The background of the page is a photograph of a person standing on a grassy hill at sunset. The person is silhouetted against the bright orange and yellow sky. To the right, a large palm tree is also silhouetted. The overall mood is serene and contemplative.

# Hubzero's 3 Hour Tutorial

# WELCOME and INTRODUCTION to the Hubzero PLATFORM

Run Applications! Collaborate! Publish! Visit  
[hubzero.org](http://hubzero.org) for more information.

## TODAY'S GOALS and ACTIVITIES

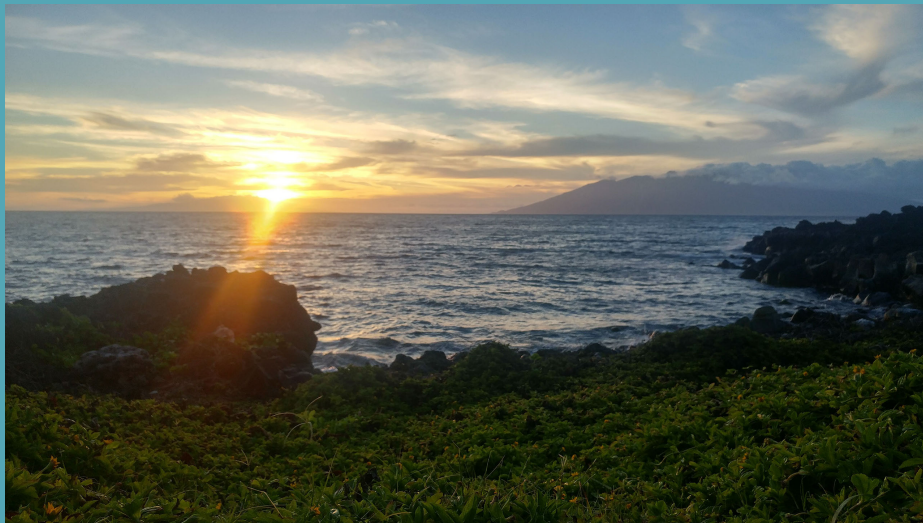
Live version of this presentation is located at  
["https://spark.adobe.com/page/d5o6kXA5Y9upi/"](https://spark.adobe.com/page/d5o6kXA5Y9upi/)

**Today's Goal is to demonstrate  
how code can be easily deployed  
and published in the Hubzero  
platform.**

- How to modifying and publish a Jupyter Notebook tool

- Step-by-step process of creating and publishing a Jupyter Notebook Tool
- Demonstrations of Linux tools, Notebook Tools, R Shiny Tools, and Web Tools

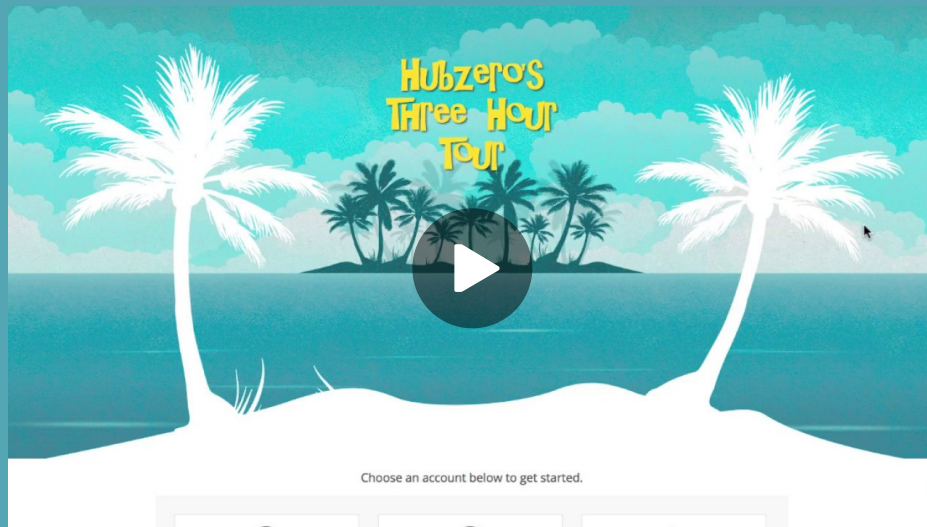
Why are we here? For a 3-hour tour about Hubzero tools!



Let's start off from one of the beautiful islands of Hawaii. Well..we can image we are, right?

About the ducks...

# Create accounts on provided Hubzero iNStance



[https://youtu.be/Qpf\\_Cw5i-3U](https://youtu.be/Qpf_Cw5i-3U)

Choose your favorite character!

