



Whamcloud

Lustre Autotest and Maloo

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Whamcloud Development Infrastructure



- ▶ JIRA Issue Tracking <https://jira.whamcloud.com/>
- ▶ Git <https://git.whamcloud.com/>
- ▶ Gerrit Change Review <https://review.whamcloud.com/>
- ▶ Jenkins Build Server <https://build.whamcloud.com/>
- ▶ Maloo Test Results Repo <https://testing.whamcloud.com/>

- ▶ Q & A

Multiple Separate Lustre Development Systems

- ▶ JIRA for issue tracking (bugs, features, improvements) for code and docs
 - Gerrit posts patch submission and landing automatically to JIRA ticket in commit message
- ▶ Gerrit tracks patches and reviews for all Lustre projects
 - Whamcloud developers have an internal OpenID provider
 - Community developers use Google OAuth2 or other OpenID provider
 - Use **Settings->Link Another Identity** to add new identity to account
- ▶ Jenkins for automated build
 - x86 servers: e18.7, e18.8 , e18.9 , e19.2 , e19.3
 - x86 clients: e18.7, e18.8 , e18.9 , e19.2 , e19.3, sles12sp5, sles15sp4, sles15sp5, ubuntu2004, ubuntu2204
 - Other client arch: e18.8 aarch64, e18.8 ppc1e64
- ▶ Multiple Autotest test sessions launched for successful patch build
 - *All enforced sessions* must pass
 - *Optional sessions* do not *need* to pass, but should still be reviewed
- ▶ Maloo tracks test results from Autotest
 - Posts into Gerrit when sessions are started
 - Posts into Gerrit when session is complete
 - Marks patch **Verified: -1** if *any enforced session* fails
- ▶ Welcome external testing contributions to use Gerrit and Maloo for improved test coverage/reporting

Autotest Test Sessions



Maloo

Patch Set 6:

The following sessions will be run for build 104168 patch 6

Enforced:

- review-ldiskfs on el8.9-x86_64/ldiskfs servers and clients
- review-zfs on el8.9-x86_64/zfs servers and clients
- review-dne-part-1 on el9.3-x86_64/ldiskfs servers and clients
- review-dne-part-2 on el9.3-x86_64/ldiskfs servers and clients
- review-dne-part-3 on el9.3-x86_64/ldiskfs servers and clients
- review-dne-part-4 on el9.3-x86_64/ldiskfs servers and clients
- review-dne-part-5 on el9.3-x86_64/ldiskfs servers and clients
- review-dne-part-6 on el9.3-x86_64/ldiskfs servers and clients
- review-dne-part-7 on el9.3-x86_64/ldiskfs servers and clients
- review-dne-part-8 on el9.3-x86_64/ldiskfs servers and clients
- review-ldiskfs on el9.2-x86_64/ldiskfs servers and clients
- review-ldiskfs on el9.2-x86_64/ldiskfs servers and el9.3-x86_64/ldiskfs clients
- review-ldiskfs on el9.3-x86_64/ldiskfs servers and clients
- review-ldiskfs-arm on el8.9-x86_64/ldiskfs servers and el8.8-aarch64/ldiskfs clients
- review-dne-selinux-ssk-part-1 on el8.9-x86_64/ldiskfs servers and clients
- review-dne-selinux-ssk-part-2 on el8.9-x86_64/ldiskfs servers and clients
- review-ldiskfs on el8.9-x86_64/ldiskfs servers and el9.2-x86_64/ldiskfs clients
- review-ldiskfs on el8.9-x86_64/ldiskfs servers and sles15sp4-x86_64/ldiskfs clients
- review-ldiskfs on el8.9-x86_64/ldiskfs servers and sles15sp5-x86_64/ldiskfs clients

Optional:

- review-dne-part-9 on el9.3-x86_64/ldiskfs servers and clients
- review-ldiskfs on el8.9-x86_64/ldiskfs servers and el9.3-x86_64/ldiskfs clients
- review-ldiskfs-ubuntu on el8.9-x86_64/ldiskfs servers and ubuntu2204-x86_64/ldiskfs clients

Maloo Test Queue: https://testing.whamcloud.com/test_queue?jobs=lustre-reviews&builds=104168&commit=Apply+Filter
Maloo Results: https://testing.whamcloud.com/test_sessions/related?jobs=lustre-reviews&builds=104168#redirect

