

Practical Reproducibility

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S2I2 HEP/CS Workshop Princeton

5/2/17



Popper
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The Popper Convention: Practical Reproducible Evaluation of Systems

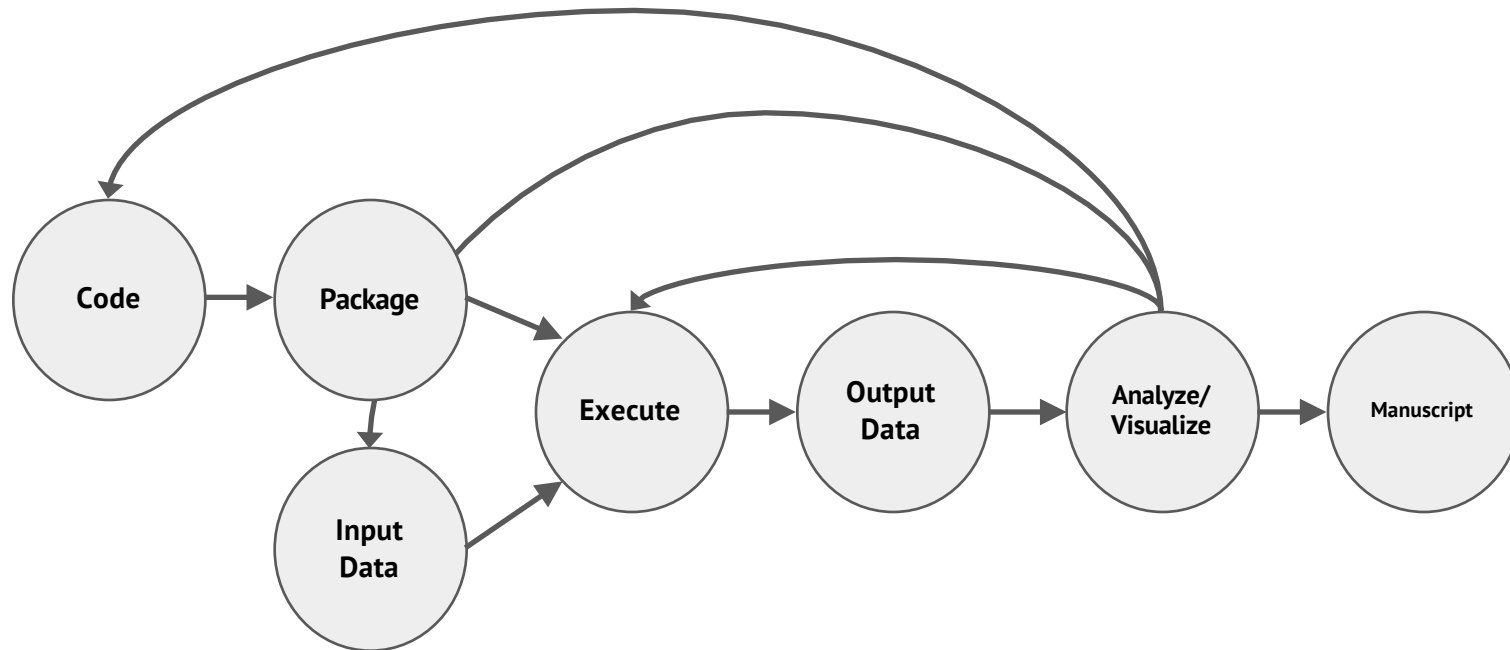
Ivo Jimenez, Michael Sevilla, Noah Watkins,
Carlos Maltzahn (UC Santa Cruz)

Jay Lofstead (SNL)

Kathryn Mohror, Adam Moody (LLNL)

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Common Experimentation Workflow

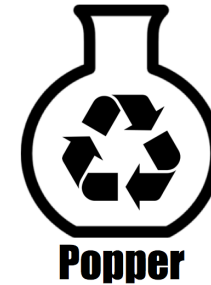


Analogies with DevOps Practice

Scientific exploration	Software project
Experiment code	Source code
Input data	Test examples
Analysis / visualization	Test analysis
Validation	CI / Regression testing
Manuscript / note book	Documentation / reports

