FV3 transition to Vlab and Git

6/12/2017

Mark A. Potts, Ph.D.

Background and roadmap

- Made FV3 available (read-only) on Vlab git on May 15, 2017.

- Currently 35+ members added to the Vlab project

- FV3 Members granted write access to git repo on June 12, 2017.

- Introduction to using vlab and git (this briefing) on June 12, 2017.

  - Invitation to practice using git and learn how to checkout, update, commit, push and merge.

- After a month or so of practice with git, further training on using Gerrit for code review.

- Transition fully to git and Gerrit around the end of July 2017.

- Convert svn to read-only at same time as transition to git/Gerrit.

Get added to Vlab and FV3!

▶ Go to https://vlab.ncep.noaa.gov/group/fv3gfs/home and fill out the web form to get added to the project and repository.

▶ If you have any particular branches from subversion you would like pushed to the git repo, put your branch in this shared document on the google drive—https://docs.google.com/a/noaa.gov/document/d/1mNfwoqmSX_owdFlYqiK_Q5EmBcKCgUSqg51yZT8ezHg/edit?usp=sharing

▶ Any users without noaa.gov email addresses will need to request they be sponsored for a vlab account (contact me mark.potts@noaa.gov).

Git basics

- Git works somewhat differently than subversion (svn)
- Clone creates a full copy, including all remote branches, in your local directory
- Changing between branches is all done in the same directory
  - Untracked files remain
  - Tracked files are swapped
- Commits are first done on the local repo
  - Local commits to a branch must be pushed to the vlab repo explicitly

Specifics of FV3 Git repo on Vlab

▶ COMFV3 is set up as a superproject that includes submodules containing both NEMS and FV3 repositories.

  ▶ https://svnemc.ncep.noaa.gov/projects/apps/NEMSfv3gfs

    ▶ https://svnemc.ncep.noaa.gov/projects/nems

    ▶ https://svnemc.ncep.noaa.gov/projects/fv3

▶ To pull all at once

  `git clone --recursive https://user.name@vlab.ncep.noaa.gov/git/comfv3`

Sample of git clone


```
[Margaux:~/tmp 4; git clone --recursive https://mark.potts@vlab.ncep.noaa.gov/git/comfv3
Cloning into 'comfv3'...
remote: Counting objects: 484, done.
remote: Compressing objects: 100% (300/300), done.
remote: Total 484 (delta 260), reused 319 (delta 156)
Receiving objects: 100% (484/484), 807.71 KiB | 1.34 MiB/s, done.
Resolving deltas: 100% (260/260), done.
Submodule 'FV3' (https://mark.potts@vlab.ncep.noaa.gov/git/fv3-ext) registered for path 'FV3'
Submodule 'NEMS' (https://mark.potts@vlab.ncep.noaa.gov/git/nems-ext) registered for path 'NE
MS'
Cloning into '/Users/mpotts/tmp/comfv3/FV3'...
remote: Counting objects: 899, done.
remote: Compressing objects: 100% (477/477), done.
remote: Total 899 (delta 407), reused 875 (delta 396)
Receiving objects: 100% (899/899), 4.07 MiB | 0 bytes/s, done.
Resolving deltas: 100% (407/407), done.
Cloning into '/Users/mpotts/tmp/comfv3/NEMS'...
remote: Counting objects: 20671, done.
remote: Compressing objects: 100% (5231/5231), done.
remote: Total 20671 (delta 15200), reused 20603 (delta 15192)
Receiving objects: 100% (20671/20671), 479.72 MiB | 11.27 MiB/s, done.
Resolving deltas: 100% (15200/15200), done.
Submodule path 'FV3': checked out '507a870fbbf8f5fa303b604c43eeef1747f4b2f1'
Submodule path 'NEMS': checked out '247d9e8c0fa4637b69e2d89f553bbee17bf2790d'
Margaux:~/tmp 5;
```

Get started with the new repo

- ▶ Change to the new comfv3 directory and look around
- ▶ Note that FV3 and NEMS are actually separate repositories in the comfv3 root.
- ▶ CD to FV3 and check out a branch from the vlab repo

```
git branch -r

git checkout origin branch-name
```

```
Terminal — -tcsh — 94×19

Margaux:~/tmp/comfv3 25; cd FV3
Margaux:~/tmp/comfv3/FV3 26; git branch -r
  origin/HEAD -> origin/master
  origin/cmake
  origin/fv3-jet
  origin/fv3.v0.0.0release
  origin/fv3_cesm
  origin/master
Margaux:~/tmp/comfv3/FV3 27; git checkout fv3-jet
Switched to branch 'fv3-jet'
Your branch is up-to-date with 'origin/fv3-jet'.
Margaux:~/tmp/comfv3/FV3 28; ls
atmos_cubed_sphere/      coupler_main.F90        makefile
atmos_model.F90          fms/                    mkDepends.pl*
compile*                 fv3_cap.F90             tests/
conf/                    gfsphysics/             time_utils.F90
configure*               io/
Margaux:~/tmp/comfv3/FV3 29;
```

