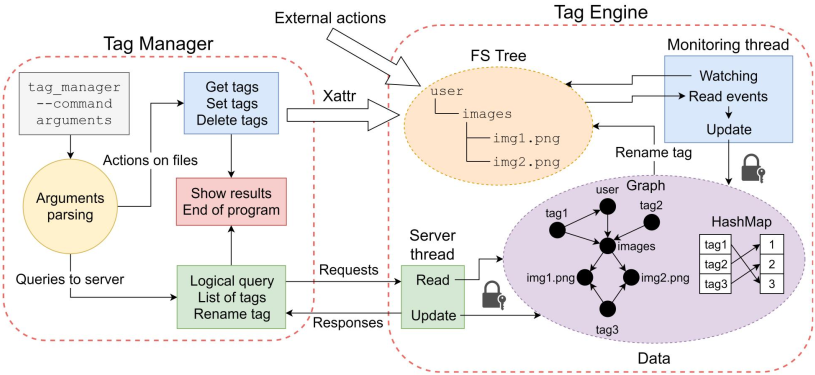
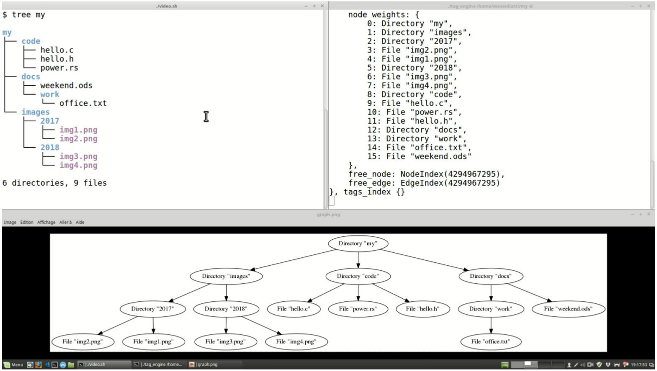


Figure – TagFS Global System

Demo

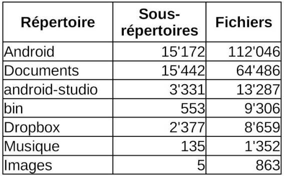


```
$ tree my

my
├── code
│   ├── hello.c
│   ├── hello.h
│   └── power.rs
├── docs
│   ├── weekend.ods
│   └── work
│       └── office.txt
└── images
    ├── 2017
    │   ├── img1.png
    │   └── img2.png
    └── 2018
        ├── img3.png
        └── img4.png

6 directories, 9 files
```

```
    node weights: {
        0: Directory "my",
        1: Directory "images",
        2: Directory "2017",
        3: File "img2.png",
        4: File "img1.png",
        5: Directory "2018",
        6: File "img3.png",
        7: File "img4.png",
        8: Directory "code",
        9: File "hello.c",
        10: File "power.rs",
        11: File "hello.h",
        12: Directory "docs",
        13: Directory "work",
        14: File "office.txt",
        15: File "weekend.ods"
    },
    free_node: NodeIndex(4294967295),
    free_edge: EdgeIndex(4294967295)
}, tags_index {}
```

Video

Performance Metrics



Répertoire	Sous-répertoires	Fichiers
Android	15'172	112'046
Documents	15'442	64'486
android-studio	3'331	13'287
bin	553	9'306
Dropbox	2'377	8'659
Musique	135	1'352
Images	5	863

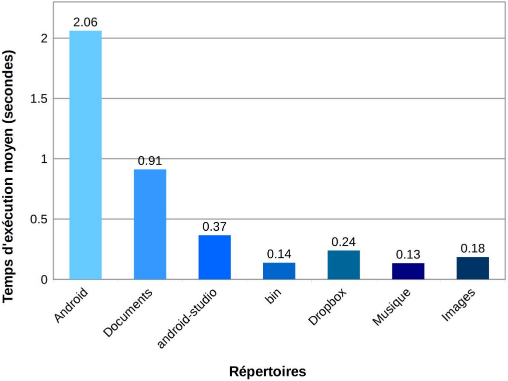


Figure – Tag Engine runtime based on directories

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- Add logical operators (NOT).

Bilan personnel

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- Study of the Rust language.

Bilan personnel

- Design and implementation of a tag management engine.
- Study of the Rust language.
- Personal progress: new technologies and best practices.

Thanks

- Florence luck
- Orestis Malaspina
- Joel Cavat

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Thank you for your attention ! Issues ?