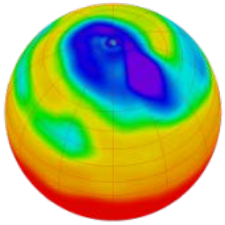

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Managing your code: version control

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Overview

- What is version control and why do it?
- SVN versus GIT
- Subversion (**SVN**) in action at the command line
  - repositories
  - adding stuff
  - committing
  - handling conflicts and rolling back

Managing code in the olden days

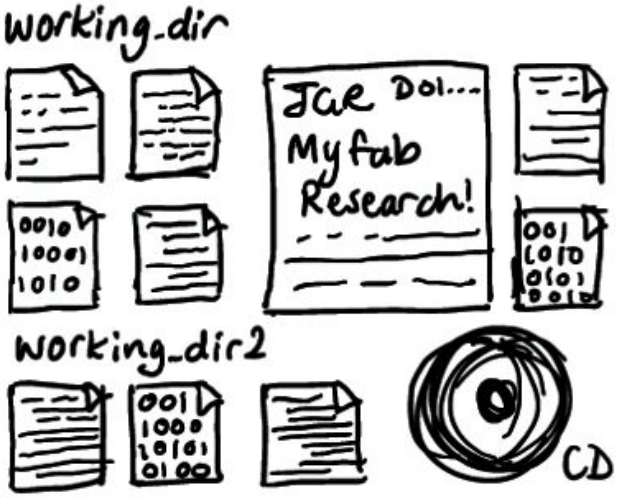
…create “working_dir”

…add some code

…write some outputs

…change the code

!!Publish a paper!!



…change the code

…copy “working_dir” to “working_dir2”

…change the code

…copy a version to a CD

Now which version is current? Is it “working_dir” or “working_dir2”? And which one relates to that paper?

But those days are gone!

- Scientists are typically required to keep and publish their data and code (by their funders/institutions).
- Collaboration between scientists requires data-sharing; this implicitly relies on code-sharing.
- There are tools that make it easy to record our changes, document our workflow and “fix” releases of our code at important steps along the way.

Introducing Version Control Systems

“Revision control, also known as **version control** and **source control** is the management of changes to documents [and] computer programs. Changes are usually identified by a number or letter code, termed the "revision number" or simply "revision".

For example, an initial set of files is "revision 1". When the first change is made, the resulting set is "revision 2", and so on. Each revision is associated with a timestamp and the person making the change. Revisions can be compared, restored, and with some types of files, merged.” (from Wikipedia!)

GIT vs SVN

So, which VCS should you use?

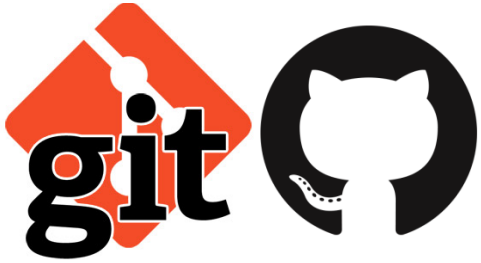
- SVN is easier to comprehend
- GIT is more powerful

  (and better for collaboration)

Keep it simple:

- What do your colleagues/collaborators use?
- What do your administrators support?

We use both at CEDA!



- git was initially designed for linux kernel development in 2005 and has since become the most widely adopted version control system for software development.
- Unlike client-server systems such as subversion, every git working directory is a fully-fledged repository with complete history and full version-tracking capabilities.
- git is independent of network access or a central server.

You can still do version control offline

- git software is free
- There are lots of online tools to help manage git repositories some of them have pictures of cats.

SVN: Basic Operation

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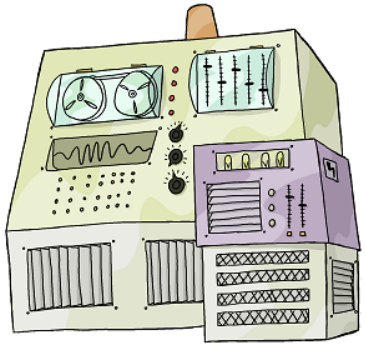

universal.software-carpentry.org

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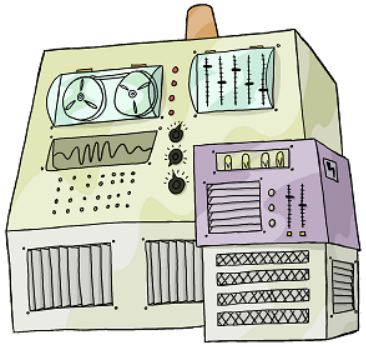