Create a new branch

- Create a new branch starting from master

  `git checkout -b new-branch`

- Verify the branch you are on

  `git branch`

- Change a file, check status, and commit change

  `git status`
  `git commit -a (changed existing file)`
  `git add new-file; git commit`

- Enter commit message

- Push your local branch up to the vlab server

  `git push origin local-branch`

```
Margaux:~/tmp/comfv3/FV3 36; git branch
[  fv3-jet
   master
*  new-branch
Margaux:~/tmp/comfv3/FV3 37; echo "this is a new file" > new-file
[Margaux:~/tmp/comfv3/FV3 38; git add new-file
[Margaux:~/tmp/comfv3/FV3 39; git commit -a
[[new-branch 0ab72e3] This is a smaple comment for a sample file
 1 file changed, 1 insertion(+)
 create mode 100644 new-file
Margaux:~/tmp/comfv3/FV3 40; git push origin new-branch
[Counting objects: 3, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 312 bytes | 0 bytes/s, done.
Total 3 (delta 1), reused 0 (delta 0)
To https://vlab.ncep.noaa.gov/git/fv3-ext
 * [new branch]      new-branch -> new-branch
Margaux:~/tmp/comfv3/FV3 41; git branch -r
[  origin/HEAD -> origin/master
   origin/cmake
   origin/fv3-jet
   origin/fv3.v0.0.0release
   origin/fv3_cesm
   origin/master
   origin/new-branch
Margaux:~/tmp/comfv3/FV3 42; 
```

```
This is a smaple comment for a sample file
# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.
# On branch new-branch
# Changes to be committed:
#       new file:   new-file
#
~
~
```

Delete a branch

▶ To delete a local branch

`git branch –D new-branch`

▶ To delete a remote branch

`git push origin :new-branch`

▶ Generally not a good idea if anyone else may have checked out a copy!

```
Terminal — -tcsh — 96×31

Margaux:~/tmp/comfv3/FV3 43; git branch
  fv3-jet
  master
* new-branch
Margaux:~/tmp/comfv3/FV3 44; git checkout master
Switched to branch 'master'
Your branch is up-to-date with 'origin/master'.
Margaux:~/tmp/comfv3/FV3 45; git branch –D new-branch
Deleted branch new-branch (was 0ab72e3).
Margaux:~/tmp/comfv3/FV3 46; git branch
  fv3-jet
* master
Margaux:~/tmp/comfv3/FV3 47; git branch -r
  origin/HEAD -> origin/master
  origin/cmake
  origin/fv3-jet
  origin/fv3.v0.0.0release
  origin/fv3_cesm
  origin/master
  origin/new-branch
Margaux:~/tmp/comfv3/FV3 48; git push origin :new-branch
To https://vlab.ncep.noaa.gov/git/fv3-ext
 - [deleted]         new-branch
Margaux:~/tmp/comfv3/FV3 49; git branch -r
  origin/HEAD -> origin/master
  origin/cmake
  origin/fv3-jet
  origin/fv3.v0.0.0release
  origin/fv3_cesm
  origin/master
Margaux:~/tmp/comfv3/FV3 50; 
```

Common issues

- Made a bunch of changes, but want to scrap them all and go back to last commit

  ```
  git reset --hard HEAD
  ```

- Made a bunch of changes and committed locally, but want to revert to previous commit

  ```
  git checkout master

  git branch -D localbranch

  git checkout origin localbranch

  OR

  git reset --hard <SOME-COMMIT> // this will delete history

  git revert <SOME-COMMIT> // this will revert to some commit

  git reset --hard HEAD~1  // this will reset to previous commit
  ```

