5. The details of the commit objects

5.1. Commit object (commit)

Conceptually a commit object (short:commit) represents a version of all files tracked in the repository at the time the commit was created. Commits know their parent(s) and this way capture the version history of the repository.

5.2. Technical details of a commit object

This commit object is addressable via a hash (*SHA-1 checksum*). This hash is calculated based on the content of the files, the content of the directories, the complete history of up to the new commit, the committer, the commit message, and several other factors.

This means that Git is safe, you cannot manipulate a file or the commit message in the Git repository without Git noticing that corresponding hash does not fit anymore to the content.

The *commit object* points to the individual files in this commit via a *tree* object. The files are stored in the Git repository as *blob* objects and might be packed by Git for better performance and more compact storage. Blobs are addressed via their SHA-1 hash.

Packing involves storing changes as deltas, compression and storage of many objects in a single *pack file*. *Pack files* are accompanied by one or multiple index files which speedup access to individual objects stored in these packs.

A commit object is depicted in the following picture.
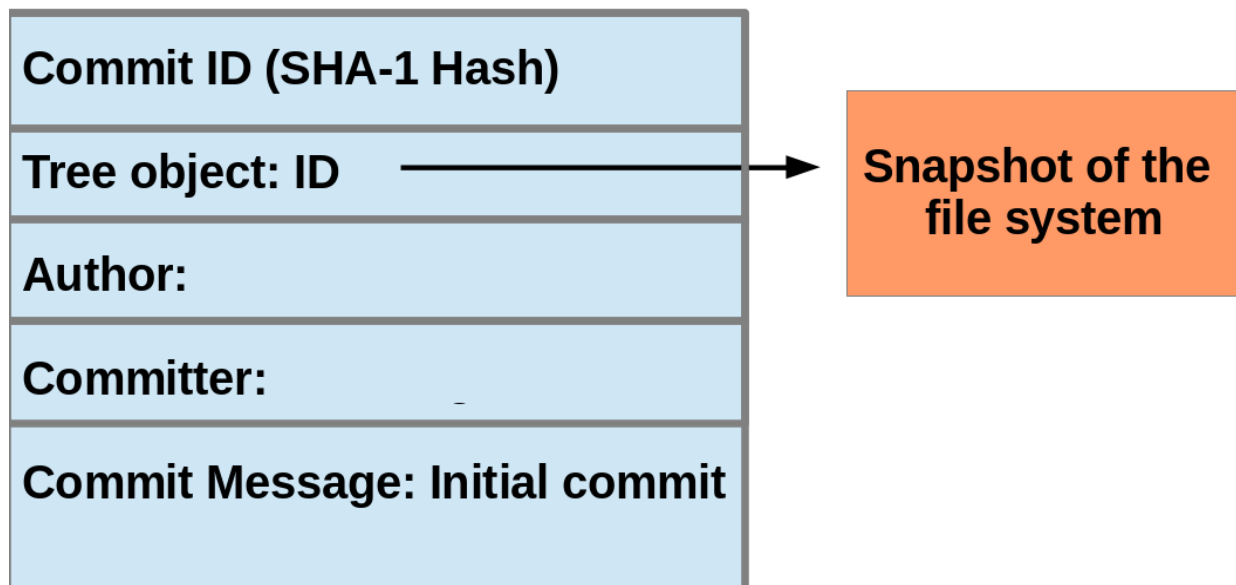
The above picture is simplified. Tree objects point to other tree objects and file blobs. Objects which didn't change between commits are reused by multiple commits.

5.3. Hash and abbreviated commit hash

A Git commit object is identified by its hash (SHA-1 checksum). SHA-1 produces a 160-bit (20-byte) hash value. A SHA-1 hash value is typically rendered as a hexadecimal number, 40 digits long.

In a typical Git repository you need fewer characters to uniquely identify a commit object. As a minimum you need 4 characters and in a typical Git repository 5 or 6 are sufficient. This short form is called the abbreviated commit hash or abbreviated hash. Sometimes it is also called the shortened SHA-1 or abbreviated SHA-1.

Several commands, e.g., the `git log` command can be instructed to use the shortened SHA-1 for their output.