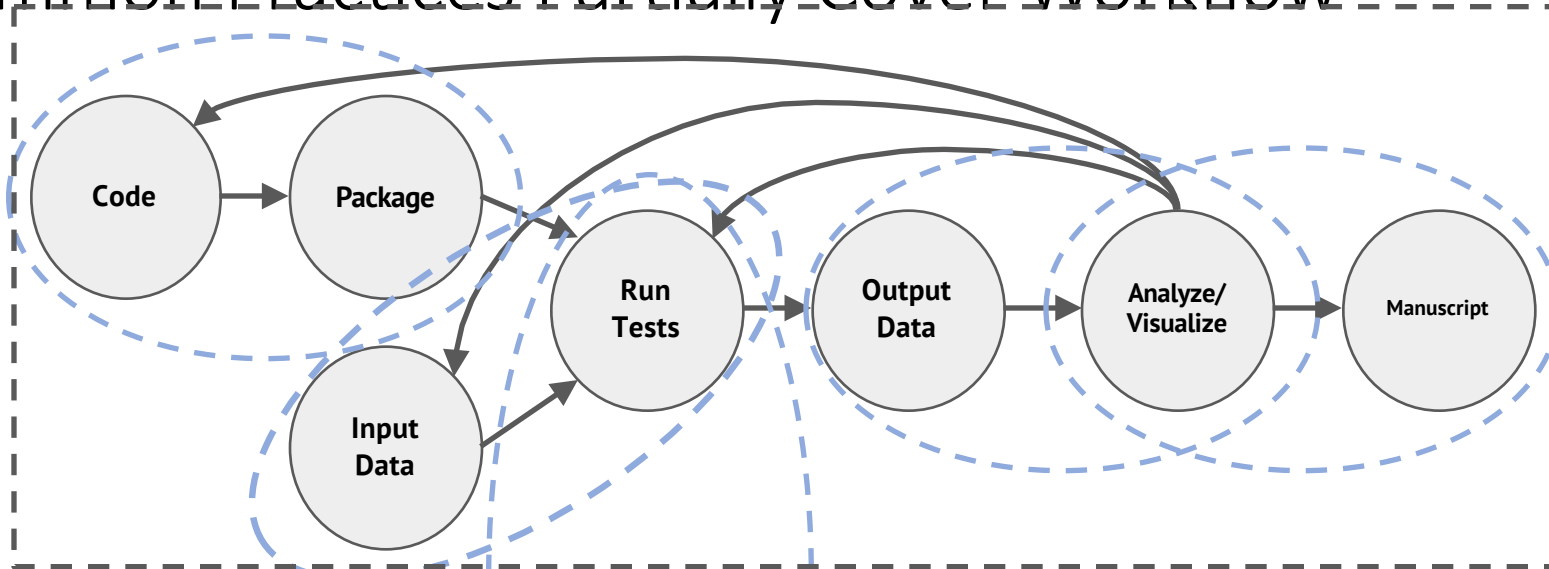
Key Idea behind The Popper Protocol: manage a scientific exploration like software projects

Popper



- It's a convention, not a tool chain
 - Tools must meet certain requirements
 - Multiple possible tool chains
- Design goals:
 - Clearly benefit individual researcher
 - Usable in many research domains
 - Abstract underlying technologies

Common Practices Partially Cover Workflow



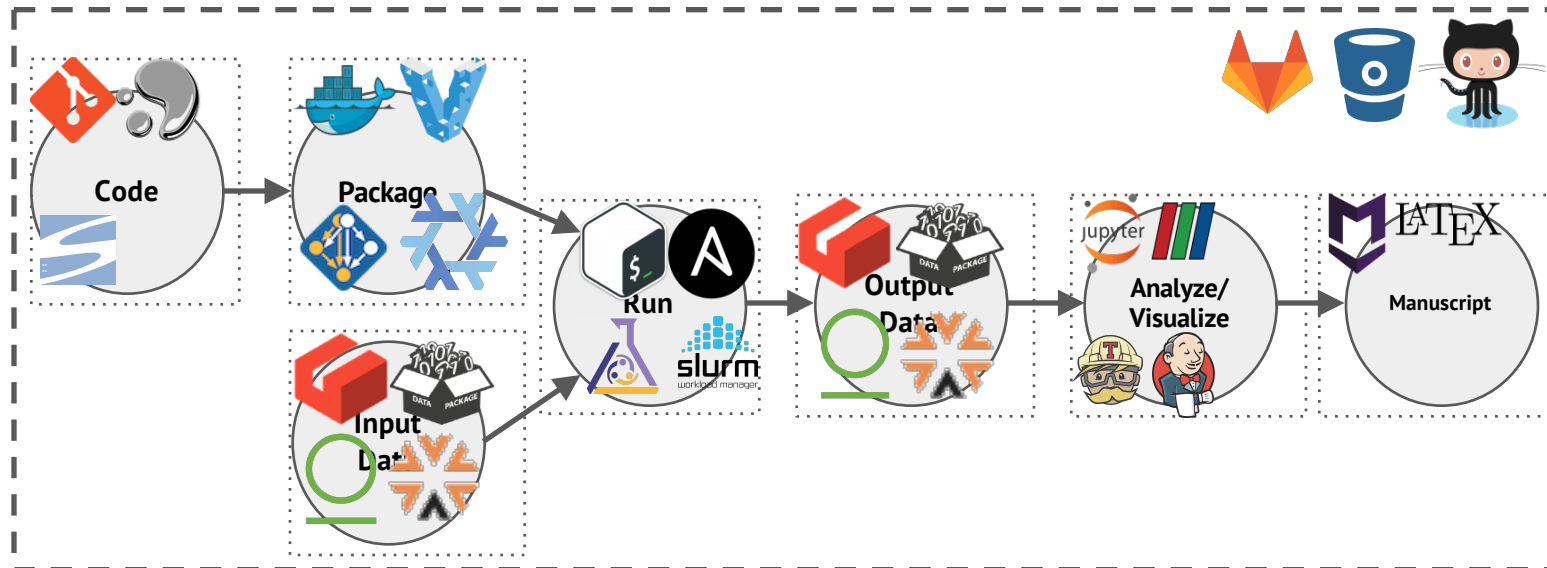
Time	Task	User
16-Dec-10 13:02:50	Edited Project	admin
16-Dec-10 12:55:46	Edited Project	admin
16-Dec-10 12:54:54	Edited Project	admin
12-Dec-10 14:30:48	Edited Project	admin
11-Dec-10 17:45:26	Edited Cell	admin
11-Dec-10 17:41:11	Edited Cell	admin
11-Dec-10 17:18:14	Edited Cell	admin
11-Dec-10 17:18:05	Edited Cell	admin
11-Dec-10 17:17:54	Edited Cell	admin
11-Dec-10 14:05:33	Edited Protein	admin
10-Dec-10 16:51:36	Edited Protein	admin
10-Dec-10 16:51:36	Edited Protein	admin
10-Dec-10 16:51:27	Edited Protein	admin