Using git log to find commits

▶ Git log will provide a listing of the history of a given branch

git log --pretty=oneline

Terminal — -tcsh — 115×32

```
34463be699fabf9c73e3a9fa4ffc4fec75a605fb Added submodules for vlab
14b4da5277762415f0b06745f8a134077862ad1d Added submodules for fix and libsrc
53eaddd6e69bac3de030b11b67e94bd9d2944f13 Trunk: Merged updateNoVarCloud_ticket640 branch at r92401 to the trunk.  T
he major code update for this commit is adding the cloud water and cloud ice number concentration in the ARW backgr
ound IO and the non-var cloud analysis driver.  Other changes include:  * Small enhancements to the non-var cloud a
nalysis: add analysis to use visibility/fog observations; add option to limit the cloud building with METAR observa
tion unto 1200m; apply the thetaV conservation to the grid that is outside the observed cloud coverage but need to
ensure the saturation because of the existing of the background cloud.  * Clean unused variable in non-var cloud an
alysis package.  Some unused variables are kept because it needs further investigation to decide if they are still
useful at sometime in the future. Most of code changes in lib/GSD/gsdcloud are for code cleaning.  * A bug fix in u
pdate_guess.f90 for correctly updating 2-m Q and T for surface analysis.  * Added a new option to read and process
global NASA LaRC cloud products in BUFR format.  The observation type for this dataset is "larcglb" and the subrout
ine is: "read_NASA_LaRC_cloud".  * A new driver ( gsdcloudanalysis4gfs.F90 ) and background converting subroutine (
 BackgroundCldgfs ) for applying non-var cloud package for the GFS are added.  We tested this option with single ca
se and a short retro.  This new code can use the global NASA LaRC cloud products to update the background cloud liq
uid water (cloud ice + cloud water) but further evaluation and tuning on the impact to the GFS forecast should be c
onducted.
5f697d47777379f1a0be8c6609c8cee6bd0bdcfd Clean the code for committing to the trunk.
9188d8f5b9830a797662d71e8e9fa28feb9e55b1 Code changes to include GSD no-var cloud analysis update.
f1e755d453ea40ca653dafd8f4456c20162eddcb Create this branch to hold the code from GSD for the enhancements of non-v
ar cloud analysis.
62454bcc35398454b14b27a0cedf47811723e4ea Trunk: Merged ImproveObsOperator_ticket639_C branch at r91564 to the trunk
.  This update brings in three changes:  * Current GSI forward model for surface observations can induce large repr
esentativeness error when surface conditions are inhomogeneous, such as on coastlines. An improved forward model fo
r surface observations is developed in GSD to analyze the observations on coastlines with GSI.  * There are many hi
gh frequency observations used in RAP/HRRR, such as aircraft and surface observations. GSI inflates the observation
 error for duplicated observations from the same station. Another option is added for duplicated observations to us
e one that is closer to the analysis time only.  * Several bugs were found and fixed in GSI T&E for RAP/HRRR applic
ation and from community GSI support and DTC T&E.
fef10c9d3684ce3cb89c5b21ef01f788ce4a426d Delete unused variables and add precision to hr_offset=min_offset/60.0_r_k
```
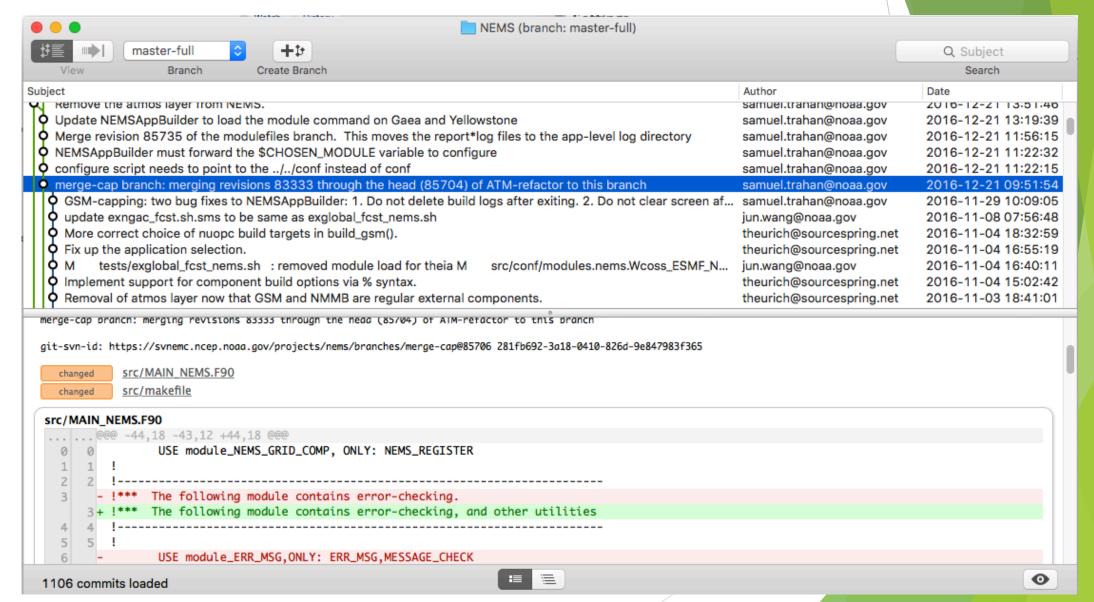
Gitk and GitX

Git stash

- Sometimes, you want to keep things you have been working on, but temporarily do something else.

