In [1]:

```
import datetime
print("Last update: " + str(datetime.datetime.now()))
```

```
Last update: 2016-07-28 21:21:49.986345
```

In [2]:

```
%%html
<h3>Select Theme</h3><select id="theme-list0"></select>
<script src="js/d3.min.js"></script>
<script src="RISE_themes/RISE_themes.js"></script>
<!-- NOTE: This cell must be code/%%html not markdown for css to be handled -->
<!-- NOTE: table test (class "noborder"): want no borders                 -->
<style> .noborder, .noborder tr, .noborder th, .noborder td {
    border-collapse: collapse; border: 0px; border: none!important;
} </style>

<table class="noborder"><tbody><tr><td> Cell1 </td><td> Cell2 </td></tr></tbody></
table>
<table><tbody><tr><td> BorderedCell1 </td><td> BorderedCell2 </td></tr></tbody></t
able>
```

Select Theme

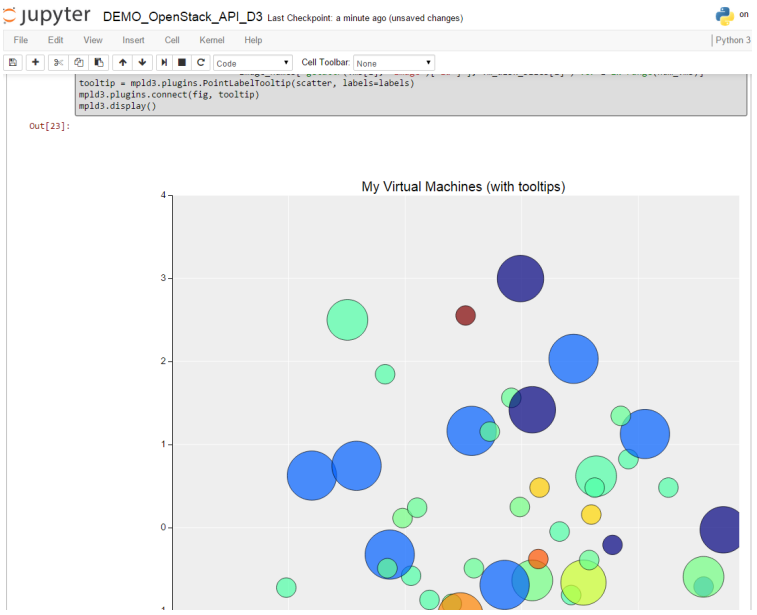
mysky ▼

Cell1 Cell2

BorderedCell1	BorderedCell2

Jupyter for Everything Else

Michael Bright, [EuroPython 2016 - Bilbao, 22 July (https://ep2016.europython.eu/conference/talks/jupyter-for-everything-else)](https://ep2016.europython.eu/conference/talks/jupyter-for-everything-else).



[mjbright](https://github.com/mjbright)
[@mjbright](http://twitter.com/mjbright)
mjbrightfr AT gmail
mjbright.github.io

Solution Architect Hewlett-Packard Enterprise

Working in the EMEA OpenNFV lab, Grenoble, France.

Outline

- Introduction: From IPython to Jupyter
- The Jupyter Project & Ecosystem:
  - Kernels, Widgets, Extensions, Tools
  - Incubating & ext. projects, Hosting
- Jupyter for Everything Else
  - Web, Command-line, Live Blogging
  - Presenting, Automated Status reports

IPython - the Console

(http://ipython.org/)

"*an afternoon hack*" (Nov 2001) by Fernando Perez

A tool to help in the exploration process

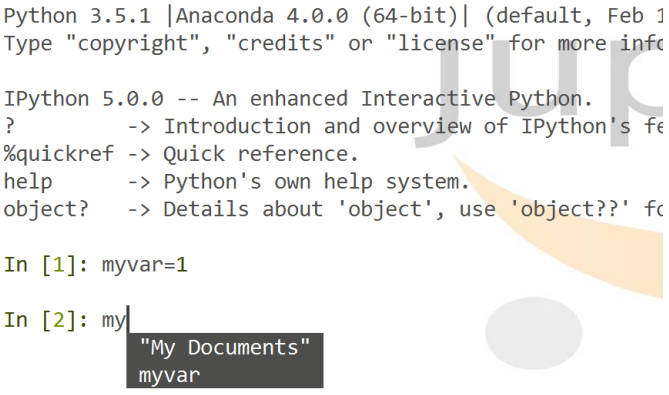
- Individual exploration
- Collaborative work
- Parallel Production Runs
- Publication of **reproducible** results
- Education
- Repeat

IPython - the Console

(http://ipython.org/)

Initial 0.0.1 version Gist (https://gist.github.com/fperez/1579699)

- REPL in 259 lines
- Input/Output cells
- History
- Plotting



IP[y]:

(http://ipython.org/)

IPython - the Console

```
Python 3.5.1 |Anaconda 4.0.0 (64-bit)| (default, Feb 16 2016, 09:4
Type "copyright", "credits" or "license" for more information.

IPython 5.0.0 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra deta

In [1]: myvar=1

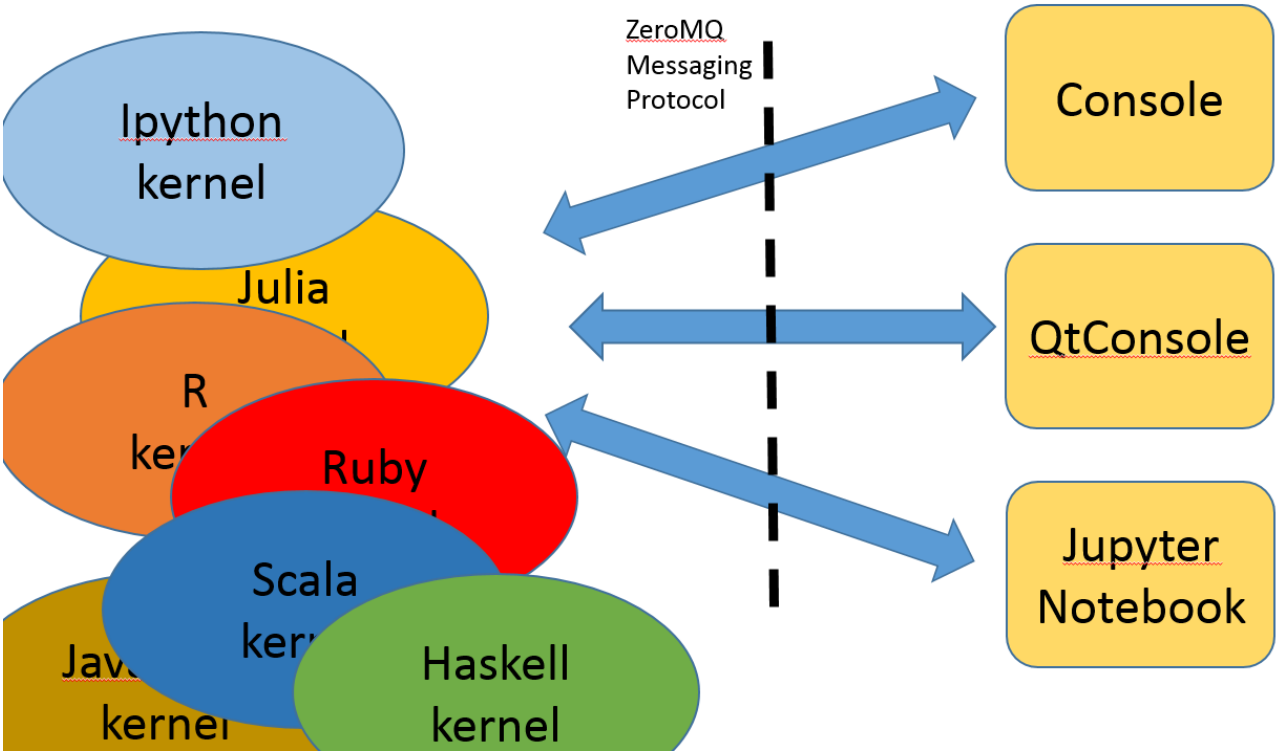
In [2]: m
```

```
%macro      %matplotlib min         MOOCs/
%magic      max         %mkdir      myvar
map         memoryview  modules/
```

```
In [3]: myvar?
Type:        int
String form: 1
Docstring:
int(x=0) -> integer
int(x, base=10) -> integer

Convert a number or string to an integer, or return 0 if no argume
are given.  If x is a number, return x.__int__().  For floating pc
numbers, this truncates towards zero.
```