▶ 20+ test sessions **per patch version!**

- Multiple sessions *enforced* for master patches
- Multiple sessions *optional* for arches, distros

▶ **Enforced** test sessions **must pass**

- Custom Test-Parameters: runs are **Enforced**

▶ **Optional** sessions *are optional*

- Run to test new distro/arch, or flakey tests (e.g. racer)
- Working toward passing and enforcement
- **Do not** resubmit optional sessions

▶ Janitor only -1 for failures in modified tests

▶ **Please use test resources wisely**

- 170 tests, 13500 subtests, 150h+ *per patch*

Gerrit Patch Status



jenkins	Patch Set 14: Verified+1 Build Successful https://build.whamcloud.com/job/lustre-reviews/89569/ : SUCCESS
Maloo	Patch Set 14: The following sessions will be run for build 89569 patch 14 Enforced: - review-ldiskfs on el8.5-x86_64
Maloo	Patch Set 14: Passed enforced test custom-101 on CentOS 8.5/x86_64 uploaded by Travis Autotest from trevis-60
Maloo	Patch Set 14: Passed enforced test custom-102 on CentOS 8.3/x86_64, CentOS 8.5/x86_64 uploaded by Onyx Au
Lustre G... Janitor	Patch Set 14: Initial testing succeeded. Succeeded: - runtests@ldiskfs+DNE runtests-ssk@ldiskfs+SharedKey runt
Maloo	Patch Set 14: Passed enforced test review-dne-part-7 on CentOS 8.5/x86_64 uploaded by Travis Autotest from tre
Maloo	Patch Set 14: Passed enforced test review-dne-zfs-part-7 on CentOS 8.5/x86_64 uploaded by Onyx Autotest from
Maloo	Patch Set 14: Failed optional test review-ldiskfs on CentOS 8.5/x86_64, SLES 15.3/x86_64 uploaded by Travis Au
Lustre G... Janitor	Patch Set 14: Testing has completed with errors! IMPORTANT: these tests appear to be new failures unique to this
Maloo	Patch Set 14: Passed enforced test review-ldiskfs on CentOS 8.5/x86_64 uploaded by Onyx Autotest from onyx-13
Maloo	Patch Set 14: Passed enforced test review-dne-zfs-part-2 on CentOS 8.5/x86_64 uploaded by Travis Autotest from

- ▶ Custom tests are numbered in order starting at custom-1001
- ▶ **Lustre Gerrit Janitor** is a separate test system that runs under loads that provoke race conditions
- ▶ Janitor test sessions often finish quickly and supply early feedback
- ▶ Janitor adds Verified -1 for **failures** on tests added or modified by patch, but failures should still be reviewed for correctness
- ▶ **Optional** test sessions are not required to pass for a test to land

Monitoring Test Results in Maloo

Maloo

Patch Set 2:

The following sessions will be run for build 104237 patch 2

Enforced:

- review-ldiskfs on el8.9-x86_64/ldiskfs servers and el9.3-x86_64/ldiskfs clients
- review-ldiskfs-ubuntu on el8.9-x86_64/ldiskfs servers and ubuntu2204-x86_64/ldiskfs clients

Maloo Test Queue: https://testing.whamcloud.com/test_queue?jobs=lustre-reviews&builds=104237&commit=Apply+Filter

Maloo Results: https://testing.whamcloud.com/test_sessions/related?jobs=lustre-reviews&builds=104237#redirect

- ▶ Permanently keeps *results* for all patches
- ▶ *Logs* are kept as long as possible (months), longer for test failures if space available
- ▶ Quickly see sessions still running
- ▶ Quickly see all session status

Job	Build/Patch	Idx	Test Group	Distros	Review	Suite/Test	Started	Time Remaining
lustre-reviews	104237:2	36	review-ldiskfs	s: el8.9-x86_64/ldiskfs c: sles15sp4-x86_64/ldiskfs	1ea8c49a5	sanity test_31d	2024-04-17 23:36 (~1 hr)	~5 hrs
lustre-reviews	104237:2	2	review-zfs	s: el8.9-x86_64/zfs c: el8.9-x86_64/zfs	1ea8c49a5	sanity-quota test_7a	2024-04-17 23:37 (~1 hr)	~5 hrs