https://universal.software-carpentry.org/monsters

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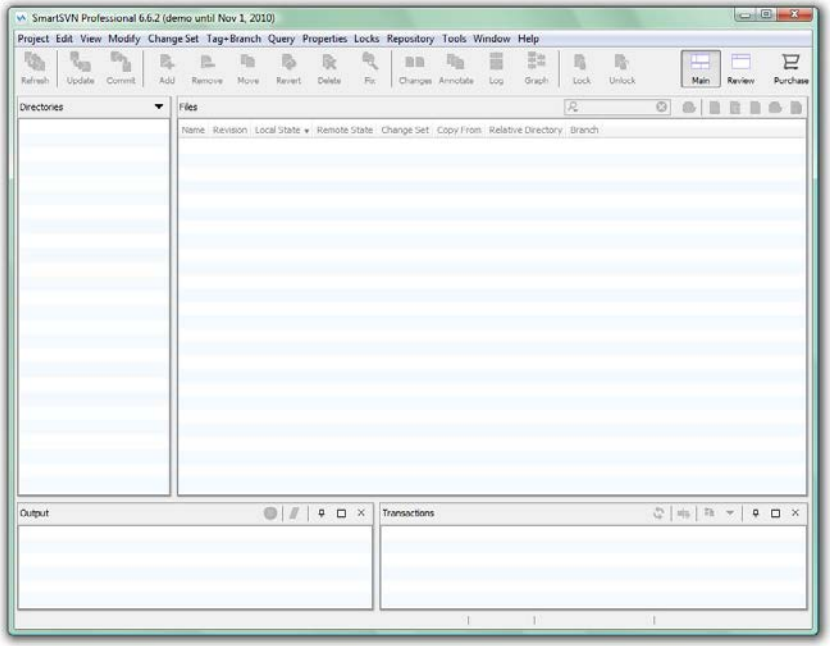
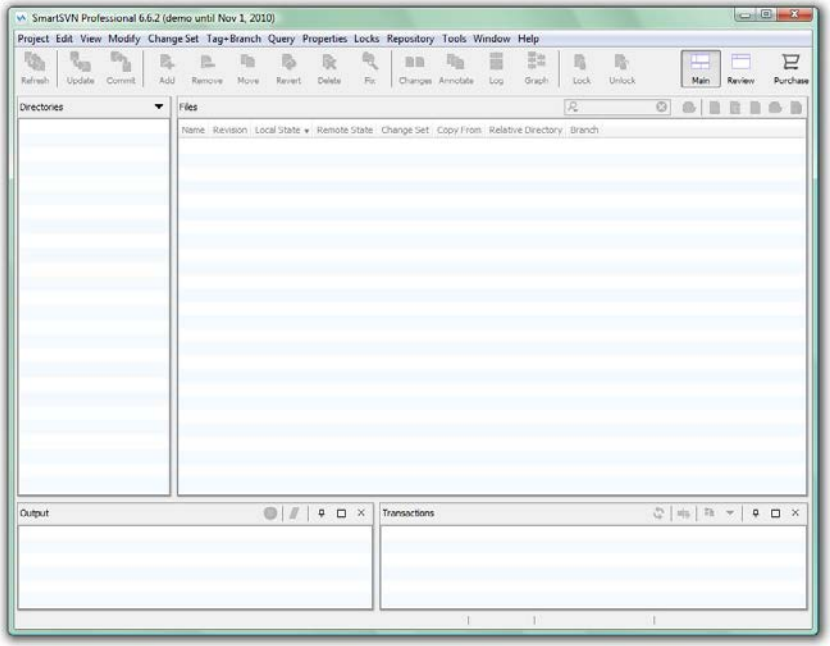
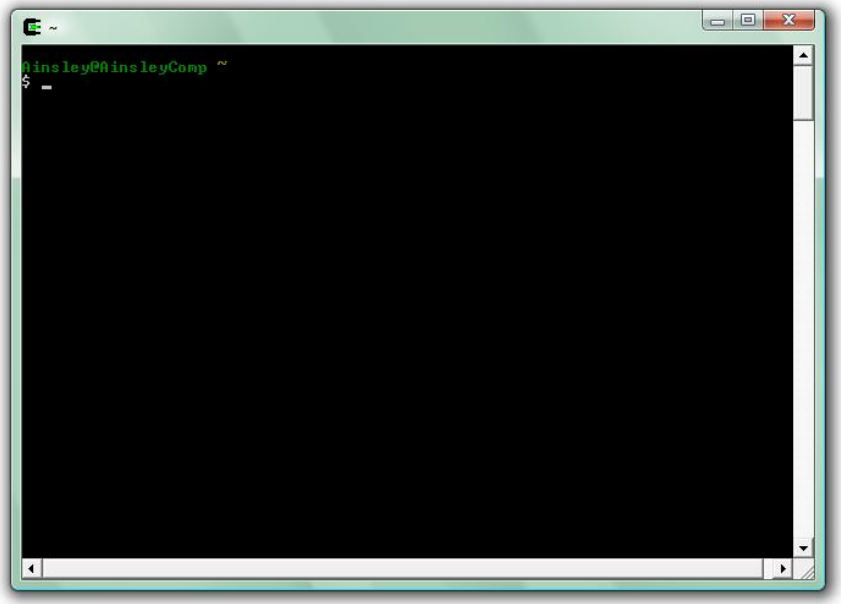
SmartSVN