<https://demo.aws.hubzero.org/> The password for  
each account is "gateways2018"

## DeMONStration: LiNux tool

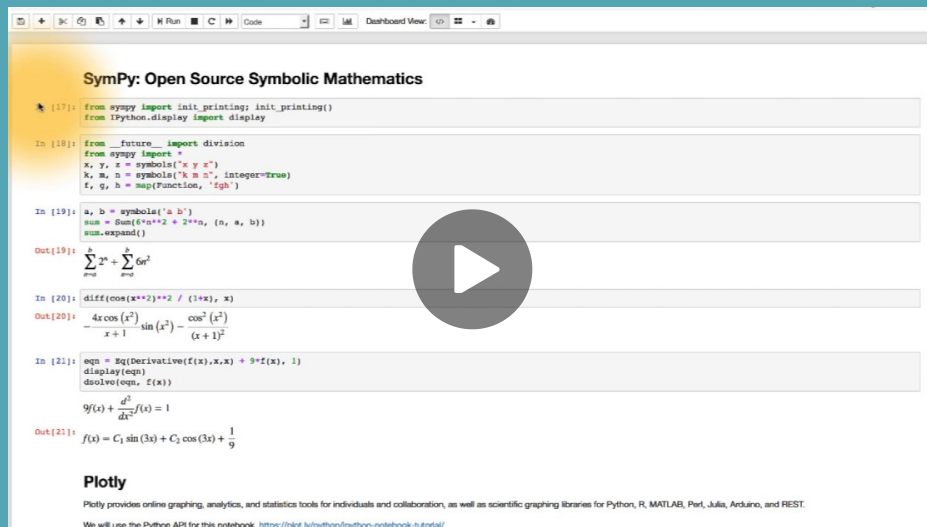


<https://youtu.be/ne8YqRBkA1U>

**Now that you've seen what a tool  
is. Let's get started.**

# **ModiFying and pUBLiSHing a Jupyter Notebook tool**

**Test the Installed tool**



**SymPy: Open Source Symbolic Mathematics**

```
[17]: from sympy import init_printing; init_printing()
      from IPython.display import display

In [18]: from __future__ import division
      from sympy import *
      x, y, z = symbols('x y z')
      A, a, b = symbols('A a b', integer=True)
      f, g, h = sympy.Function('fgh')

In [19]: a, b = symbols('a b')
      sum = sum(x**2 + 2**a, (n, a, b))
      sum.expand()

Out[19]: 
$$\sum_{a=0}^b 2^a + \sum_{a=0}^b 6a^2$$


In [20]: diff(cos(x**2)**2 / (1+x), x)

Out[20]: 
$$\frac{4x \cos(x^2) \sin(x^2) - \cos^2(x^2)}{x+1} - \frac{\cos^2(x^2)}{(x+1)^2}$$


In [21]: eqn = Eq(derivative(f(x), x, x) + 9*f(x), 1)
      display(eqn)
      dsolve(eqn, f(x))

Out[21]: 
$$9f(x) + \frac{d^2}{dx^2}f(x) = 1$$


$$f(x) = C_1 \sin(3x) + C_2 \cos(3x) + \frac{1}{9}$$

```

**Plotly**

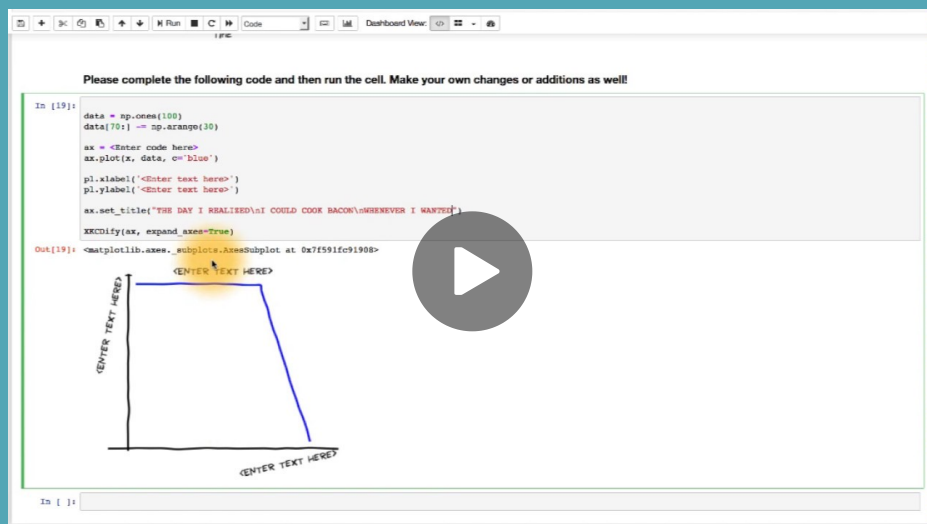
Plotly provides online graphing, analytics, and statistics tools for individuals and collaboration, as well as scientific graphing libraries for Python, R, MATLAB, Perl, Julia, Arduino, and REST.