<input type="checkbox"/>	Name	Test Sets	Index
	ENFORCED		
<input type="checkbox"/>	lustre-reviews_el8.9-x86_64_review-ldiskfs		1
	2024-04-17 14:54:02 UTC	5/5	
<input type="checkbox"/>	lustre-reviews_el8.9-x86_64_review-zfs		2
	2024-04-17 14:54:11 UTC	7/8	
	Testing for ~1 hr		

Control Autotest Sessions with Test-Parameters

```
Test-Parameters: testlist=sanity env=ONLY=16,HONOR_EXCEPT=y
Test-Parameters: serverversion=2.14 testlist=sanity env=ONLY=16,HONOR_EXCEPT=
Fixes: 7905359296 ("LU-15748 osc: fallocate interop for 2.14 clients")
Signed-off-by: Andreas Dilger <adilger@whamcloud.com>
Change-Id: I327183025a8de6fd814a7c2929365497153ebbe5
```

► Use the Test-Parameters: tag in a commit message:

- Test-Parameters: testlist=sanity,racer # run *additional* test scripts, *one session per line*
- ... env=ONLY=32,ONLY_REPEAT=50 # environment vars (run a subtest many times)
- ... ostfstype=zfs # use specific backing fstype
- ... clientversion=2.12 # old client new server interop
- ... serverversion=2.15 # new client old server interop
- ... mdscount=4 mdtcount=8 ostcount=8 # change server counts for DNE testing

► Use trivial keyword **only** for limited testing of test scripts, man pages, build, etc.

- ... trivial # runs **sanity**, **lnet-selftest**, x86 and arch64
- ... testlist=recovery-small,replay-single # add more sessions, config options as needed

<https://wiki.whamcloud.com/display/PUB/Changing+Test+Parameters+with+Gerrit+Commit+Messages>



Adding Extra Test Sessions to an Existing Patch (New!)

The following sessions will be run for build 104169 patch 1

Enforced:

- review-lsdisks-dne on el9.3-x86_64/diskfs servers and clients
- custom on el8.9-x86_64/diskfs servers and el9.3-x86_64/diskfs clients

Maloo Test Queue: https://testing.whamcloud.com/test_queue?jobs=lustre-reviews&builds=104169&commit=Apply+Filter
Maloo Results: https://testing.whamcloud.com/test_sessions/related?jobs=lustre-reviews&builds=104169#redirect

<input type="checkbox"/>	Name	Test Sets	Index
ENFORCED			
<input type="checkbox"/>	lustre-reviews_el9.3-x86_64_review-lsdisks-dne		40
	2024-04-14 08:14:54 UTC	5/5	
<input type="checkbox"/>	lustre-reviews_el8.9-x86_64_el9.3-x86_64_custom		1001
	2024-04-14 08:15:14 UTC	3/3	

Code review link: [54782](#)

Issue retests for selected sessions above

Quick select failures...

Jira:

Retest

Test-Parameter request

Request *additional* test sessions via 'Test-Parameter:' lines

```
Test-Parameters: testlist=sanity-sec env=ONLY=69,ONLY_REPEAT=100
Test-Parameters: testlist=sanity-sec,sanity-sec,sanity-sec serverdistro=el9.3
Test-Parameters: testlist=sanity-sec,sanity-sec,sanity-sec serverversion=2.15
```

Request

1. Requests are in *addition* to default sessions and 'Test-Parameters:' lines in git commit message
2. Each line should start with 'Test-Parameters:' and use same syntax as in commit message (see [wiki TP help page](#))
3. The following TP attributes are not allowed via this interface:
forjanitoronly, forbuidonly, fortestonly, ignore, optional, trivial
4. TP requests are enforced (signofftest=true) unless Maloo has already sent +/- score or signofftest=false is specified
5. Request may take a few minutes to show up in the Maloo test queue, if there is an issue you will be notified via email

- ▶ Maloo Results page can add new sessions
- ▶ Use Test-Parameters as needed
- ▶ Good to **add** test sessions to **existing** patches
- ▶ **Re-uses existing build!** Faster and less work
- ▶ Useful when patch already finished testing
- ▶ Tests are Enforced if testing is not finished
- ▶ Tests are Optional if Maloo +1 is already set
- ▶ **Merge Test-Parameters into patch if refreshed**

Reviewing Test Failures in Maloo

test_64f

Error: 'buffered io, not write rpc: grants mismatch: 12656640, expected 4218880'