- Git stash will put all changes since last commit into "hiding"

- Run git stash, then do some other new thing.

- To pull changes back, run `git stash pop`

- Can also be used to stash changes made on one branch and then apply them to another.

Git Stash example

Terminal — -tcsh — 80×39

```
Margaux:~/tmp/comfv3/FV3 24; git status
On branch master
Your branch is up-to-date with 'origin/master'.
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   gfsphysics/physics/sascnv.f
        modified:   gfsphysics/physics/sascnvn.f
        modified:   gfsphysics/physics/set_soilveg.f
        modified:   gfsphysics/physics/sfc_cice.f
        modified:   gfsphysics/physics/sfc_diag.f
        modified:   gfsphysics/physics/sfc_diff.f
        modified:   gfsphysics/physics/sfc_drv.f
        modified:   gfsphysics/physics/sfc_land.f
        modified:   gfsphysics/physics/sfc_nst.f
        modified:   gfsphysics/physics/sfc_ocean.f
        modified:   gfsphysics/physics/sfc_sice.f
        modified:   gfsphysics/physics/sfcsub.f
        modified:   gfsphysics/physics/sflx.f
        modified:   gfsphysics/physics/shalcnv.f
        modified:   gfsphysics/physics/shalcv.f
        modified:   gfsphysics/physics/shalcv_1lyr.f
        modified:   gfsphysics/physics/shalcv_fixdp.f
        modified:   gfsphysics/physics/shalcv_opr.f

Untracked files:
  (use "git add <file>..." to include in what will be committed)

        gfsphysics/physics/comment
        gfsphysics/physics/lst

no changes added to commit (use "git add" and/or "git commit -a")
Margaux:~/tmp/comfv3/FV3 25; git stash
Saved working directory and index state WIP on master: 507a870 TRUNK UPDATE, tic
ket 15: update for runnig FV3GFS with NSST, output frequency, grid size length s
cales etc.
HEAD is now at 507a870 TRUNK UPDATE, ticket 15: update for runnig FV3GFS with NS
ST, output frequency, grid size length scales etc.
```

Merging changes

▶ Git tends to be pretty smart about handling merges. Will look for common ancestor and apply changes one on top of the other.

▶ To prepare for merge of your branch into trunk/master

```
git checkout your-branch

git merge master
```

▶ If conflicts arise, use git mergetool –t (vimdiff, kdiff3, etc.) I prefer to do this locally (mac or linux) using kdiff3

```
git mergetool –t kdiff3
```

▶ Once conflicts are settled, commit changes to local branch and push them to vlab.

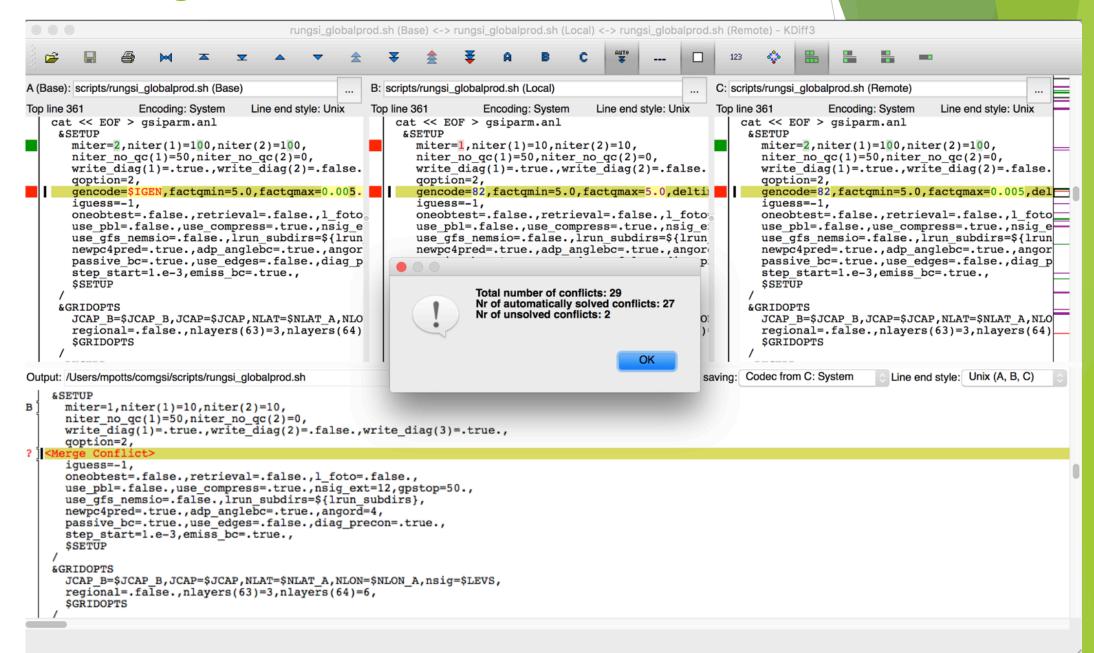▶ Now, change to master and merge your updated local branch into master

```
git checkout master

git merge your-branch
```