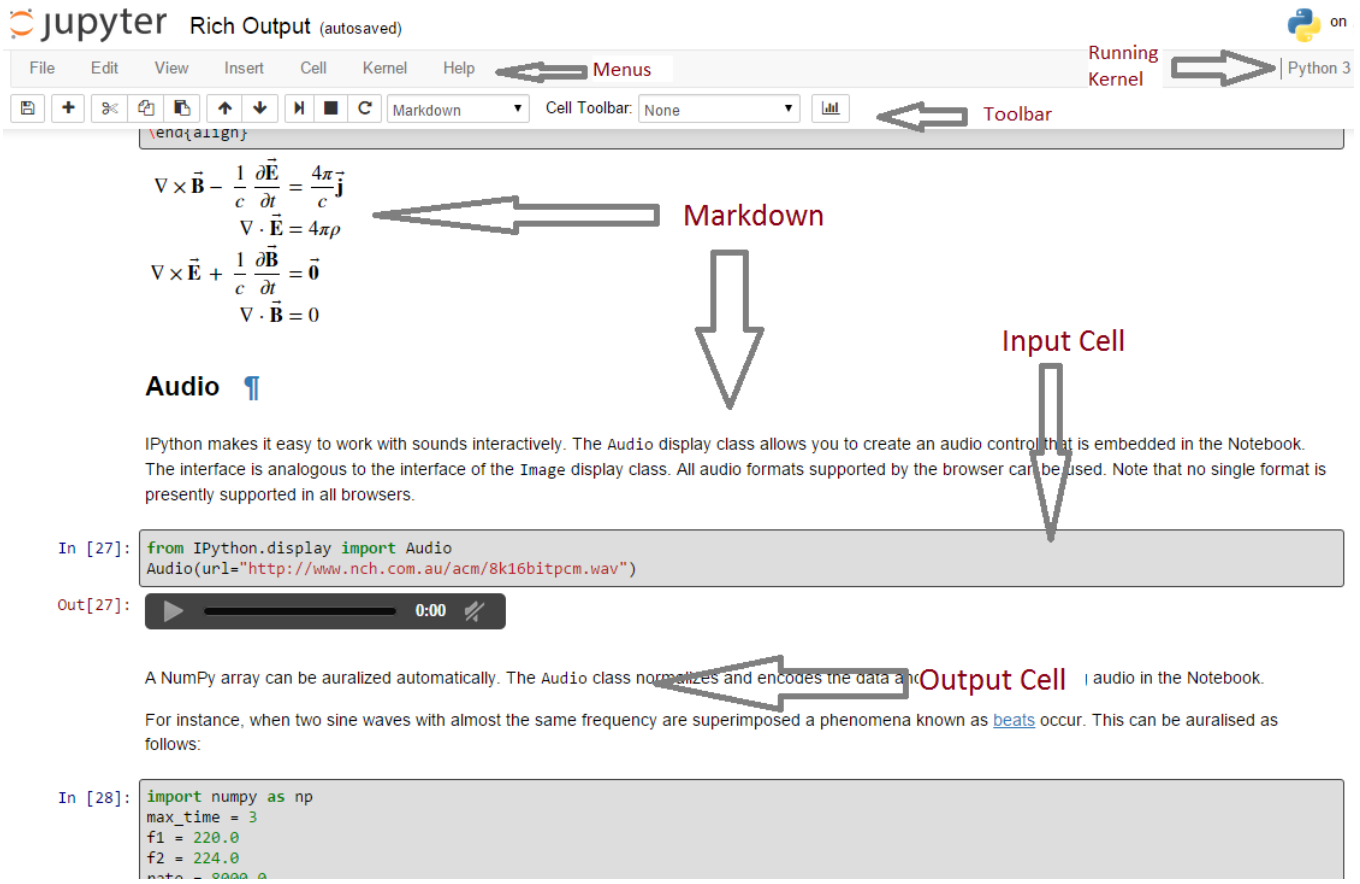
The Jupyter Project



A notebook runs under one kernel

The (Jupyter) Dashboard & [Notebook](http://localhost:8888/notebooks/Demos/Demo_0_IN

Create & share documents of code, equations, visualizations and explanatory text as a **(reproducible) narrative**



Jupyter: Public Notebooks

Jupyter notebooks are used in many domains

- scientific (physics, chemistry, biology, genomics, data analysis)
- and non-scientific (finance)

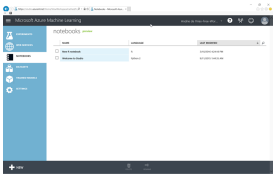
Site	URL	Info
nbviewer	https://nbviewer.org (https://nbviewer.org)	submit your url, browse by theme
github	https://github.com (https://github.com)	*> 200k notebooks* [*Announcement - May '15*] (http://blog.jupyter.org/2015/05/07/rendering-notebooks-on-github/)
IPython gallery	A-gallery-of-interesting-IPython-Notebooks (https://github.com/ipython/ipython/wiki/A-gallery-of-interesting-IPython-Notebooks)	many notebooks organized by domain
Notebook Gallery	**http://nb.bianp.net/ (http://nb.bianp.net/)**	view submitted notebooks by '*most viewed*' or '*data*'