Failure Rate: 1.05% of most recent 95 runs, 5 skipped (all branches)

OST 1, OST 2, OST 3, OST 4, OST 5, OST 6, OST 7, OST 8 (trevis-100vm9)

- [sanity.test_64f.debug.trevis-100vm9.log](#) [[Download](#) | [Show](#) | [Preview 50](#)]
- [sanity.test_64f.debug_log.trevis-100vm9.1664078772.log](#) [[Download](#) | [Show](#) | [Preview 50](#)]

MDS 1, MDS 3 (trevis-100vm10)

- [sanity.test_64f.debug.trevis-100vm10.log](#) [[Download](#) | [Show](#) | [Preview 50](#)]
- [sanity.test_64f.debug_log.trevis-100vm10.1664078772.log](#) [[Download](#) | [Show](#) | [Preview 50](#)]
- [sanity.test_64f.dmesg.trevis-100vm10.1664078772.log](#) [[Download](#) | [Show](#) | [Preview 50](#)]
- [sanity.test_64f.dmesg.trevis-100vm10.log](#) [[Download](#) | [Show](#) | [Preview 50](#)]
- [sanity.test_64f.journal.trevis-100vm10.log](#) [[Download](#) | [Show](#) | [Preview 50](#)]
- [sanity.test_64f.stack_trace.trevis-100vm10.log](#) [[Download](#) | [Show](#) | [Preview 50](#)]

Bugs

No bugs

Associate bug...

Raise bug...

Retest...

▶ **Quick search** for similar subtest failures with URL at failed subtest name

▶ **Review** test failures

▶ **Associate** known failures to existing bugs

▶ **Raise** new bug for new test failures

▶ Help track common failures/rates/trends

▶ Contributions welcome to fix intermittent failures

Search Test Results in Maloo



Navigation: LUSTRE | Sessions | Results | Reports & Stats | Queues | Requests

Search | Test sets | Sub | Search | s

Upload

Test set script: sanity

Sub test script: test_64f

Status: FAIL

Bug(s): e.g. LU-1234, DCO-777

Code review: Commit id (SHA)

Code review: Change number (12345)

Trigger job(s): All jobs

Trigger build(s): e.g. 123, 456

Host(s): e.g. travis*, onyx-33vm*

Group(s): Any group

User(s): All users

Within: Last 4 weeks

From: [calendar icon] To: [calendar icon]

Buttons: Search, Reset form, Associate bugs..., Disassociate bugs...

- ▶ Start **Search** from Results menu
 - Select Test or Subtest search
- ▶ May need to increase date range to find occasional failures for subtest
- ▶ Check for other similar failures with associated LU ticket to speed up failure analysis
- ▶ Some failures are caused by prior errors (eg. 'mount failed')
- ▶ Repeated failures for same patch or ticket indicate patch regression

Download results as CSV
16 records found

<input type="checkbox"/>	Name	Status	Date	Duration	Code	Error	Bugs	Links	Test log
<input type="checkbox"/>	test_64f	FAIL	2022-09-25	3604	1	buffered io, not write rpc: grants mi:		gerrit:47131 , jira:LU-8151	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-20	3602	1	buffered io, not write rpc: grants mi:		gerrit:47121 , jira:LU-15777	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-19	10	1	direct io with grant allocation: grant	LU-13847	gerrit:48579 , jira:LU-16165	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-13	14	1	direct io with grant allocation: grant		gerrit:43707 , jira:LU-14139	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-13	3602	1	buffered io, not write rpc: grants m:	LU-13847	gerrit:48278 , jira:LU-16087	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-07	3601	1	buffered io, not write rpc: grants mi:	LU-13847	gerrit:48445 , jira:EX-5398	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-05	3601	1	buffered io, not write rpc: grants mi:		gerrit:45890 , jira:LU-15058	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-02	3	1	mount failed		gerrit:46334 , jira:EX-4567	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-01	3	1	mount failed		gerrit:46334 , jira:EX-4567	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-08-29	3	1	mount failed		gerrit:46334 , jira:EX-4567	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-08-29	3603	1	buffered io, not write rpc: grants mi:	LU-13847	gerrit:48278 , jira:LU-16087	Preview 50



Associate Failures with Multiple Patches

Search

Reset form

Associate bugs...