Git merge example


```
Margaux:~/comgsi 110; ls
fix/            lib/            libsrc/         scripts/        src/            util/
Margaux:~/comgsi 111; git branch
* fov_util_goes
  master
Margaux:~/comgsi 112; git merge master
Auto-merging util/Radiance_Monitor/parm/Makefile.conf.theia
Removing util/Radiance_Monitor/nwprod/radmon_shared.v2.0.2/sorc/verf_radtime.fd/Makefile.conf
Removing util/Radiance_Monitor/nwprod/radmon_shared.v2.0.2/sorc/verf_radbcor.fd/Makefile.conf
Removing util/Radiance_Monitor/nwprod/radmon_shared.v2.0.2/sorc/verf_radbcoef.fd/Makefile.conf
Removing util/Radiance_Monitor/nwprod/radmon_shared.v2.0.2/sorc/verf_radang.fd/Makefile.conf
Auto-merging util/Radiance_Monitor/nwprod/gdas_radmon.v2.0.2/scripts/exgdas_vrfyrad.sh.ecf
Auto-merging util/Radiance_Monitor/nwprod/gdas_radmon.v2.0.2/jobs/JGDAS_VERFRAD
Removing util/Radiance_Monitor/nwprod/gdas_radmon.v2.0.0/versions/gdas_radmon.ver
Removing util/Radiance_Monitor/image_gen/src/Makefile.conf
Removing util/Radiance_Monitor/data_extract/sorc/validate_time.fd/Makefile.conf
Removing util/Radiance_Monitor/data_extract/sorc/make_base.fd/Makefile.conf
Removing util/Radiance_Monitor/data_extract/parm/rgnl_conf
Removing util/Radiance_Monitor/data_extract/parm/glbl_conf
Removing util/Radiance_Monitor/data_extract/parm/README
Removing util/ObsStat/gsistats/plot_gsistat.py
Removing util/ObsStat/gsistats/parse_gsistat.py
Removing util/ObsStat/gsistats/cmp_gsistat.py
Removing util/ObsStat/gsistats/README
Removing util/NMC_Bkerror/util/convert2gcv.f
Removing util/NMC_Bkerror/sorc/Makefile.conf
Removing util/Minimization_Monitor/nwprod/gdas_minmon.v1.0.0/versions/gdas_minmon.ver
Auto-merging util/EnKF/gfs/src/recentersigp.fd/Makefile.conf.nco
Removing util/EnKF/gfs/src/getnstensmeanp.fd/getsfcensmeanp.f90
Removing src/wrwrfnmma.F90
Removing src/wrwrfmassa.F90
Removing src/write_obsdiags.F90
Removing src/wrf_netcdf_interface.F90
Removing src/wrf_binary_interface.F90
Removing src/setupyobs.f90
Removing src/regional_io.f90
Removing src/read_wrf_nmm_guess.F90
Removing src/read_wrf_nmm_files.F90
Removing src/read_wrf_mass_guess.F90
Removing src/read_wrf_mass_files.F90
Removing src/read_obsdiags.F90
Auto-merging src/read_obs.F90
Auto-merging src/read_goesndr.f90
CONFLICT (content): Merge conflict in src/read_goesndr.f90
Auto-merging src/read_diag.f90
Removing src/m_obdiag.F90
Removing src/get_wrf_nmm_ensperts.F90
Removing src/get_wrf_mass_ensperts_netcdf.F90
Removing src/get_pseudo_ensperts.F90
Auto-merging src/enkf/smooth_gfs.f90
```
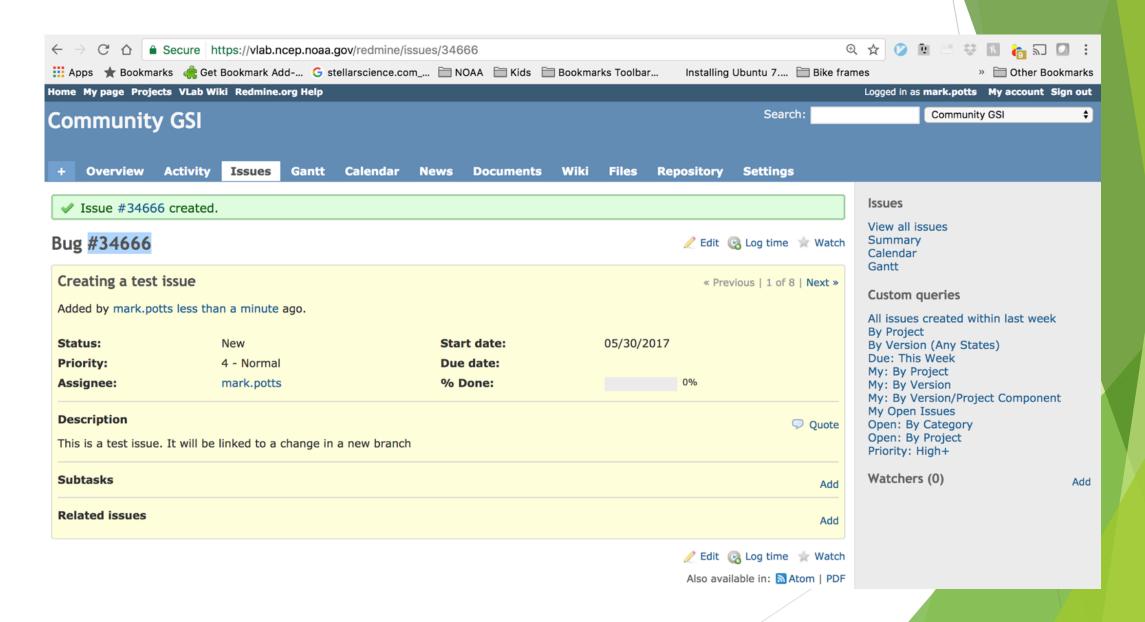
Kdiff3 as mergetool

