Contributing to Bitcoin Core

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The Bitcoin Core project operates an open contributor model where anyone is

welcome to contribute towards development in the form of peer review, testing

and patches. This document explains the practical process and guidelines for

contributing.

Firstly in terms of structure, there is no particular concept of "Core

developers" in the sense of privileged people. Open source often naturally

revolves around meritocracy where longer term contributors gain more trust from

the developer community. However, some hierarchy is necessary for practical

purposes. As such there are repository "maintainers" who are responsible for

merging pull requests as well as a "lead maintainer" who is responsible for the

release cycle, overall merging, moderation and appointment of maintainers.

Contributor Workflow

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The codebase is maintained using the "contributor workflow" where everyone

without exception contributes patch proposals using "pull requests". This

facilitates social contribution, easy testing and peer review.

To contribute a patch, the workflow is as follows:

- Fork repository

- Create topic branch

- Commit patches

The project coding conventions in the [developer notes](doc/developer-notes.md)

must be adhered to.

In general [commits should be atomic](https://en.wikipedia.org/wiki/Atomic\_commit#Atomic\_commit\_convention)

and diffs should be easy to read. For this reason do not mix any formatting

fixes or code moves with actual code changes.

Commit messages should be verbose by default consisting of a short subject line

(50 chars max), a blank line and detailed explanatory text as separate

paragraph(s); unless the title alone is self-explanatory (like "Corrected typo

in init.cpp") then a single title line is sufficient. Commit messages should be

helpful to people reading your code in the future, so explain the reasoning for

your decisions. Further explanation [here](http://chris.beams.io/posts/git-commit/).

If a particular commit references another issue, please add the reference, for

example `refs #1234`, or `fixes #4321`. Using the `fixes` or `closes` keywords

will cause the corresponding issue to be closed when the pull request is merged.

Please refer to the [Git manual](https://git-scm.com/doc) for more information

about Git.

- Push changes to your fork

- Create pull request

The title of the pull request should be prefixed by the component or area that

the pull request affects. Valid areas as:

- \*Consensus\* for changes to consensus critical code

- \*Docs\* for changes to the documentation

- \*Qt\* for changes to bitcoin-qt

- \*Mining\* for changes to the mining code

- \*Net\* or \*P2P\* for changes to the peer-to-peer network code

- \*RPC/REST/ZMQ\* for changes to the RPC, REST or ZMQ APIs

- \*Scripts and tools\* for changes to the scripts and tools

- \*Tests\* for changes to the bitcoin unit tests or QA tests

- \*Trivial\* should \*\*only\*\* be used for PRs that do not change generated

executable code. Notably, refactors (change of function arguments and code

reorganization) and changes in behavior should \*\*not\*\* be marked as trivial.

Examples of trivial PRs are changes to:

- comments

- whitespace

- variable names

- logging and messages

- \*Utils and libraries\* for changes to the utils and libraries

- \*Wallet\* for changes to the wallet code

Examples:

Consensus: Add new opcode for BIP-XXXX OP\_CHECKAWESOMESIG

Net: Automatically create hidden service, listen on Tor

Qt: Add feed bump button

Trivial: Fix typo in init.cpp

If a pull request is specifically not to be considered for merging (yet) please

prefix the title with [WIP] or use [Tasks Lists](https://help.github.com/articles/basic-writing-and-formatting-syntax/#task-lists)

in the body of the pull request to indicate tasks are pending.

The body of the pull request should contain enough description about what the

patch does together with any justification/reasoning. You should include

references to any discussions (for example other tickets or mailing list

discussions).

At this stage one should expect comments and review from other contributors. You

can add more commits to your pull request by committing them locally and pushing

to your fork until you have satisfied all feedback.

Squashing Commits

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If your pull request is accepted for merging, you may be asked by a maintainer

to squash and or [rebase](https://git-scm.com/docs/git-rebase) your commits

before it will be merged. The basic squashing workflow is shown below.

git checkout your\_branch\_name

git rebase -i HEAD~n

# n is normally the number of commits in the pull

# set commits from 'pick' to 'squash', save and quit

# on the next screen, edit/refine commit messages

# save and quit

git push -f # (force push to GitHub)

If you have problems with squashing (or other workflows with `git`), you can

alternatively enable "Allow edits from maintainers" in the right GitHub

sidebar and ask for help in the pull request.