SmartSVN Professional 6.6.2 (demo until Nov 1, 2010)
Project Edit View Modify Change Set Tag+Branch Query Properties Locks Repository Tools Window Help
Refresh Update Commit Add Remove Move Revert Delete Fix Changes Annotate Log Graph Lock Unlock Main Review Purchase
Directories
Files
Name Revision Local State Remote State Change Set Copy From Relative Directory Branch
Output
Transactions

SmartSVN



Command Line



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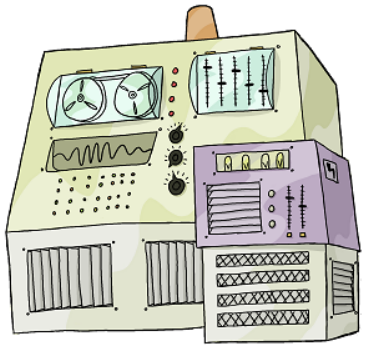
It's fast.

It's fast.

It's simple.



revision 6

```
$ svn checkout
```

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```
$ svn co
```

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```
$ svn co https://universal.software-carpentry.org
  /cygwin/home/dracula/monsters
```

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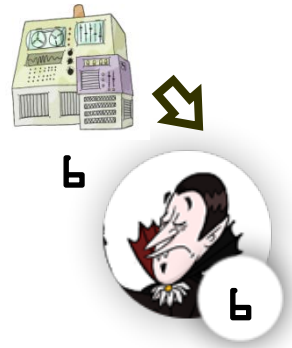
```
$ svn co https://universal.software-carpentry.org
  /cygwin/home/dracula/monsters
```

repository

```
$ svn co https://universal.software-carpentry.org
  /cygwin/home/dracula/monsters
```

working copy

```
$ svn co https://universal.software-carpentry.org
  /cygwin/home/dracula/monsters
A  earth/carlsbad.txt
A  earth/antarctica.txt
...
Checked out revision 6.
$
```



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$ svn co https://universal.software-carpentry.org
  /cygwin/home/dracula/monsters
A  earth/carlsbad.txt
A  earth/antarctica.txt
...
Checked out revision 6.
$ cd /cygwin/home/dracula/monsters
$
```

```
$ svn co https://universal.software-carpentry.org
  /cygwin/home/dracula/monsters
A  earth/carlsbad.txt
A  earth/antarctica.txt
...
Checked out revision 6.
$ cd /cygwin/home/dracula/monsters
$ ls
earth    mars    jupiter    ...
$
```

```
$ svn log
```

```
$ svn log
Damn the budget - the Jovian moons would be …
------------------------------------------------------------------------
r6 | mummy | 2010-07-26 09:21:39 | 1 lines

The budget might not even stretch to a deep…
------------------------------------------------------------------------
r5 | mummy | 2010-07-26 09:19:18 | 1 lines
…

$
```

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The budget might not even stretch to a deep…
------------------------------------------------------------------------
r5 | mummy | 2010-07-26 09:19:18 | 1 lines
…

$
```

```
$ cd jupiter
$
```

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```
$ cd jupiter
$ nano moons.txt
GNU Nano
Name        Orbital Radius          Orbital Period          Mass
Io          421.6                   1.769138                893.2
Europa      670.9                   3.551181                480.0
Ganymede    1070.4                  7.154553                1481.9
Calisto     1882.7                  16.689018               1075.9
...
$
```

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Ganymede    1070.4                  7.154553                1481.9
Calisto     1882.7                  16.689018               1075.9
...
$
```

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$ cd jupiter
$ nano moons.txt
GNU Nano
Name        Orbital Radius        Orbital Period        Mass
Io          421.6                 1.769138              893.2
Europa      670.9                 3.551181              480.0
Ganymede    1070.4                7.154553              1481.9
Calisto     1882.7                16.689018             1075.9
...
$ svn add
```

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GNU Nano
Name        Orbital Radius      Orbital Period      Mass
Io          421.6               1.769138            893.2
Europa      670.9               3.551181            480.0
Ganymede    1070.4              7.154553            1481.9
Calisto     1882.7              16.689018           1075.9
...
$ svn add moons.txt
```

```
$ cd jupiter
$ nano moons.txt
GNU Nano
Name        Orbital Radius        Orbital Period        Mass
Io          421.6                 1.769138              893.2
Europa      670.9                 3.551181              480.0
Ganymede    1070.4                7.154553              1481.9
Calisto     1882.7                16.689018             1075.9
...
$ svn add moons.txt
A  moons.txt
$
```

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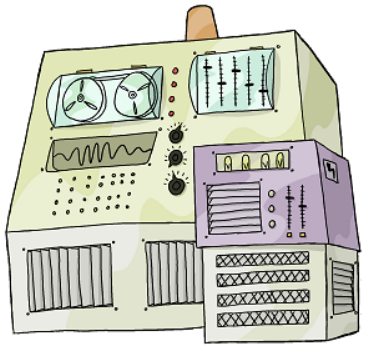

revision 6

revision 6+

```
$ svn commit -m "Some basic facts about the
  Galilean moons of Jupiter."
```