Jupyter: Running notebooks

- Native OS Python distribution + Pip, or Anaconda
- JupyterHub, multi-user server
- Under Docker [e.g. *docker-stacks* images]
- Integrated into data science Cloud Hosting or plain IaaS:
  - Azure ML Studio (https://blogs.technet.microsoft.com/machinelearning/2015/07/24/introducing-jupyter-notebooks-in-azure-ml-studio/)
  - Google Cloud DataLab Beta (https://cloud.google.com/datalab/)
  - IBM Data Scientist Workbench (https://my.datascientistworkbench.com/)
- **Cloud hosted (ephemereal)**
  - **tryjupyter.org** (https://try.jupyter.org/) [uses *docker-demo* image]
  - **Binder** (https://mybinder.org (https://mybinder.org))

Jupyter & Azure ML Studio

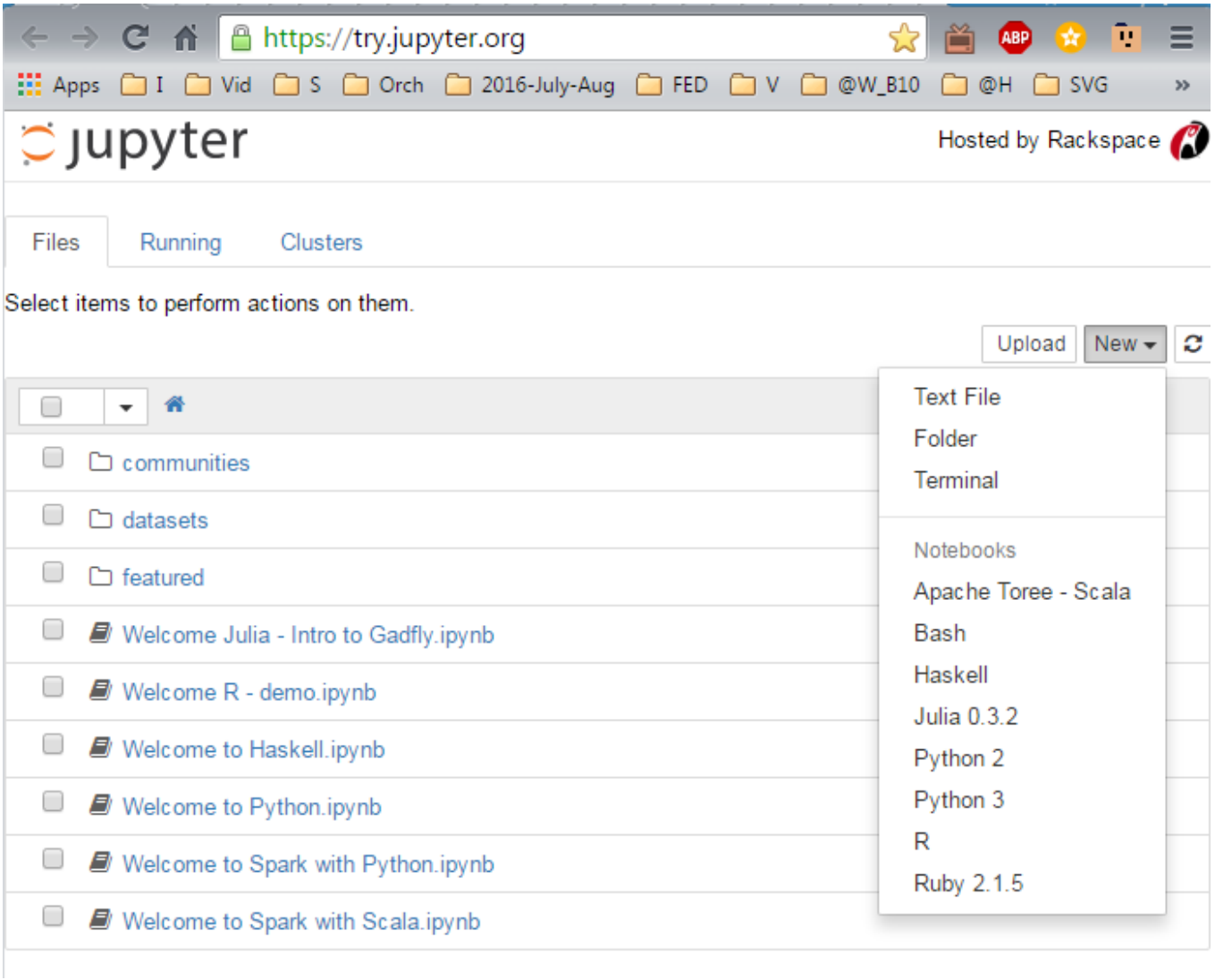
Jupyter integration in Azure ML Studio (https://blogs.technet.microsoft.com/machinelearning/2015/07/24/introducing-jupyter-notebooks-in-azure-ml-studio/)