git mergetool –t kdiff3

Using Redmine

- Access via https://vlab.ncep.noaa.gov/redmine
  - Select the Community FV3 from the drop down menu on the top right
- Select Issues tab
- Click on New issue on the top right side
- Fill out the form and assign to yourself (or someone else on the project)
- Note the reference number for the issue.
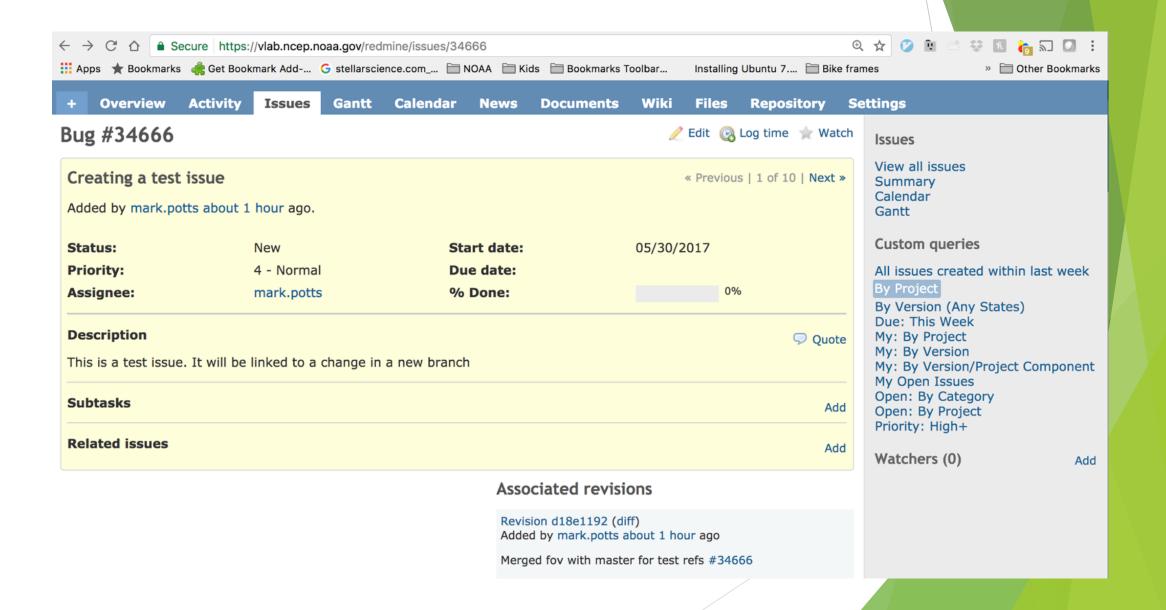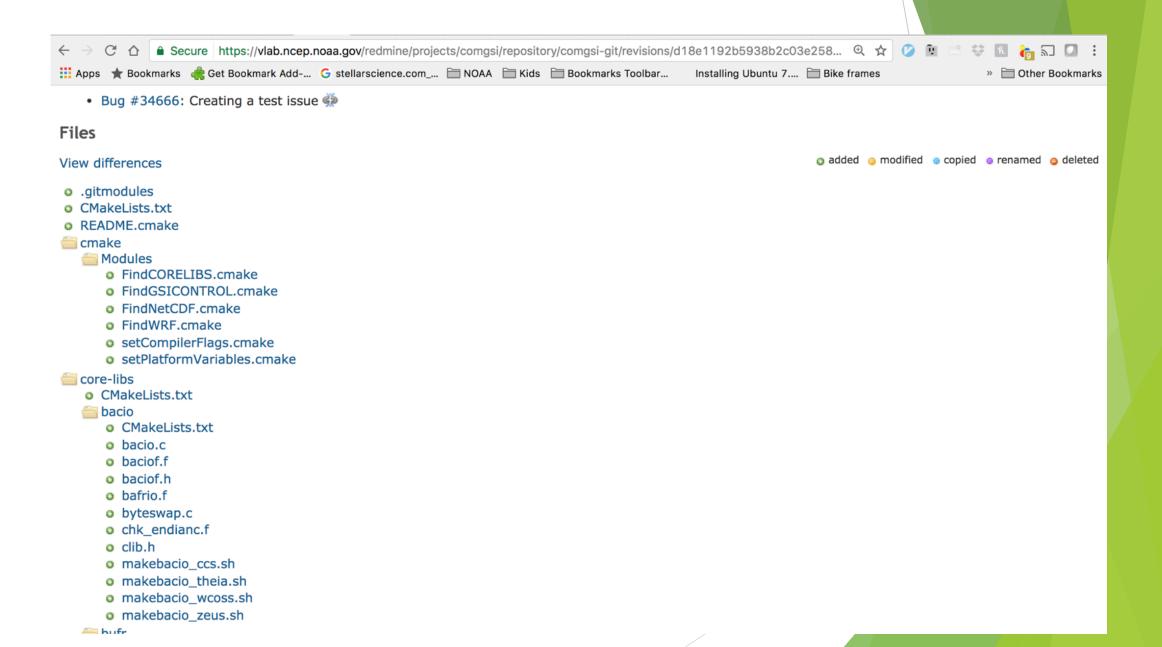- Can be linked to git commits