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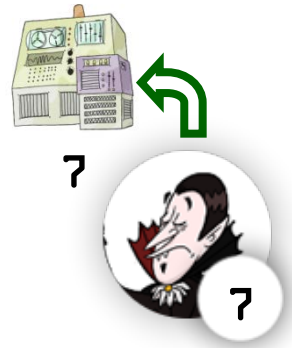
```
$ svn commit -m "Some basic facts about the
  Galilean moons of Jupiter."
```

```
$ svn commit -m "Some basic facts about the
  Galilean moons of Jupiter."
Adding       moons.txt
Transmitting file data . .
Committed revision 7.
$
```



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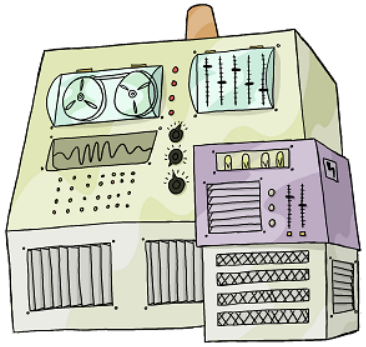
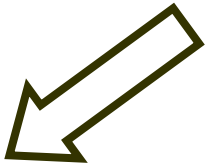


revision 7



revision 6

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```
$ cd /cygwin/home/wolfman/monsters
```

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```
$ cd /cygwin/home/wolfman/monsters
$ svn update
```

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```
$ cd /cygwin/home/wolfman/monsters
$ svn update
A  jupiter/moons.txt
Updated to revision 7.
$
```

```
$ cd /cygwin/home/wolfman/monsters
$ svn update
A  jupiter/moons.txt
Updated to revision 7.
$ cd jupiter
$ less moons.txt
```

Name	Orbital Radius	Orbital Period	Mass
Amalthea	181.4	0.498179	0.075
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Calisto	1882.7	16.689018	1075.9

```
$ cd /cygwin/home/wolfman/monsters
$ svn update
A  jupiter/moons.txt
Updated to revision 7.
$ cd jupiter
$ less moons.txt
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Name	Orbital Radius	Orbital Period	Mass
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Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Calisto	1882.7	16.689018	1075.9

```
$ nano moons.txt
GNU Nano
Name        Orbital Radius          Orbital Period          Mass
Io          421.6                   1.769138                893.2
Europa      670.9                   3.551181                480.0
Ganymede    1070.4                  7.154553                1481.9
Callisto        1882.7                  16.689018               1075.9
```

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```
$ nano moons.txt
GNU Nano
Name        Orbital Radius        Orbital Period        Mass
Amalthea    181.4                 0.498179              0.075
Io          421.6                 1.769138              893.2
Europa      670.9                 3.551181              480.0
Ganymede    1070.4                7.154553              1481.9
Callisto        1882.7                16.689018             1075.9
```

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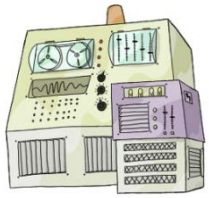
```
$ nano moons.txt
GNU Nano
Name        Orbital Radius          Orbital Period          Mass
Amalthea    181.4                   0.498179                0.075
Io          421.6                   1.769138                893.2
Europa      670.9                   3.551181                480.0
Ganymede    1070.4                  7.154553                1481.9
Callisto        1882.7                  16.689018               1075.9
...
$ svn commit -m "1. Fixed typo Calisto->Callisto.
  2. Added info about Amalthea."
Sending        jupiter/moons.txt
Transmitting file data .
Committed revision 8.
```

Dealing with Conflicts



revision 8

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius	Orbital Period	Mass
Amalthea	181.4	0.498179	0.075
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9
Himalia	11460	250.5662	0.095
Elara	11740	259.6528	0.008

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius	Orbital Period	Mass
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9

revision 8+

revision 8+

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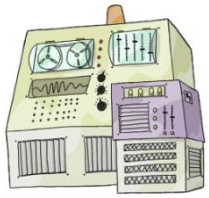

revision 9

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius	Orbital Period	Mass
Amalthea	181.4	0.498179	0.075
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
~~Callisto~~	~~1882.7~~	~~16.689018~~	~~1075.9~~
Himalia	11460	250.5662	0.095
Elara	11740	259.6528	0.008

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius	Orbital Period	~~Mass~~
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	~~893.2~~
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9

revision 8+

revision 9

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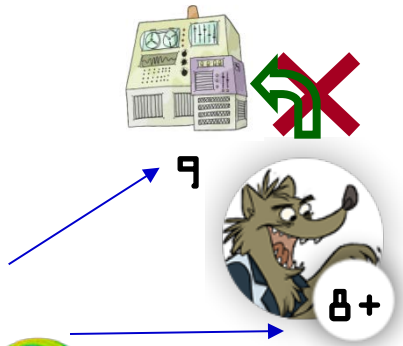
NATURAL ENVIRONMENT RESEARCH COUNCIL