Disassociate bugs...

- ▶ While reviewing your own patch, also associate the same LU ticket for other similar test failures
 - Helps other developers
 - Improves failure analysis

ID:

[Download results as CSV](#)

16 records found

<input type="checkbox"/>	Name	Status	Date	Duration	Code	Error	Bugs	Links	Test log
<input checked="" type="checkbox"/>	test_64f	FAIL	2022-09-25	3604	1	buffered io, not write rpc: grants mi		gerrit:47131 , jira:LU-8151	Preview 50
<input checked="" type="checkbox"/>	test_64f	FAIL	2022-09-20	3602	1	buffered io, not write rpc: grants mi		gerrit:47121 , jira:LU-15777	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-19	10	1	direct io with grant allocation: grant	LU-13847	gerrit:48579 , jira:LU-16165	Preview 50
<input checked="" type="checkbox"/>	test_64f	FAIL	2022-09-13	14	1	direct io with grant allocation: grant		gerrit:43707 , jira:LU-14139	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-13	3602	1	buffered io, not write rpc: grants mi	LU-13847	gerrit:48278 , jira:LU-16087	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-07	3601	1	buffered io, not write rpc: grants mi	LU-13847	gerrit:48445 , jira:EX-5398	Preview 50
<input checked="" type="checkbox"/>	test_64f	FAIL	2022-09-05	3601	1	buffered io, not write rpc: grants mi		gerrit:45890 , jira:LU-15058	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-02	3	1	mount failed		gerrit:46334 , jira:EX-4567	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-09-01	3	1	mount failed		gerrit:46334 , jira:EX-4567	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-08-29	3	1	mount failed		gerrit:46334 , jira:EX-4567	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-08-29	3603	1	buffered io, not write rpc: grants mi	LU-13847	gerrit:48278 , jira:LU-16087	Preview 50
<input type="checkbox"/>	test_64f	FAIL	2022-08-29	2	1	mount failed		gerrit:45122 , jira:LU-14958	Preview 50

Limit Maloo Search Incrementally

- ▶ Very useful when looking for test regressions
- ▶ Limit or increase search dates to find when failure started
 - Broad searches with large date ranges/many results will timeout, limit searches to specific subtest and status
- ▶ Limit branch, architecture, filesystem to isolate effects
- ▶ "git log --oneline --after YYYY-MM-DD --before YYYY-MM-DD" to find related patch landings

Search [Test sets](#) | [Sub tests](#) | [Bug links](#)

Test set script	sanity	Trigger job(s)	All jobs	Client	not	Server	not
Sub test script	test_64f	Trigger build(s)	e.g. 123, 456	Distribution type		Distribution type	
Status	FAIL ✕	Host(s)	e.g. travis*, onyx-33vm*	Architecture type	<input checked="" type="checkbox"/> aarch64	Architecture type	<input type="checkbox"/>
Bug(s)	e.g. LU-1234, DCO-777	Group(s)	Any group	File system type	<input type="checkbox"/>	File system type	zfs <input type="checkbox"/>
Code review	Commit id (SHA)	User(s)	All users	Branch type	<input type="checkbox"/> b2_12	Branch type	<input type="checkbox"/>
Code review	Change number (12345)	Within		Network type	<input type="checkbox"/>	Network type	<input type="checkbox"/>
		or					
		From	2022-06-01	To	2022-08-31		

[Search](#) [Reset form](#) [Associate bugs...](#) [Disassociate bugs...](#)

Keep Patches Moving Forward

▶ Developers are responsible for their own patches

- Update patches to address inspection comments
- Review, fix, resubmit failed testing sessions promptly (< 7 days) to avoid restarting process
- Remind inspectors to review patches with friendly pings (~7 days is reasonable)

▶ Provide inspection feedback for others in a timely manner

- Helps everyone benefit from effort put into development, testing resources

▶ After inspection, help move patch to next state

- Two or more inspectors on the patch? If not, add another inspector, or ping others
- Tests have passed or triaged? If not, retests needed **within 7 days** before build expires