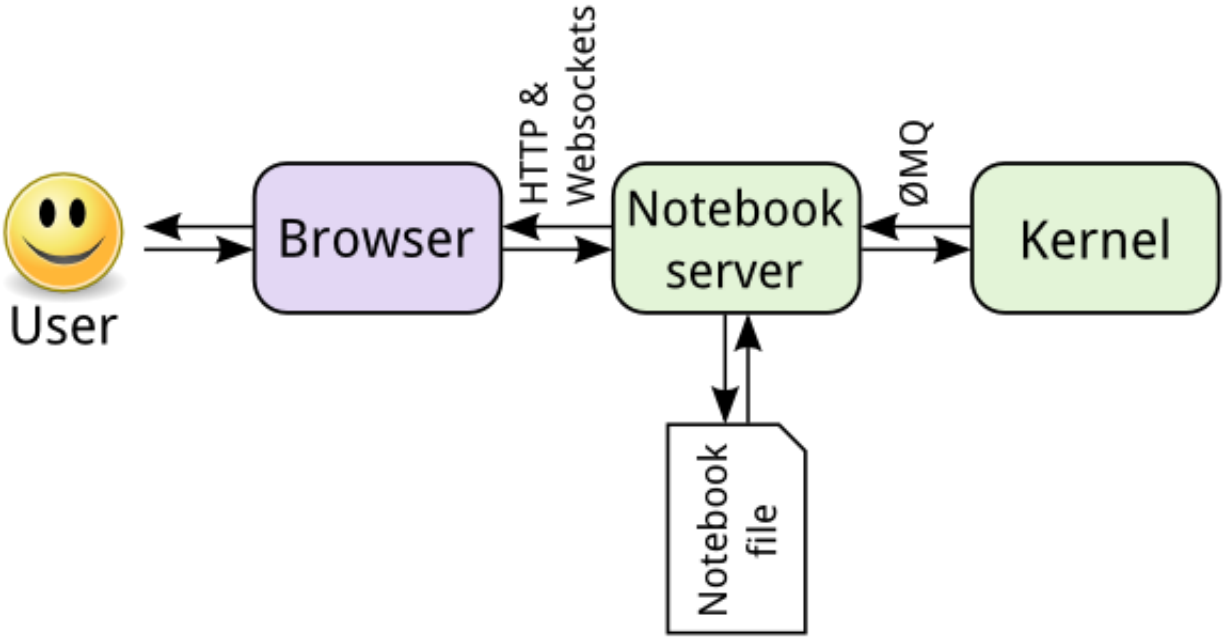
- R

- Python

try.jupyter.org



Kernels, Widgets & Extensions



~ 50 Kernels

Kernels are execution environments - typically a language [[Kernels Page]]
(https://github.com/ipython/ipython/wiki/IPython-kernels-for-other-languages)

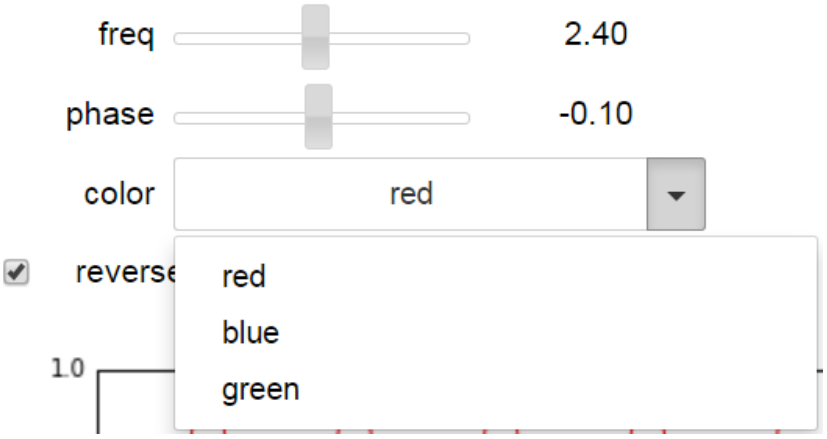
IJulia	**IRKernel**	**IPython**	IRuby	IGo
IScilab	IMatlab	Hy	Clojure	**Bash**
Lua	Mochi	IErlang	**Spark**	**MetaKernel**
IVisual VP	Brainfuck	Brython	IOCaml	**MetaKernel_Bash**
IScala	IMathics	IAldor	Calico Pro	Calysto Prolog
IForth	**IPerl**	**IPerl6**	IPHP	IOctave
KDB+/Q Ker	ICryptol	**C++ (cling)**	**Xonsh**	IJavascript
cl-jupyter	IHaskell	IElixir	Java 9	Calysto LC
Redis	jove	Prolog	IFSharp	Calysto Scheme

Widgets

Widgets are eventful python objects with a representation in the browser. [[documentation]] (https://ipywidgets.readthedocs.io/en/latest/examples/Widget%20Basics.html#What-are-widgets?)

Provided widgets include:

- IntSlider, FloatSlider, FloatProgress
- Buttons, Checkboxes, Radio buttons
  Dropdown menus



Extensions

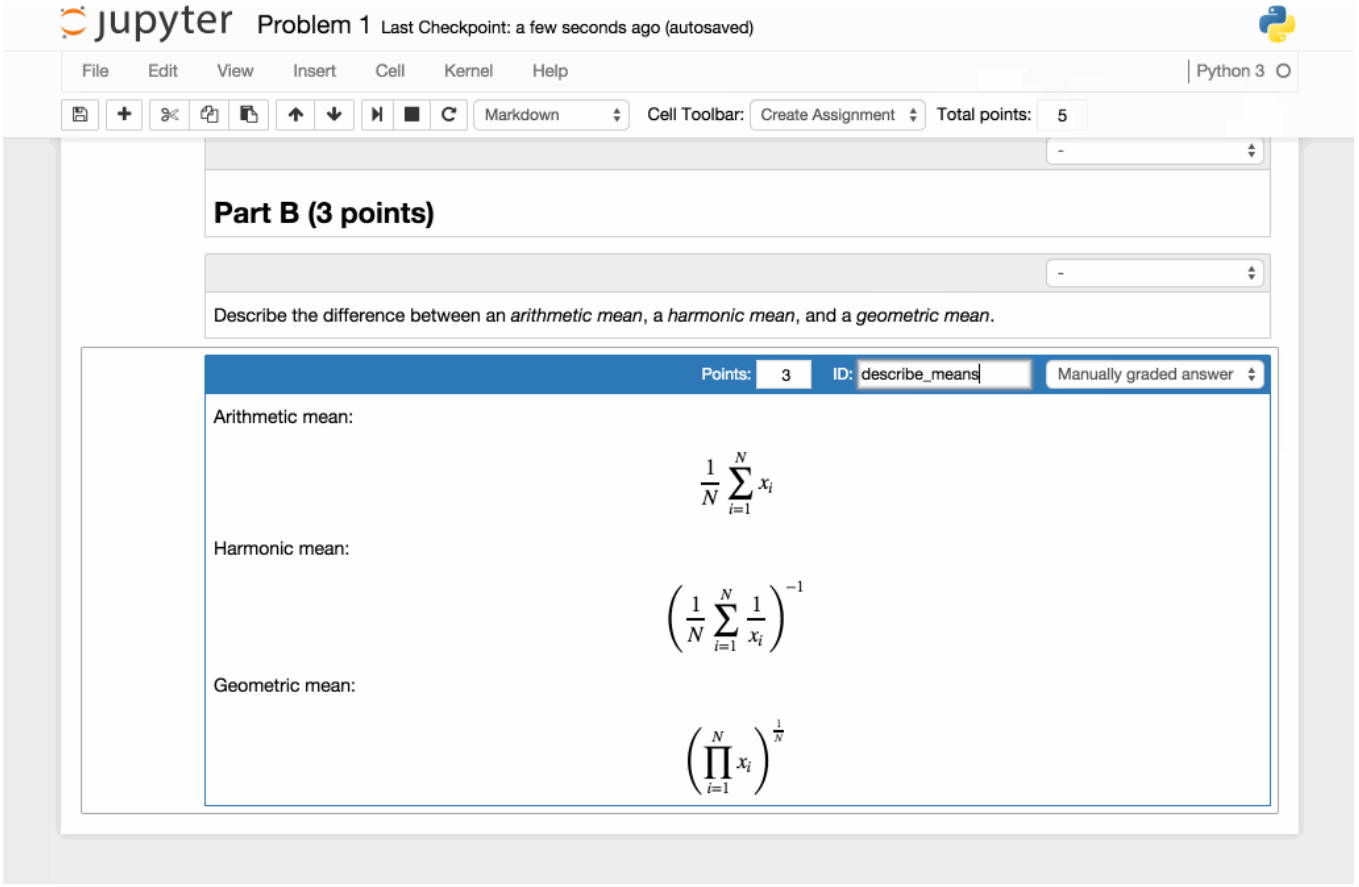
- Collection [github]: ipython-contrib/IPython-notebook-extensions (https://github.com/ipython-contrib/IPython-notebook-extensions)
- Installed to http://localhost:8888/nbextensions/ (http://localhost:8888/nbextensions/)