Please refrain from creating several pull requests for the same change.

Use the pull request that is already open (or was created earlier) to amend

changes. This preserves the discussion and review that happened earlier for

the respective change set.

The length of time required for peer review is unpredictable and will vary from

pull request to pull request.

Pull Request Philosophy

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Patchsets should always be focused. For example, a pull request could add a

feature, fix a bug, or refactor code; but not a mixture. Please also avoid super

pull requests which attempt to do too much, are overly large, or overly complex

as this makes review difficult.

###Features

When adding a new feature, thought must be given to the long term technical debt

and maintenance that feature may require after inclusion. Before proposing a new

feature that will require maintenance, please consider if you are willing to

maintain it (including bug fixing). If features get orphaned with no maintainer

in the future, they may be removed by the Repository Maintainer.

###Refactoring

Refactoring is a necessary part of any software project's evolution. The

following guidelines cover refactoring pull requests for the project.

There are three categories of refactoring, code only moves, code style fixes,

code refactoring. In general refactoring pull requests should not mix these

three kinds of activity in order to make refactoring pull requests easy to

review and uncontroversial. In all cases, refactoring PRs must not change the

behaviour of code within the pull request (bugs must be preserved as is).

Project maintainers aim for a quick turnaround on refactoring pull requests, so

where possible keep them short, uncomplex and easy to verify.

"Decision Making" Process

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The following applies to code changes to the Bitcoin Core project (and related

projects such as libsecp256k1), and is not to be confused with overall Bitcoin

Network Protocol consensus changes.

Whether a pull request is merged into Bitcoin Core rests with the project merge

maintainers and ultimately the project lead.

Maintainers will take into consideration if a patch is in line with the general

principles of the project; meets the minimum standards for inclusion; and will

judge the general consensus of contributors.

In general, all pull requests must:

- have a clear use case, fix a demonstrable bug or serve the greater good of

the project (for example refactoring for modularisation);

- be well peer reviewed;

- have unit tests and functional tests where appropriate;

- follow code style guidelines;

- not break the existing test suite;

- where bugs are fixed, where possible, there should be unit tests

demonstrating the bug and also proving the fix. This helps prevent regression.

Patches that change Bitcoin consensus rules are considerably more involved than

normal because they affect the entire ecosystem and so must be preceded by

extensive mailing list discussions and have a numbered BIP. While each case will

be different, one should be prepared to expend more time and effort than for

other kinds of patches because of increased peer review and consensus building

requirements.

###Peer Review

Anyone may participate in peer review which is expressed by comments in the pull

request. Typically reviewers will review the code for obvious errors, as well as

test out the patch set and opine on the technical merits of the patch. Project

maintainers take into account the peer review when determining if there is

consensus to merge a pull request (remember that discussions may have been

spread out over GitHub, mailing list and IRC discussions). The following

language is used within pull-request comments:

- ACK means "I have tested the code and I agree it should be merged";

- NACK means "I disagree this should be merged", and must be accompanied by

sound technical justification (or in certain cases of copyright/patent/licensing

issues, legal justification). NACKs without accompanying reasoning may be

disregarded;

- utACK means "I have not tested the code, but I have reviewed it and it looks

OK, I agree it can be merged";

- Concept ACK means "I agree in the general principle of this pull request";

- Nit refers to trivial, often non-blocking issues.

Reviewers should include the commit hash which they reviewed in their comments.

Project maintainers reserve the right to weigh the opinions of peer reviewers

using common sense judgement and also may weight based on meritocracy: Those

that have demonstrated a deeper commitment and understanding towards the project

(over time) or have clear domain expertise may naturally have more weight, as

one would expect in all walks of life.

Where a patch set affects consensus critical code, the bar will be set much

higher in terms of discussion and peer review requirements, keeping in mind that

mistakes could be very costly to the wider community. This includes refactoring

of consensus critical code.

Where a patch set proposes to change the Bitcoin consensus, it must have been

discussed extensively on the mailing list and IRC, be accompanied by a widely

discussed BIP and have a generally widely perceived technical consensus of being

a worthwhile change based on the judgement of the maintainers.

Release Policy

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The project leader is the release manager for each Bitcoin Core release.

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