Redmine Sample

Adding reference numbers to commit

```
Margaux:~/comgsi 125; git commit -a
[test_branch d18e1192] Merged fov with master for test refs #34666
 1456 files changed, 246421 insertions(+), 71113 deletions(-)
 create mode 100644 .gitmodules
 create mode 100644 CMakeLists.txt
 create mode 100644 README.cmake
 create mode 100644 cmake/Modules/FindCORELIBS.cmake
 create mode 100644 cmake/Modules/FindGSICONTROL.cmake
 create mode 100644 cmake/Modules/FindNetCDF.cmake
 create mode 100644 cmake/Modules/FindWRF.cmake
 create mode 100644 cmake/Modules/setCompilerFlags.cmake
 create mode 100644 cmake/Modules/setPlatformVariables.cmake
 create mode 100644 core-libs/CMakeLists.txt
 create mode 100644 core-libs/bacio/CMakeLists.txt
 create mode 120000 core-libs/bacio/bacio.c
 create mode 120000 core-libs/bacio/baciof.f
 create mode 120000 core-libs/bacio/baciof.h
 create mode 120000 core-libs/bacio/bafrio.f
 create mode 120000 core-libs/bacio/byteswap.c
 create mode 120000 core-libs/bacio/chk_endianc.f
 create mode 120000 core-libs/bacio/clib.h
 create mode 120000 core-libs/bacio/makebacio_ccs.sh
 create mode 120000 core-libs/bacio/makebacio_theia.sh
 create mode 120000 core-libs/bacio/makebacio_wcoss.sh
 create mode 120000 core-libs/bacio/makebacio_zeus.sh
 create mode 100644 core-libs/bufr/CMakeLists.txt
 create mode 100644 core-libs/crtm/CMakeLists.txt
 create mode 100644 core-libs/io_int/CMakeLists.txt
 create mode 100644 core-libs/nemsio/CMakeLists.txt
 create mode 100644 core-libs/sfcio/CMakeLists.txt
 create mode 100644 core-libs/sigio/CMakeLists.txt
 create mode 100644 core-libs/sp/CMakeLists.txt
 create mode 120000 core-libs/test
 create mode 100644 core-libs/w3emc/CMakeLists.txt
 create mode 100644 core-libs/w3nco/CMakeLists.txt