Many extensions available, including:

- **RISE** (https://github.com/damianavila/RISE) - **these slides are running under Jupyter**
- nbpresenter
- nbgrader (https://nbgrader.readthedocs.org/en/stable/) - creation/grading of classroom assignments

Generally installable via pip or from github repo

nbgrader



The Ecosystem & Future Projects

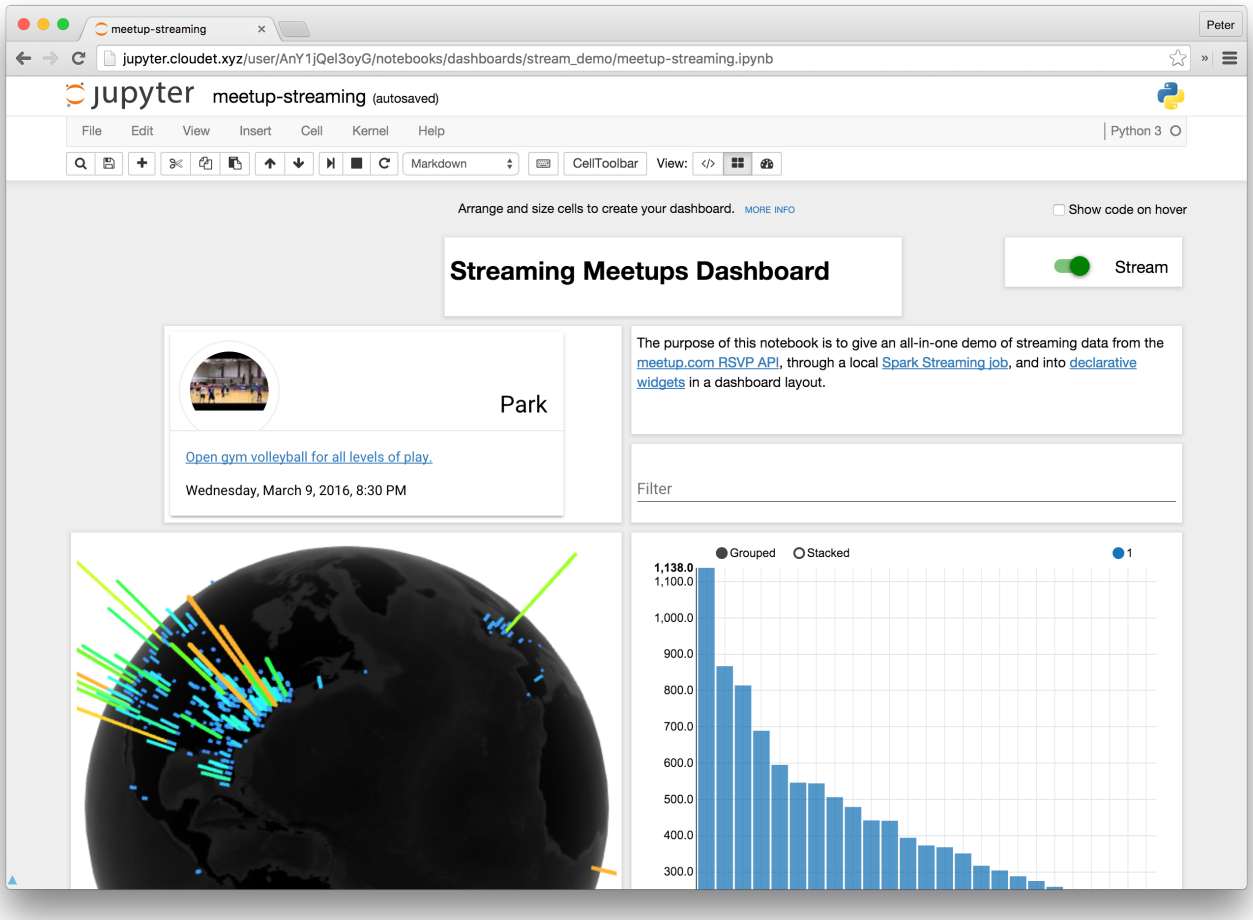
Jupyter Incubator Projects

(https://github.com/jupyter-incubator) [proposals](https://github.com/jupyter-incubator/proposals)

[sparkmagic] (https://github.com/jupyter-incubator/sparkmagic)	Jupyter magics and kernels for working with remote Spark cluster
[declarativewidgets] (https://github.com/jupyter-incubator/declarativewidgets)	Declare Widgets in HTML
[dashboards] (https://github.com/jupyter-incubator/dashboards)	Create Dashboards from Notebooks
[contentmanagement] (https://github.com/jupyter-incubator/contentmanagement)	Extensions for search, notebook modules/[cookbooks](https://gith incubator/contentmanagement/blob/master/etc/notebooks/cookbo ToC, [bundlers](https://github.com/jupyter-incubator/contentmanagement/blob/master/etc/notebooks/associ [vid](https://www.youtube.com/watch?v=SJiezXPhVv8)
[kernel_gateway] (https://github.com/jupyter-incubator/kernel_gateway)	Support different protocols to Jupyter server, e.g. non-nb web clie