Baskin
Engineering

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Lots of scriptable tools



Standardize headers between files
2 hours ago by bernars

Standardize headers between files
2 hours ago by bernars

CONTRIBUTING.md

...	...	@@ -1,4 +1,4 @@
1	-	# Contributing to the Octo-Repo
1	+	### Contributing to the Octo-Repo
2	2	
3	3	1. Fork this repository.
4	4	2. Create a branch.

README.md

...	...	@@ -1,5 +1,4 @@
1	-	The Octo-Repo
2	-	-----
1	+	### The Octo-Repo

Add link to new CONTRIBUTING file
20 hours ago by bernars

Add instructions for contributing
20 hours ago by bernars

Add Contributing section
20 hours ago by bernars

Add Installation section
20 hours ago by bernars

Add responsible team to README
21 hours ago by bernars



1. Pick one or more DevOps tools.
 - At each stage of experimentation workflow.
2. Put all associated scripts in version control.
 - Make experiment self-contained.
 - For external dependencies (code and data), reference specific versions.
3. Document changes as experiment evolves.
 - In the form of commits.

[1]: Jimenez et al. *Standing on the Shoulders of Giants by Managing Scientific Experiments Like Software*, ;login: Winter 2016, Vol. 41, No. 4.

[2]: Jimenez et al. *The Popper Convention: Making Reproducible Systems Evaluation Practical*, REPPAR 2017.

Popper-compliant Experiments

- An experiment is *Popper-compliant* if all of the following is available (self-contained):
 - Experiment code.
 - Data dependencies.
 - Parameterization.
 - Results.
 - Validation.

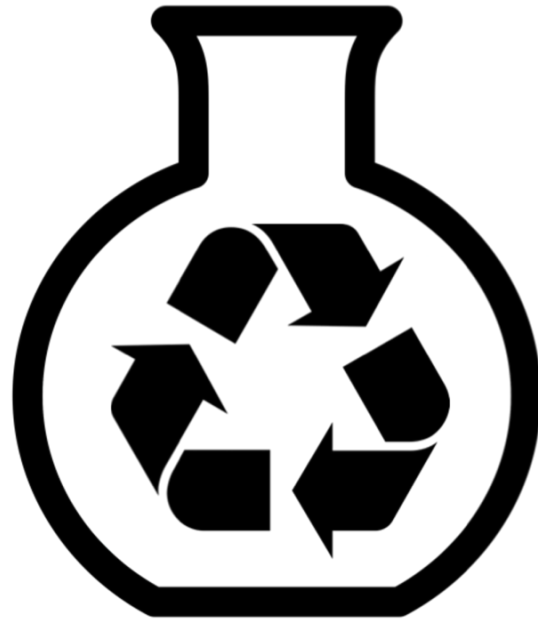
```
$ cd mypaper-repo
$ popper init
-- Initialized Popper repo mypaper-repo

$ popper experiment list
-- available templates -----
ceph-rados    proteustm    mpi-comm     adam
cloverleaf    gassyfs     zlog         bww
spark-stand   torpor      malacology   genevo
hadoop-yarn   kubsched    alg-encycl   macrob

$ popper add gassyfs
-- Added gassyfs experiment to mypaper-repo
```

```
$ popper experiment init exp1
-- Initialized exp1 experiment.

$ ls -l experiments/exp1/
total 20K
-rw-r----- 1 ivo ivo   8 Apr 29 23:58 README.md
-rwxr-x--- 1 ivo ivo 210 Apr 29 23:58 run.sh
-rwxr-x--- 1 ivo ivo 206 Apr 29 23:58 setup.sh
-rwxr-x--- 1 ivo ivo  61 Apr 29 23:58 teardown.sh
```



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