Understanding Git with Alloy

Milestone 3

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Git as VCS

Git is one of many Version Control Systems

- Fast
- Efficient
- Oriented to snapshots, not differences
- Widely used

Motivation for this project

Gap in the understanding of Git

- Lack of precise descriptions
- Contradictions in some manuals
- Developers could benefit from a manual that is precise and rigorous

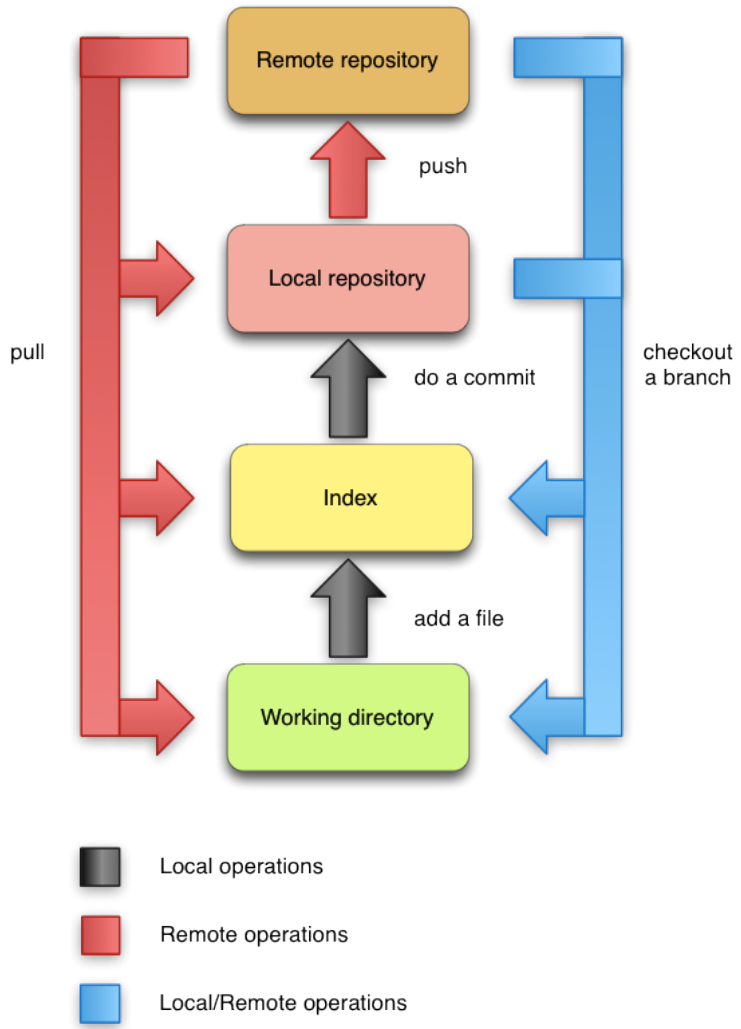
Quotation

Objectives of this project

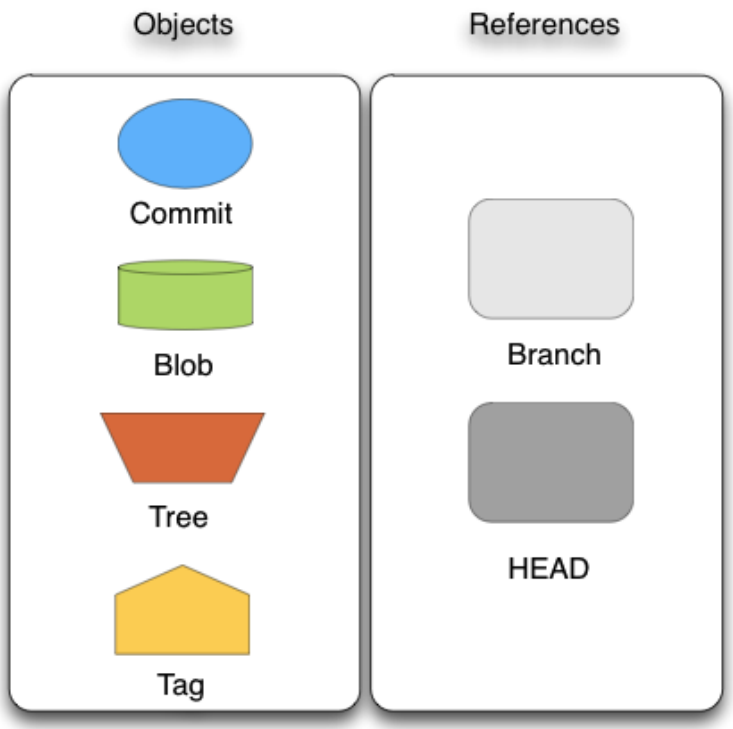
Shine some light in the dark world of Git