We will use the Python API for this notebook. <https://plot.ly/python/python-notebook-tutorial/>

<https://youtu.be/zRo4BbSFYY>

You should be logged into your account and be on your member dashboard. Find the "My Drafts" Section and click on your character's tool.

## Modify the code



Please complete the following code and then run the cell. Make your own changes or additions as well!

```
In [19]: data = np.ones(100)
      data[70:] = np.arange(30)
      ax = <Enter code here>
      ax.plot(x, data, c='blue')
      pl.xlabel('<Enter text here>')
      pl.ylabel('<Enter text here>')
      ax.set_title('THE DAY I REALIZED I COULD CODE RATHER THAN EVER I WANTED')
      XXXlify(ax, expand_axes=True)

Out[19]: <matplotlib.axes._subplots.AxesSubplot at 0x7f591fc91908>
```

The output shows a plot with a blue line. The x-axis is labeled '<ENTER TEXT HERE>' and the y-axis is labeled '<ENTER TEXT HERE>'. The plot shows a horizontal line at y=1 for x values from 0 to 70, and then a line that decreases linearly from y=1 to y=0 at x=100.

<https://youtu.be/KLev1AwARAQ>

<https://gitlab.hubzero.org/demo/<characterstool>>

Login is same as hub login. Ex. u: superman p:  
gateways2018

```
ax = pl.axes()
```

```
ax.plot(x, data, c='blue')
```

```
jupyter_tool.py -at gateways18demo.ipynb
```

```
jupyter trust gateways18demo.ipynb
```

## Resource Page creation



<https://youtu.be/vNUwyuzOMhw>

Abstract, Authors, Support Documents,  
Screenshots, Tags

# Approval Process



[https://youtu.be/H3Ct4Sw4X\\_E](https://youtu.be/H3Ct4Sw4X_E)

Version, License

# Publishing the Tool



<https://youtu.be/fU08mdadlBk>



For Tool administrators

## Review of Tool Resource Page



[https://youtu.be/\\_0t4esF4N8Q](https://youtu.be/_0t4esF4N8Q)

Break (3:00PM –  
3:30PM)

Step-by-Step: Creating and  
publishing a Jupyter  
Notebook Tool

# DISCUSSION: What resources do you need?



What coding language, GUI is required, how will I build that?, Name of tool, Tool abstract, Tool authors,

Special Software, Database, Storage requirements,  
etc.

# CHOOSE AN Jupyter Notebook or USE your OWN!

Choose from the following examples: Programming and Computer Science; Statistics and Data Science; Mathematics, Physics, Chemistry, Biology; Scientific Computing; Social Data; Psychology and Neuroscience; Physics, Chemistry and Biology; Earth science and geo-spatial data; Data visualization and plotting; Reproducible academic publications.

A list of Example Notebooks -  
<https://demo.aws.hubzero.org/examplenotebooks>

## Activity: TOOL Registration



<https://youtu.be/R2qxY-Cznw0>

<https://demo.aws.hubzero.org/resources/new>

## Activity: Repository Creation and Check-out



<https://youtu.be/nbzw6K8eO9E>

# BUILDing the User Application InterFace



<https://youtu.be/kOTJGvzJSi0>

## CHeck-iN code to Repository



<https://youtu.be/PHUvSYWPCnA>

```
nano middleware/invoke
```

```
/usr/bin/invoke_app "$@" -C "start_jupyter -t -T @tool  
gateways18demo.ipynb" -u anaconda3-5.1
```

```
jupyter_tool.py -at gateways18demo.ipynb
```

```
jupyter trust gateways18demo.ipynb
```

```
git status
```

```
git commit -m "initial commit"
```

```
git push
```

# DeMONStration: Web tool



<https://youtu.be/ySb-8TwJ0Ds>

Who are tool  
administrators and tool  
developers What are  
their responsibilities?

Library installs, Support for Tool devs, etc.