▶ Good inspections avoid more effort finding defects later

- Chance to find and fix latent bugs, cleanup nearby code

Autotest Failures Affect Everyone

- ▶ Need to identify all test failures on a patch before resubmitting
 - Don't just spam resubmit button, or assume others will fix test failures
 - Patch may otherwise be adding new intermittent bugs
- ▶ **Associate** or **Raise** bugs in Maloo for all test failures
- ▶ Search for similar failures via Maloo, JIRA, associate with failure(s)
 - Can be done more efficiently in batches
- ▶ Data needed to prioritize bugs causing the most failures
 - This speeds up fixing the most frequent failures
 - This in turn speeds up every other patch testing and landing



Whamcloud

Using Git and Gerrit

Managing Branches

- Keep patches for independent changes on separate branches
- A git "branch" is just a pointer to some series of commits
- Each commit or rebase moves pointer to new tip of the branch
- All of the old commits/branches stay in repository, unreferenced
 - `git checkout branch` # check out specific branch
 - `git branch {new_branch}` # create new, **keep current branch**
 - `git checkout -b {new_branch} [old_branch]` # create new branch from current and move there
 - `git status` # show modified/staged/untracked

Finding Branches

► Show local branches

```
# git branch -lv
b_test5          5fefbd1078 LU-15548 tests: skip conf-sanity/131 for older servers
b_def_mask      5efdbeab24 LU-9859 libcfs: add "default" keyword for debug mask
b_comma_list    76cffe0f2c LU-12597 tests: remove need for comma_list
master          1b09fb2296 LU-16062 ldlm: improve bl_timeout for prolong
```

► Show all remote branches

```
# git branch -alv
[as above, plus]
remotes/origin/HEAD-> origin/master
remotes/prime/b2_13  a298f8c137 New release 2.13.0
remotes/prime/b2_14  e1635c6afb New release 2.14.0
```

Commit Message Should Describe Patch Well

- ▶ Patch summary line should be brief, but useful by itself
 - Appears in many patch summaries ("`git log --oneline`", "`git reflog`", etc.)
- ▶ What should be in the commit message?
 - What problem/feature does this patch address?
 - Usage/test that triggered problem, with error messages/stack
 - Performance improvements resulting from patch
 - How it is being fixed, clear description of tricky code
- ▶ **Fixes**: label finds related patches when searching by hash or LU ticket
- ▶ Why is the commit message content important?
 - Initial inspectors understand the patch more quickly
 - Gatekeeper understands importance of the patch
 - Anyone dealing with the patch later has some guidance

<https://wiki.whamcloud.com/display/PUB/Commit+Comments>

Committing Changes

- ▶ Install Git commit hooks for patch verification before push to Gerrit

```
# ln -sf ../../contrib/git-hooks/commit-msg .git/hooks
```

```
# ln -sf ../../contrib/git-hooks/prepare-commit-msg .git/hooks
```

- ▶ Read the comments provided by `prepare-commit-msg` hook and address them!

```
# git add [PATH ...]
```

```
# stage specified file(s) or dirs for commit
```

```
# git add [-u]
```

```
# stage all changes for commit
```

```
# git commit -av
```

```
# stage and commit all changes, show diff
```

```
# git commit -av --amend
```

```
# add current changes to previous commit
```

```
# git reset --hard {BRANCH|HEAD~n}
```

```
# permanently revert to branch, or last n commits
```

```
# git cherry-pick {BRANCH|COMMIT}
```

```
# copy specific patch to current branch
```

Committing Partial Changes

► Add individual patch hunks

```
# git add -p
diff --git a/obd_support.h b/obd_support.h
@@ -482,6 +482,8 @@ int obd_alloc_fail(const void *ptr,
    #define OBD_FAIL_LFSCK_NO_AUTO                0x160b
    #define OBD_FAIL_LFSCK_NO_DOUBLESCAN         0x160c

+#define OBD_FAIL_FID_MAPPING                    0x1500
+
+/* Assign references to moved code to reduce code changes */
#define OBD_FAIL_PRECHECK(id)                   CFS_FAIL_PRECHECK(id)
#define OBD_FAIL_CHECK(id)                     CFS_FAIL_CHECK(id)
```

Stage this hunk [y,n,q,a,d,/,e,?]?