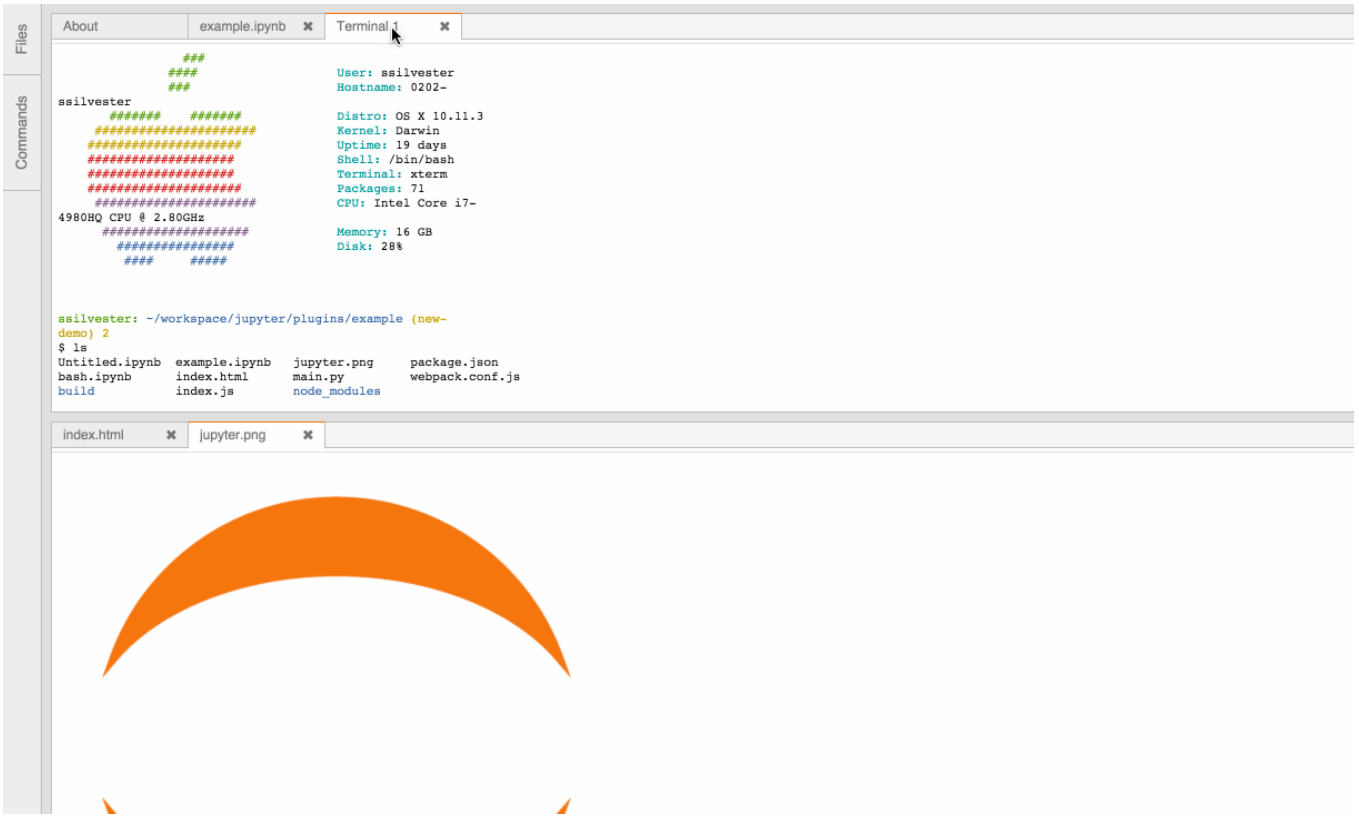
Incubator: Jupyter Dashboards

(https://github.com/jupyter-incubator/dashboards) - alternative layouts



JupyterLab - pre-Alpha

(https://github.com/jupyter/jupyterlab/) - the future interface



External Jupyter Projects

Many external projects integrating Jupyter:

Beaker, *Hydrogen (ATOM)*, *EIN (Emacs)*, *Rodeo*, *SageMathCloud*.

Publishers are turning to Jupyter for books, blogs, reports, theses sometimes with live code examples.

- e.g. **Thebe** (O'Reilly) (https://github.com/oreillymedia/thebe)
- Nature, Scientific American Magazines

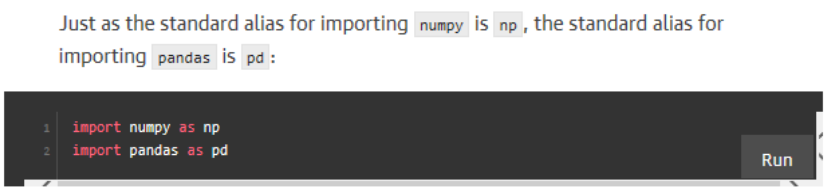
Educators

- tutorials, assignments, presentations, documenting
- MOOCs - online education:
  - notebook-based (**Edx/Apache Spark**)
  - jupyter-integrated (**F.U.N.**)
- in classrooms using JupyterHub

OReilly Blog Article - using Thebe

(https://www.oreilly.com/learning/introducing-pandas-objects)

Blog post with modifiable, runnable code cells with **RUN** button :



</td></tr></tbody></table>

Jupyter for Everything Else

- Use of web technologies: mix-in HTML, CSS, js, SVG ...
- Use of bash kernel for command-line work
- Supplement command-line tools with graphics
- Create interactive presentations (thanks *RISE* extension !)
- Publish "live blog posts"
- Creating status reports from notebooks using nbconvert

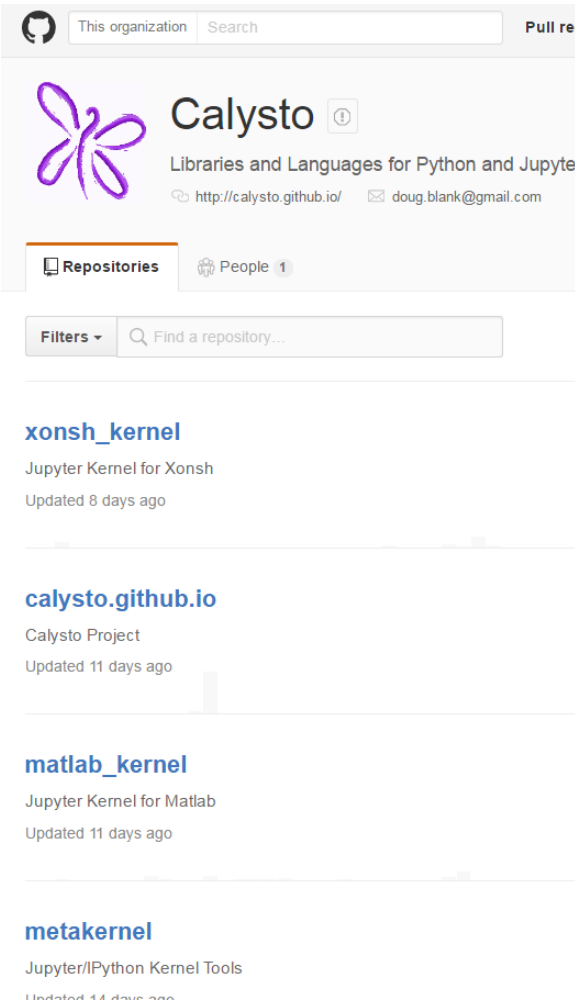
Everything Else: web technologies

- HTML/JavaScript/css experimentation
  - HTML, CSS, JS capabilities but **proceed with care**
  - d3.js animations if
    - Need more interactivity
    - Prototyping a D3 project
    - Reusing existing D3 e.g. from http://bl.orcks.org (http://bl.orcks.org)
- SVG