```
$ svn commit -m  “Added data for Himalia, Elara"
Sending        jupiter/moons.txt
svn: Commit failed (details follow):
svn: File or directory ’moons.txt’ is out of date;
     try updating
svn: resource out of date; try updating
$
```

```
$ svn commit -m  “Added data for Himalia, Elara"
Sending        jupiter/moons.txt
svn: Commit failed (details follow):
svn: File or directory ’moons.txt’ is out of date;
     try updating
svn: resource out of date; try updating
$
```



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```
$ svn commit -m  “Added data for Himalia, Elara"
Sending        jupiter/moons.txt
svn: Commit failed (details follow):
svn: File or directory ’moons.txt’ is out of date;
     try updating
svn: resource out of date; try updating
$ svn update
G    jupiter/moons.txt
Updated to revision 9.
$
```

```
$ svn commit -m  “Added data for Himalia, Elara"
Sending        jupiter/moons.txt
svn: Commit failed (details follow):
svn: File or directory ’moons.txt’ is out of date;
     try updating
svn: resource out of date; try updating
$ svn update
G    jupiter/moons.txt
Updated to revision 9.
$ svn commit -m  “Added data for Himalia, Elara"
Sending        jupiter/moons.txt
Transmitting file data .
Committed revision 10.
$
```

revision 10

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius (10**3 km)	Orbital Period (days)	Mass (10**20 kg)
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9
Himalia	11460	250.5662	0.095
Elara	11740	259.6528	0.008

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius * 10^3 km	Orbital Period * days	Mass * 10^20 kg
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9
Himalia	11460	250.5662	0.095
Elara	11740	259.6528	0.008

revision 10+

revision 9+

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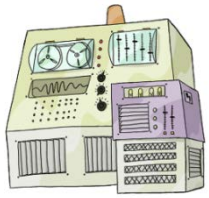


revision 11

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius (10**3 km)	Orbital Period (days)	Mass (10**20 kg)
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9
Himalia	11460	250.5662	0.095
Elara	11740	259.6528	0.008

revision 11

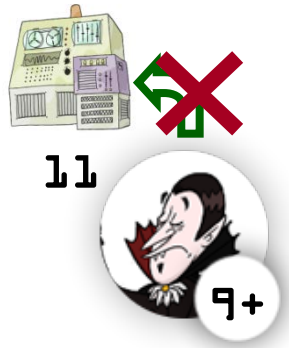
moons.txt - Notepad

File Edit Format View Help

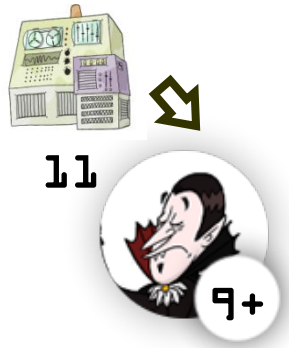
Name	Orbital Radius * 10^3 km	Orbital Period * days	Mass * 10^20 kg
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9
Himalia	11460	250.5662	0.095
Elara	11740	259.6528	0.008

revision 9+

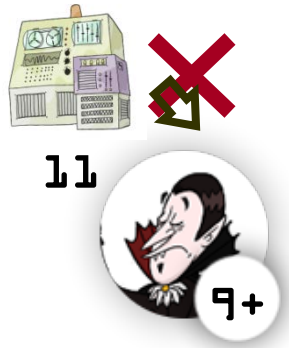
```
$ svn commit -m  “Added measurement units"
Sending        jupiter/moons.txt
svn: Commit failed (details follow):
svn: File or directory ’moons.txt’ is out of date;
     try updating
svn: resource out of date; try updating
$
```