 create mode 100644 doc/EnKF_user_guide/ack.tex
 create mode 100644 doc/EnKF_user_guide/dtcdoc.sty
 create mode 100644 doc/EnKF_user_guide/enkf_appendix_A.tex
```
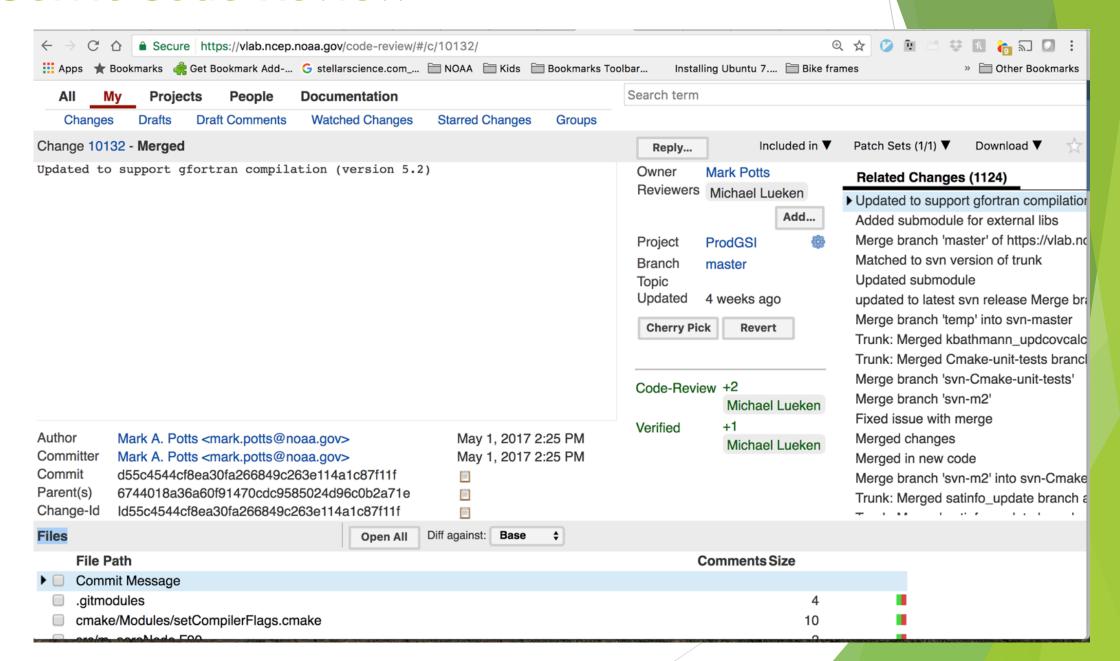
Eventually shows up in Vlab

Link to page showing changes made

Gerrit Code Review

Subversion	Git
svn checkout https://svn….	git clone https://….
svn update	git pull origin branchname (may need git remote update to refresh upstream info)
svn commit	git add; git commit OR git commit –a git push origin branchname (to push to vlab)
svn merge --dry-run ^/fv3/trunk svn merge ^/fv3/trunk	From your branch, 'git merge master' After conflicts fixed, 'git checkout master' 'git merge yourbranch' (your branch merged to master locally) git push prod HEAD:/refs/for/master (your merged branch pushed to Gerrit for code review/approval)
svn copy https://….trunk https:// …..newbranch	from master, 'git checkout –b newbranch' Also, 'git branch newbranch; git checkout newbranch'
svn stat	git status
svn merge –rNEW:OLD	git revert oldSHA git checkout oldSHA git reset –hard HEAD~1
svn log	git log git log –pretty=oneline gitk or GitX (Mac)

Conclusion

- ▶ The final transition to Vlab will not occur until the end of July at the earliest.

- ▶ We have not turned on Gerrit yet. There will be a further briefing before we transition to the code review section of Vlab.

- ▶ Please try out git and start becoming familiar with it.

- ▶ Feel free to push new branches to vlab and modify/merge/delete them as you wish (master branch excepted).

  - ▶ Note that if you are sharing work on a branch, deleting it on vlab can cause issues with collaboration.

- ▶ If you run into problems, feel free to contact me (mark.potts@noaa.gov) and I will help you work through them.