- Build a precise model of how Git works
- Analyze the model
- Build a user manual based on specification a analysis

The Git Structure



Repository



Blob and Tree

Blob

- Represents the content of a file;
- The name is calculated from its content;

```
sig Blob extends Object {}
```

Tree

- Relation from names to Blobs or/and Trees;
- Used to represent the file system structure;

```
sig Tree extends Object {
    contains: Name -> lone(Tree+Blob)
}
```

Commit

- It is like a snapshot of the project on a certain moment in time;
- Author, Committer, Comment - Not important for us;
- Parent - The Commit which originated the current;
- Tree - Pointer to a Tree Object;

```
sig Commit extends Object {
    points : Tree,
    parent : set Commit,
    abs: Path -> Object,
    merge : set State
}

sig RootCommit extends Commit {}
```

Branch and HEAD

Branch

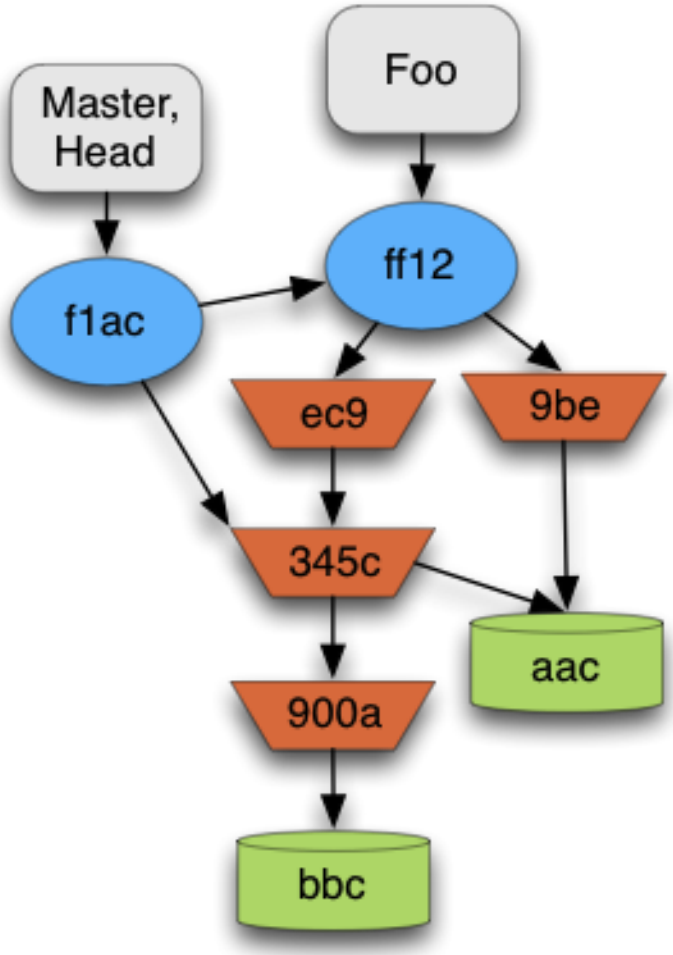
- It is just a pointer to a commit;

HEAD

- Special reference that identifies the current Branch;

```
sig Branch{
    marks: Commit lone -> State,
    branches: set State,
    head: set State
}

lone sig Master extends Branch{}
```

Repository



Working Directory

- Subset of a file system with the content of a project;
- These files can be the current files or files retrieved from the repository.