Select Theme: ▼

Everything Else: command-line

Two bash kernels exist for Jupyter: bash_kernel and calysto/metakernel_ba



[Calysto](https://github.com/Calysto) Metakernels

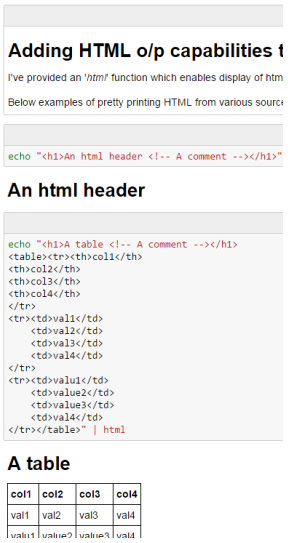
- easy to fix for Windows/Cygwin
- Family of metakernels
- - Common magics
- Active development

Everything Else: command-line

Why? ... I hear you ask

Inspired by the notebook as an educational tool, I used it for CLI-ba

- [**Docker demos / labs **] (http://mjbright.blogspot.fr/2016/02/creating-docker-build-lab-with-jupyter.html)
- Bash:1st-class citizen with magics+
- [**Example notebook**] (Demos/Demo_Metakernel_Bash.ipynb)
- CLI tutorials as runnable "live notebook".



Adding HTML o/p capabilities t

I've provided an '*html*' function which enables display of htm

Below examples of pretty printing HTML from various source

In [1]:

```
echo "<h1>An html header <!-- A comment --></h1>"
```

An html header

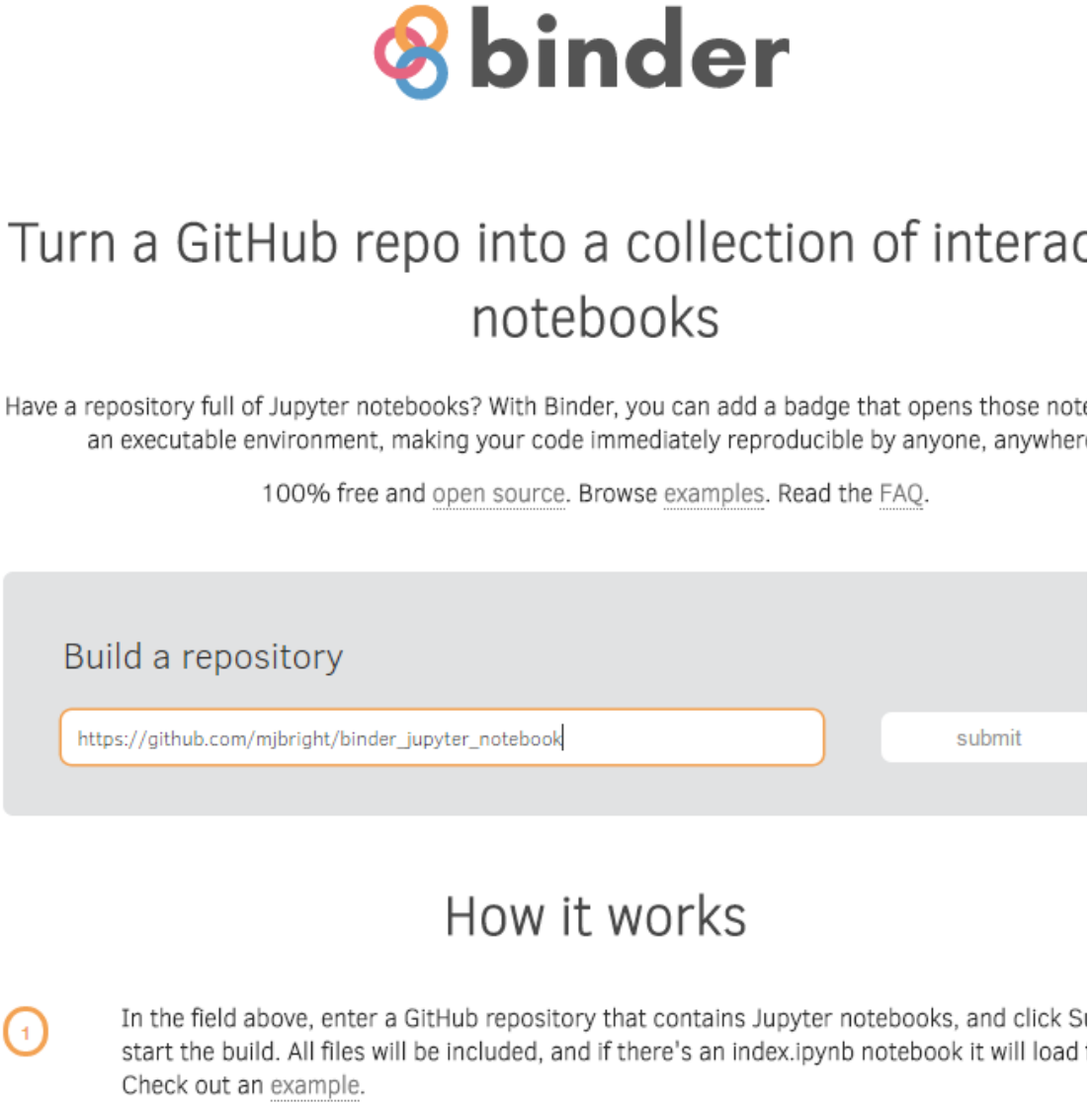
In [2]:

```
echo "<h1>A table <!-- A comment --></h1>
<table><tr><th>col1</th>
<th>col2</th>
<th>col3</th>
<th>col4</th>
</tr>
<tr><td>val1</td>
    <td>val2</td>
    <td>val3</td>
    <td>val4</td>
</tr>
<tr><td>valu1</td>
    <td>value2</td>
    <td>value3</td>
    <td>val4</td>
</tr></table>" | html
```

A table

col1	col2	col3	col4
val1	val2	val3	val4
valu1	value2	value3	val4

Everything Else: Binder "live notebook



Everything Else: "live tutorials"

</tr> </tbody></table> https://github.com/mjbright/binder_jupyter_notebook (https://github.com/mjbright/binder_jupyter_notebook)

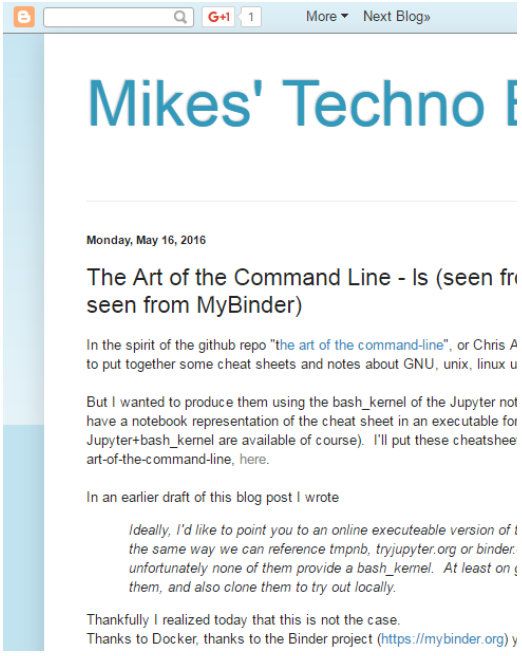
Everything Else: Binder CLI "live tutoria

Create live tutorials online on Binder.