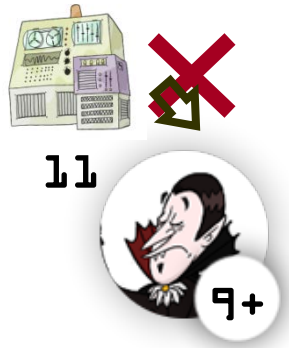
```
$ svn commit -m  “Added measurement units"
Sending        jupiter/moons.txt
svn: Commit failed (details follow):
svn: File or directory 'moons.txt' is out of date;
     try updating
svn: resource out of date; try updating
$ svn update
```



```
$ svn commit -m  “Added measurement units"
Sending        jupiter/moons.txt
svn: Commit failed (details follow):
svn: File or directory 'moons.txt' is out of date;
     try updating
svn: resource out of date; try updating
$ svn update
Conflict discovered in  'jupiter/moons.txt'.
Select: (p) postpone, (df) diff-full, (e) edit,
        (mc) mine-conflict, (tc) theirs-conflict,
        (s) show all options:
```



```
$ svn commit -m  “Added measurement units"
Sending        jupiter/moons.txt
svn: Commit failed (details follow):
svn: File or directory 'moons.txt' is out of date;
     try updating
svn: resource out of date; try updating
$ svn update
Conflict discovered in  'jupiter/moons.txt'.
Select: (p) postpone, (df) diff-full, (e) edit,
        (mc) mine-conflict, (tc) theirs-conflict,
        (s) show all options:  df
```



```
--- jupiter/.svn/text-base/moons.txt.svn-base   Fri Oct  1 21:08
+++ jupiter/.svn/tmp/moons.txt.tmp              Fri Oct  1 22:59
@@ -1,6 +1,11 @@
 Name                Orbital Radius     Orbital Period     Mass
+<<<<<<< .mine
+                    * 10^3 km          * days             * 10^20 kg
+=======
+                    (10**3 km)         (days)             (10**20 kg)
+>>>>>>> .r11
 Amalthea            181.4              0.498179           0.074
 Io                  421.6              1.769138           893.2
 Europa              670.9              3.551181           480.0
 Ganymede            1070.4             7.154553           1481.9
 Callisto            1882.7             16.689018          1075.9
Select: (p) postpone, (df) diff-full, (e) edit, (r) resolved,
        (mc) mine-conflict, (tc) theirs-conflict, (s) show all options:
```

```
--- jupiter/.svn/text-base/moons.txt.svn-base  Fri Oct  1 21:08
+++ jupiter/.svn/tmp/moons.txt.tmp             Fri Oct  1 22:59
@@ -1,6 +1,11 @@
 Name              Orbital Radius     Orbital Period     Mass
+<<<<<<< .mine
+                  * 10^3 km          * days             * 10^20 kg
+=======
+                  (10**3 km)         (days)             (10**20 kg)
+>>>>>>> .r11
 Amalthea          181.4              0.498179           0.074
 Io                421.6              1.769138           893.2
 Europa            670.9              3.551181           480.0
 Ganymede          1070.4             7.154553           1481.9
 Callisto          1882.7             16.689018          1075.9
Select: (p) postpone, (df) diff-full, (e) edit, (r) resolved,
        (mc) mine-conflict, (tc) theirs-conflict, (s) show all options: e
```

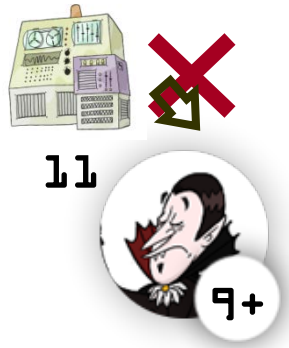
```
GNU Nano
Name                Orbital Radius  Orbital Period   Mass
<<<<<<< .mine
+                       * 10^3 km         * days          * 10^20 kg
+=======
+                       (10**3 km)        (days)          (10**20 kg)
+>>>>>>> .r11
Amalthea            181.4               0.498179        0.074
Io                      421.6               1.769138        893.2
Europa              670.9               3.551181        480.0
Ganymede        1070.4              7.154553        1481.9
Callisto                1882.7              16.689018       1075.9

...
```

GNU Nano

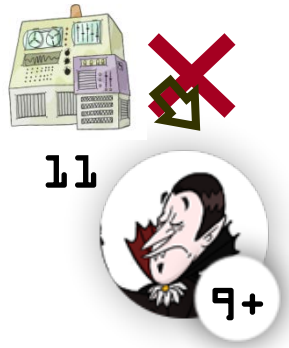
Name	Orbital Radius * 10^3 km	Orbital Period * days	Mass * 10^20 kg
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9

...

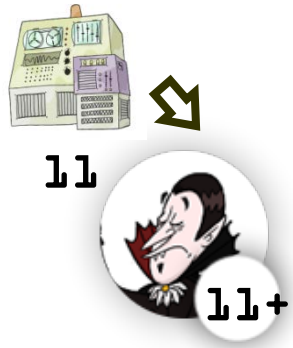
Select: (p) postpone, (df) diff-full, (e) edit, (r) resolved,
(mc) mine-conflict, (tc) theirs-conflict, (s) show all options:



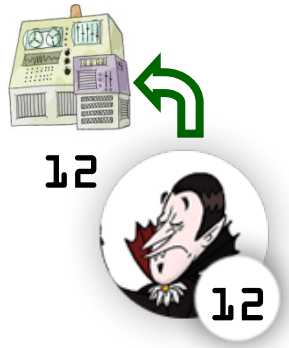
```
Select: (p) postpone, (df) diff-full, (e) edit, (r) resolved,
        (mc) mine-conflict, (tc) theirs-conflict, (s) show all options: r
```



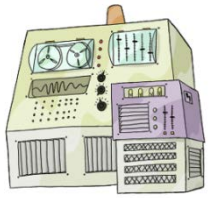
```
Select: (p) postpone, (df) diff-full, (e) edit, (r) resolved,
        (mc) mine-conflict, (tc) theirs-conflict, (s) show all options: r
Updated to revision 11.
$
```



```
Select: (p) postpone, (df) diff-full, (e) edit, (r) resolved,
        (mc) mine-conflict, (tc) theirs-conflict, (s) show all options: r
Updated to revision 11.
$ svn commit -m "Added measurement units "
Sending        jupiter/moons.txt
Transmitting file data .
Committed revision 12.
```