Rebasing Patches

- Patches should be kept up-to-date with master branch
- WC Checkpatch marks patches `Verified: -1` that don't apply
- Multiple dependent patches in a single series
 - # `git rebase [-i] {master|b2_15}` # edit/reorder patches (interactively)
 - # `git add -u` # add updated file(s) to commit
 - # `git rebase {--continue|--abort}` # apply or discard changes
 - # `git rebase --skip` # drop current patch entirely
 - # `git rebase --onto BRANCH` # rebase onto a new branch

Rebasing a Patch or Series

► Rebase last two patches

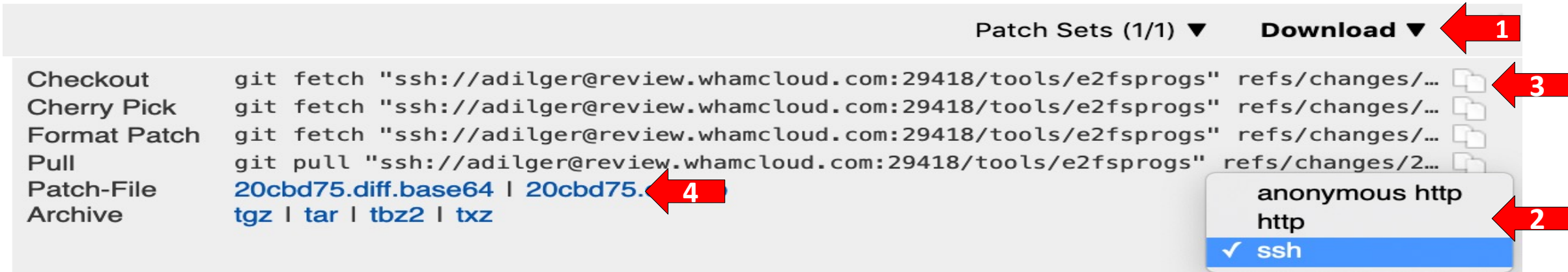
```
# git rebase -i {master|HEAD~2}
pick    4043c3c3bd LU-12885 llite: add enum ll_file_flags for clarity
fixup   fc350ac3f4 LU-12885 mds: add enums for MDS_OPEN flags
reword  27723374a3 LU-16073 utils: double snapshot_mount fix
```







```
# Rebase fc350ac3f4.. 4043c3c3bd onto 27723374a3
# Commands:
# p, pick = use commit
# r, reword = use commit, but edit the commit message
# e, edit = use commit, but stop for amending
# s, squash = use commit, but meld into previous commit
# f, fixup = like "squash", but discard this commit's log message
# x, exec = run command (the rest of the line) using shell
# These lines can be re-ordered; they are executed top to bottom.
```

► Can also change patch ordering in this way

(Re)basing Another Patch onto an Existing Change



	Patch Sets (1/1) ▼	Download ▼
Checkout	git fetch "ssh://adilger@review.whamcloud.com:29418/tools/e2fsprogs" refs/changes/...	
Cherry Pick	git fetch "ssh://adilger@review.whamcloud.com:29418/tools/e2fsprogs" refs/changes/...	
Format Patch	git fetch "ssh://adilger@review.whamcloud.com:29418/tools/e2fsprogs" refs/changes/...	
Pull	git pull "ssh://adilger@review.whamcloud.com:29418/tools/e2fsprogs" refs/changes/2...	
Patch-File	20cbd75.diff.base64 20cbd75.tgz tar tbz2 txz	
Archive		

Download options dropdown:

- anonymous http
- http
- ✓ ssh

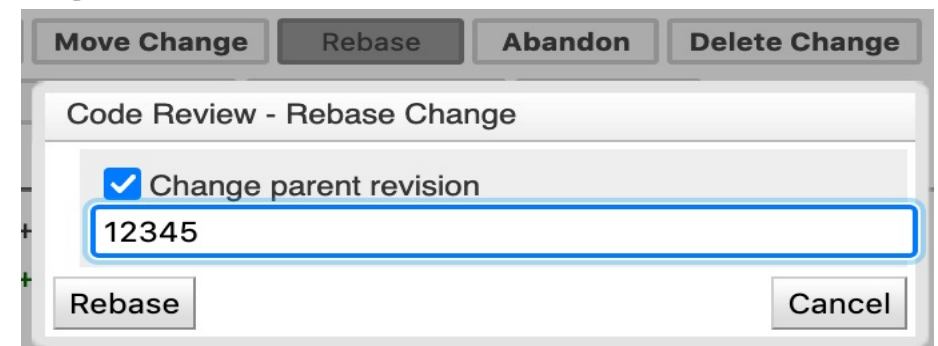
```
# git fetch ... && git checkout -b b_new_patch FETCH_HEAD # checkout patch (#1, #2, #3)
# git cherry-pick {my patch} # apply new patch on top
# git log # verify old commit hash is same (#4)
# git push ... HEAD:refs/for/master # push new patch to Gerrit
```