Notebook server is launched by clicking on the binder icon

in a github repo

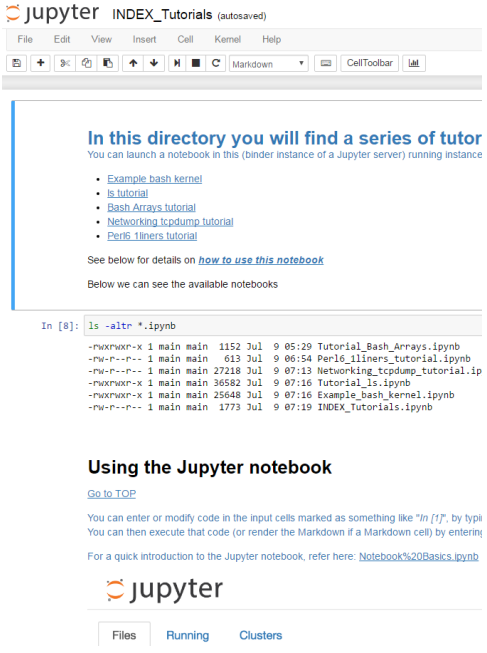
[Blog post](http://mjbright.blogspot.fr/2016/05/the-art-of-command-line-ls-seen-from.html) with link to "**live tutorial**"



In that [github **repo**] (http://mybinder.org/repo/mjbright/binder_jupyter_notebook) is an

INDEX notebook to tutorial

notebooks in the same repo



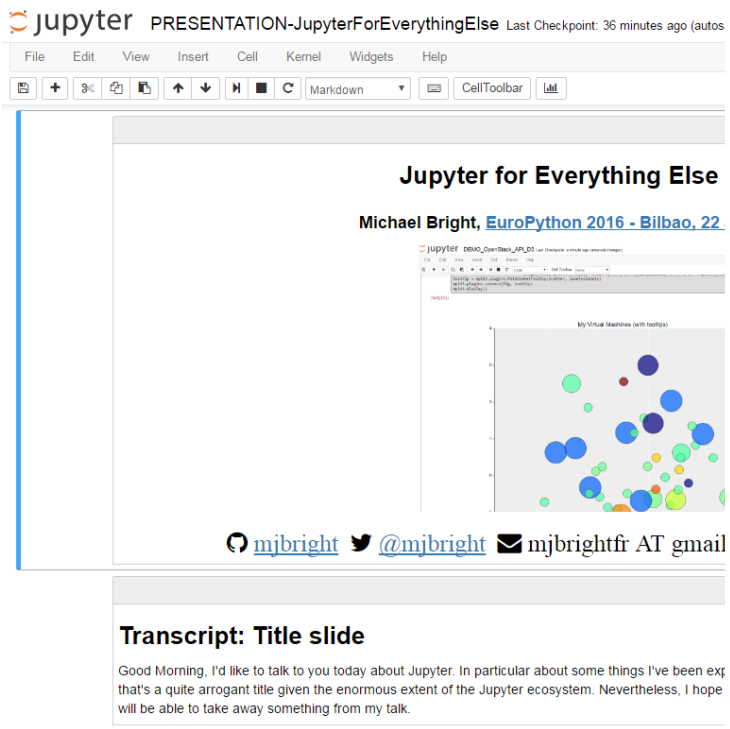
(http://mybinder.org/repo/mjbright/b

Everything Else: Slideshows

This **slideshow** (PRESENTATION-JupyterForEverythingElse.ipynb) is made usin
with the RISE extension

RISE adds special "Slide Type"
menu options to each cell to specify one of

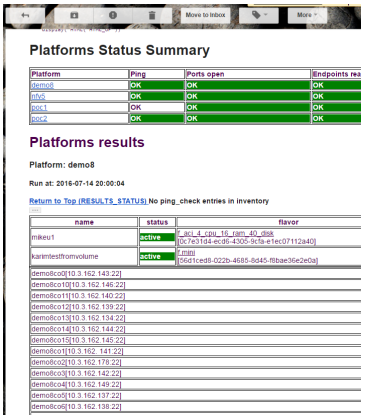
- Slide
- Sub-Slide
- Fragment
- Notes
- Skip



Everything Else: Cron e-mail status repo

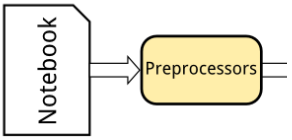
nbconvert can [execute notebooks](http://10.3.216.210:8888/notebooks/notebooks/OpenStack_
from the command-line

- Run the notebook under cron
- **nbconvert** the result to html
- send html [report]
(https://mail.google.com/mail/u/0/#inbox/155b805d4e9f68df)
as e-mail
- Capabilities created incrementally in notebook, code
migrated to modules to reduce notebook (report) code



Everything Else: Cron e-mail status reports (nl

``` nbconvert --execute --template basic --to html Monitoring.ipynb ```



- --execute: run the notebook
- --template: specify o/p template
- --to: specify o/p format
- Input notebook

Everything Else: Coming up ...

- Experiment with JupyterHub, nbgrader, Binder
  - Reimplement labs as graded assignments
- More Metakernel_Bash experiments
- Make pull requests to Metakernel_bash
- Propose this stuff outside of the Python community
- Xonsh_kernel
  - Take advantage of new Python / unix-like shell
- CLing C++ interpreter kernel

Questions ?

![The End](images/END_sillywalk.jpg)

[mjbright](https://github.com/mjbr
[@mjbright](http://twitter.com/mjbr
mjbrightfr AT gmail_
[mjbright.github.io](http://mjbright.gi

The End ...
```

References: IPython / Jupyter Books

Learning IPython for Interactive Computing & Data Visualization

(http://cyrille.rossant.net/books/) Cyrille Rossant

Introductory usage

IPython Interactive Computing & Visualization Cookbook

(http://cyrille.rossant.net/books/) Cyrille Rossant

Advanced usage

The Jupyter GitBook

(https://www.gitbook.com/book/carreau/jupyter-book/details)

Extension writing

Documentation on ReadTheDocs

(https://www.readthedocs.io/)

Extension writing

(https://www.oreilly.com/learning/introducing-pandas-objects)