Rollback with SVN



revision 12

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius * 10^3 km	Orbital Period * days	Mass * 10^20 kg
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9

revision 12

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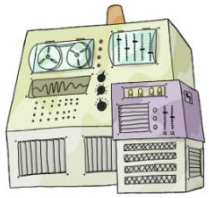
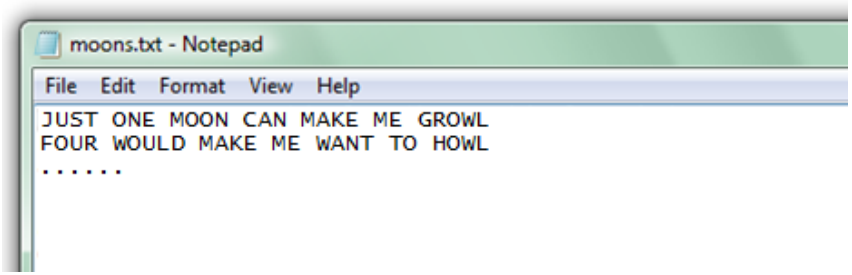
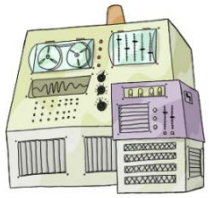


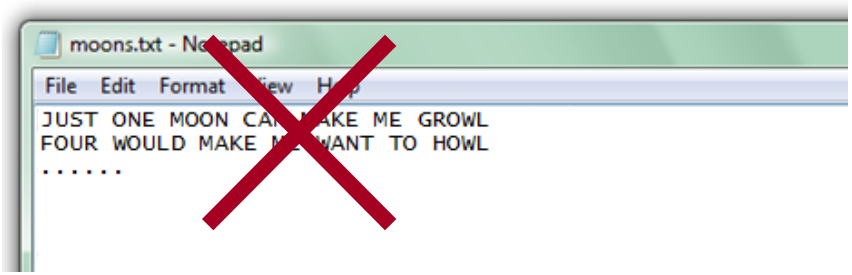
revision 12



revision 12+



revision 12



UNDO!

revision 12+

```
$ cd /cygwin/home/wolfman/monsters/jupiter
$
```

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```
$ cd /cygwin/home/wolfman/monsters/jupiter
$ svn revert
```

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```
$ cd /cygwin/home/wolfman/monsters/jupiter
$ svn revert moons.txt
```

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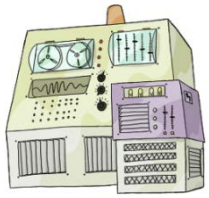
```
$ cd /cygwin/home/wolfman/monsters/jupiter
$ svn revert moons.txt
Reverted    moons.txt
$
```



revision 12

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius * 10^3 km	Orbital Period * days	Mass * 10^20 kg
Amalthea	181.4	0.498179	0.074
Io	421.6	1.769138	893.2
Europa	670.9	3.551181	480.0
Ganymede	1070.4	7.154553	1481.9
Callisto	1882.7	16.689018	1075.9

revision 12

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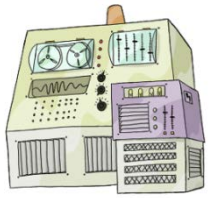


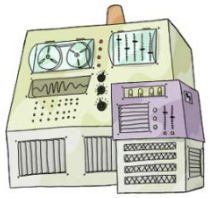
revision 12

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius * km	Orbital Period * days	Mass * 10^20 kg
Amalthea	181,400	0.498179	0.074
Io	421,600	1.769138	893.2
Europa	670,900	3.551181	480.0
Ganymede	1070,400	7.154553	1481.9
Callisto	1882,700	16.689018	1075.9

revision 12+



revision 13

moons.txt - Notepad

File Edit Format View Help

Name	Orbital Radius * km	Orbital Period * days	Mass * 10^20 kg
Amalthea	181,400	0.498179	0.074
Io	421,600	1.769138	893.2
Europa	670,900	3.551181	480.0
Ganymede	1070,400	7.154553	1481.9
Callisto	1882,700	16.689018	1075.9

revision 13

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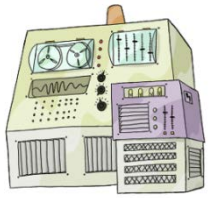

revision 13

I want to reverse!

revision 13

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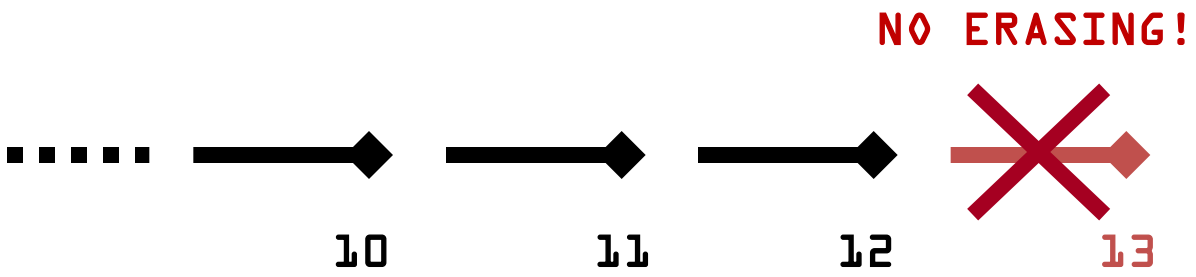