► **Do not** rebase new branch onto latest master before submitting

- Original developer should rebase or land their patch first

► Can also do simple rebase in Gerrit with [Rebase] button

- "Change parent revision" and specify patch number
- Cannot resolve patch conflicts directly in Gerrit



Code Review - Rebase Change

Change parent revision

12345

Rebase Cancel

Searching in Git

- `git diff [-w]` # show current change (no whitespace changes)
- `git diff --cached` # show "git add" changes already are staged for commit
- `git log [BRANCH|PATH]` # show commits (branch/dir/file)
- `git log -S STRING` # search changes in **patches** that add/remove specific string
- `git log -S STRING --patch` # show patch for each matching commit found
- `git log --grep REGEXP` # search **commit messages** with regular expression
- `git grep REGEXP` # show all **files in repository** with regular expression
- `git show [-w] [COMMIT]` # show specific commit (ignore whitespace differences)
- `git describe [COMMIT]` # name [of COMMIT] relative to tag (e.g. v2_14_57-26-g54d4cca6)

Finding Change History of Code

- ▶ Shows last commit that modified each line in a file

```
# git blame lustre/obdclass/class_obd.c
```

```
:
```

```
52257a67e4d (Liu Xuezhao          2012-07-10 21:13:26 +0800  96)
829dd8b39a8 (Nathan Rutman        2009-05-28 00:00:48 +0000  97)
7817e4c785d (John L. Hammond       2015-01-11 11:56:32 -0500  98)
5707f919e41 (James Simmons       2013-09-27 10:24:42 -0400  99)
5707f919e41 (James Simmons       2013-09-27 10:24:42 -0400 100)
54d4cca6cb0 (Arshad Hussain     2021-03-21 06:32:07 +0530 101)
```

- ▶ Show history of commits *before* a specific commit, ignore whitespace changes


```
# git blame -w lustre/obdclass/class_obd.c COMMIT~1
```

- ▶ Show patches landed between specific dates (with margin to account for time zones)

```
# git log --after 2022-09-10 --before 2022-09-13
```


Gerrit Searching Shortcut in Firefox

- ▶ Searching for patches is fairly flexible
 - A few basic keywords are useful to know
 - Many options available (state, content, age, reviews)
 - Default to search for word in commit message
- open change #12345
`review 12345`
- find commit messages for specific text
`review LU-12250`
- find merged patches owned by specific user
`review owner:bzzz is:merged`
- find open patches modifying specific file
`review file:lustre_idl.h is:open`

 **Edit bookmark**

Name

URL

Tags
 

Use tags to organize and search for bookmarks from the address bar

Keyword

Use a single keyword to open bookmarks directly from the address bar

<https://review.whamcloud.com/Documentation/user-search.html>

What To Do When Things Go Wrong

- ▶ All old commits/branches remain in the repository (until garbage collection)

```
# git reflog
```

```
3c96fb6 HEAD@{49}: rebase: LU-11721 tests: enable full debugging for sanity
da6cf33 HEAD@{1}: commit: LU-2468 libcfs: quiet debug messages
0b3e852 HEAD@{2}: checkout: moving from b_cleanup9 to b_cleanup7
5ea4d20 HEAD@{3}: rebase finished: returning to refs/heads/b_cleanup9
5ea4d20 HEAD@{4}: rebase: LU-1798 tests: don't set jobid if not changing
0b3e852 HEAD@{5}: checkout: moving from b_cleanup9 to 0b3e852a58^0
```

- ▶ If things go really badly, you can abort rebase/am and start again

```
# git rebase --abort
```

Extracting and Sharing Changes

- ▶ Default values in `$HOME/.gitconfig` or `.git/config` in local repository

```
[user]
  name = Andreas Dilger
  email = adilger@whamcloud.com
[sendemail]
  smtpserver = shawmail.cg.shawcable.net
  smtpserverport = 25
  confirm = compose
[core]
  abbrev=12
[pretty]
  fixes=Fixes: %h ("%s")
[format]
  pretty=fuller
```



Whamcloud

Thank You