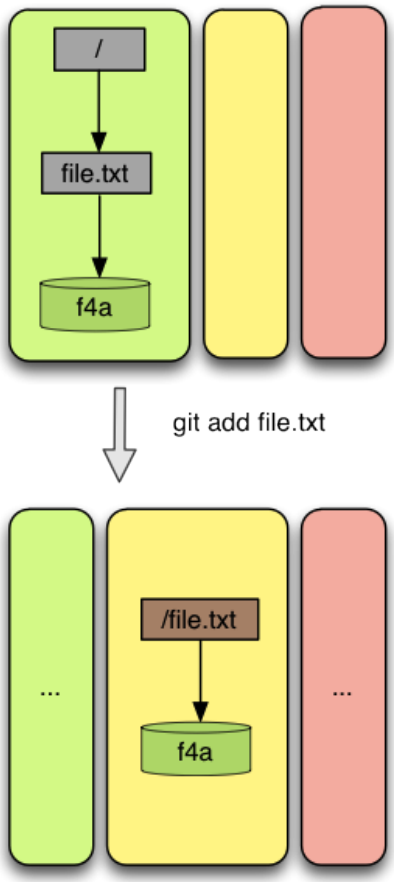
```
sig Path {
    pathparent: lone Path,
    name: Name,
    unmerge: set State
}

one sig Root extends Path{}
```

Index

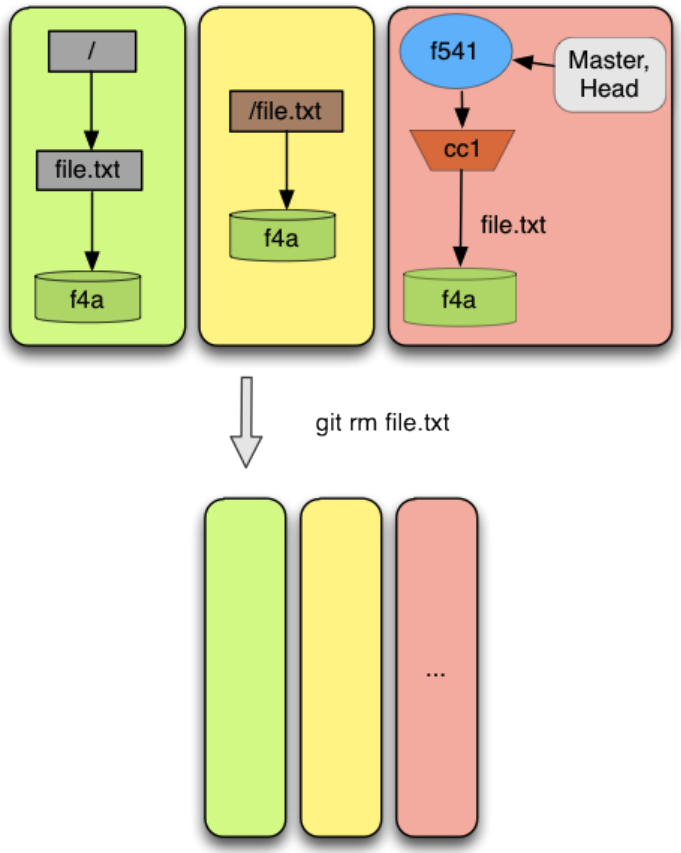
- Something in between the working directory and repository;
- It keeps a relation from file to content;
- The files in index will be in the next commit;

```
sig File{
    path: Path,
    blob: Blob,
    index: set State
}
```

Add



Remove


/
file.txt
f4a
/file.txt
f4a
f541
Master,
Head
cc1
file.txt
f4a
git rm file.txt
...

Commit

Checkout

Merge

Modeled Operations

- Add and Remove
- Commit
- Branch and Branch Remove
- Checkout
- Merge (2-way and fast-forward)

Manual

Built a manual that describes

- Motivation for the manual
- Git internals
- Git operations

Website

- Website was created based on the manual, for public access
- http://nevrenato.github.com/CSAIL_Git

Future Work

Conclusions

Scarlet Johanson