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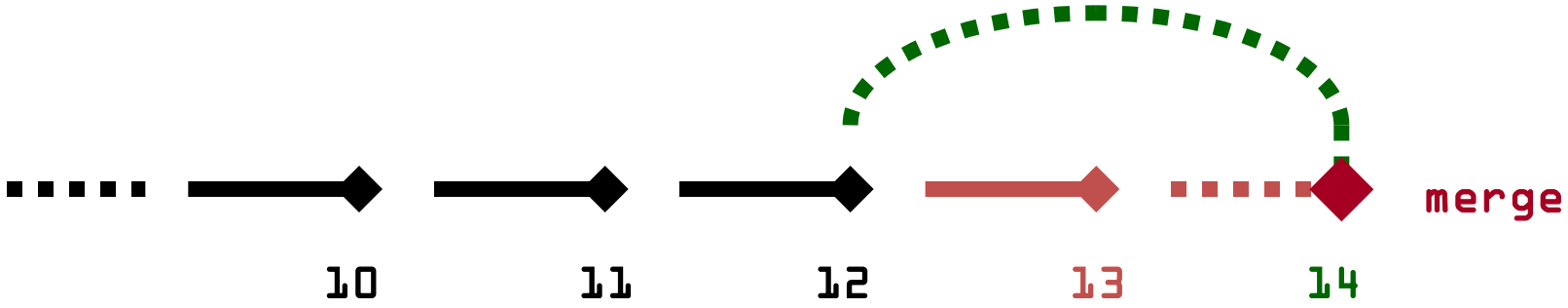

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```
$ cd /cygwin/home/dracula/monsters/jupiter
$ svn merge
```

```
$ cd /cygwin/home/dracula/monsters/jupiter
$ svn merge -r
```

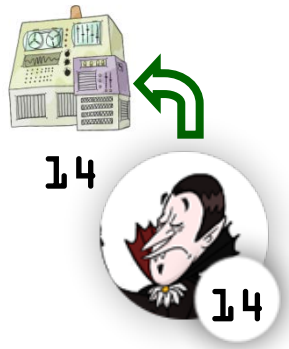
```
$ cd /cygwin/home/dracula/monsters/jupiter
$ svn merge -r HEAD:12
```

```
$ cd /cygwin/home/dracula/monsters/jupiter
$ svn merge  -r HEAD:12 moons.txt
```

```
$ cd /cygwin/home/dracula/monsters/jupiter
$ svn merge  -r HEAD:12 moons.txt
-- Reverse-merging r13 into  'moons.txt'
U  moons.txt
$
```

```
$ cd /cygwin/home/dracula/monsters/jupiter
$ svn merge  -r HEAD:12 moons.txt
-- Reverse-merging r13 into  'moons.txt'
U  moons.txt
$ svn diff
...
$
```

```
$ cd /cygwin/home/dracula/monsters/jupiter
$ svn merge -r HEAD:12 moons.txt
-- Reverse-merging r13 into 'moons.txt'
U  moons.txt
$ svn diff
...
$ svn commit -m "Alright, no commas."
Sending        jupiter/moons.txt
Transmitting file data .
Committed revision 14.
```



`svn co`	check out repository
`svn log`	view change history
`svn add`	add file
`svn commit`	commit file
`svn update`	update to most recent revision
`svn diff`	view differences between revisions
`svn merge`	merge revisions

Please use Version Control

- It will **save you time** – *No more accidentally deleting your workspace, or working on the wrong version of a file.*
- It will **make you a better programmer** – *It encourages good working practices: such as documenting change.*
- It will help you **collaborate more effectively** – *Others can access tagged releases of your code.*
- It will **boost your scientific integrity** – *Helping you document your work; aiding reproducibility.*
- It will **make you feel safe** – *No more waking up at 3 a.m. wondering if you backed up your work!*

Further information (1)

Subversion web site:

http://subversion.apache.org/

Subversion documentation:

http://svnbook.red-bean.com/

Definitive guide to GIT:

http://git-scm.com/

Git documentation:

http://git-scm.com/documentation

Further information (2)

- Git Crash Course for people who know SVN:
  http://git.or.cz/course/svn.html
- GitHub: a social source-code sharing site:
  http://github.com/

Acknowledgements

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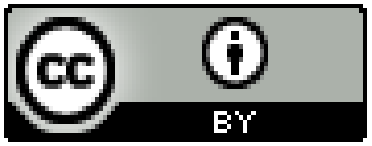

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"Introduction to GIT". Lukas Fittl (http://fittl.com).

"*Git and GitHub*". Darren Oakley.

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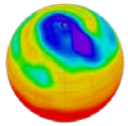

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