Installing the tool



<https://youtu.be/IHehNCIQC4Y>

# Testing the Installed tool

**SymPy: Open Source Symbolic Mathematics**

```
In [17]: from sympy import init_printing; init_printing()
from IPython.display import display

In [18]: from __future__ import division
from sympy import *
x, y, z = symbols('x y z')
k, m, n = symbols('k m n', integer=True)
f, g, h = map(Function, 'fgh')
```

```
In [19]: a, b = symbols('a b')
sum = Sum(x**a*x**2 + 2**n, (n, a, b))
sum.expand()
```

Out[19]: 
$$\sum_{n=a}^b x^a + \sum_{n=a}^b 6x^2$$

```
In [20]: diff(cos(x**2)**2 / (1+x), x)
```

Out[20]: 
$$\frac{4x \cos(x^2)}{x+1} \sin(x^2) - \frac{\cos^2(x^2)}{(x+1)^2}$$

```
In [21]: eqn = Eq(Derivative(f(x), x, x) + 9*f(x), 1)
display(eqn)
dsolve(eqn, f(x))
```

Out[21]: 
$$y'(x) + \frac{d^2}{dx^2} f(x) = 1$$
  
$$f(x) = C_1 \sin(3x) + C_2 \cos(3x) + \frac{1}{9}$$

**Plotly**

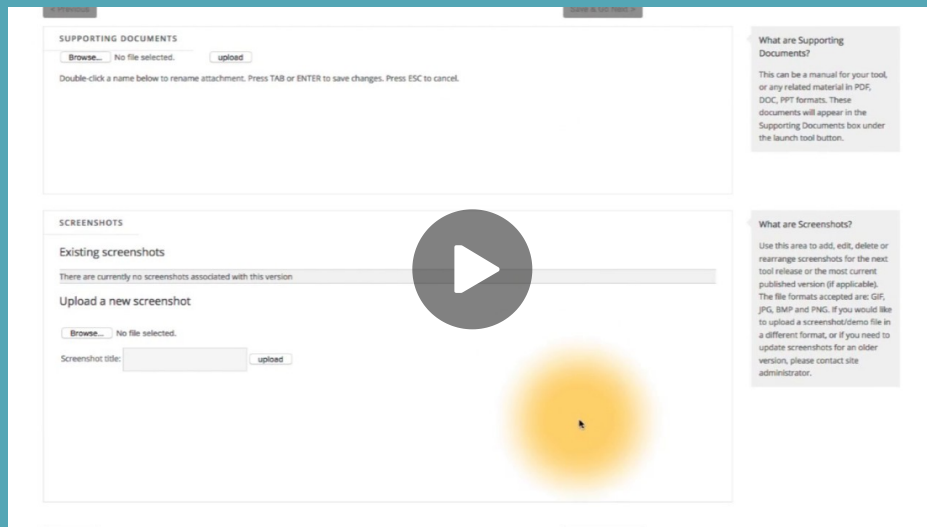
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<https://youtu.be/zRo4BbSFYYY>

# Resource Page creation





<https://youtu.be/8Hy2OQy-wAk>

# Approval Process



[https://youtu.be/H3Ct4Sw4X\\_E](https://youtu.be/H3Ct4Sw4X_E)

# PUBLISHING the TOOL



<https://youtu.be/fU08mdadlBk>

## Wrap-Up

Demonstrations of your newly published tools

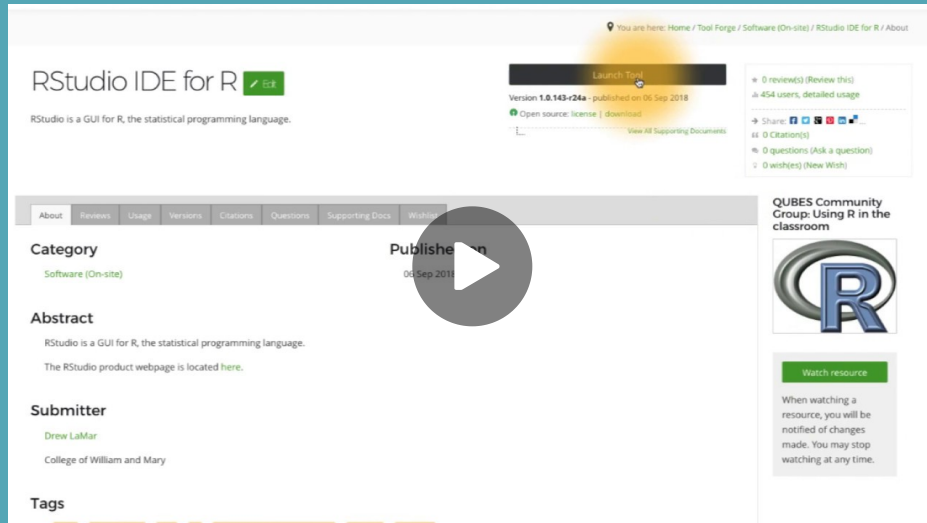
What did you learn? Were you able to publish a Jupyter Notebook tool on your own?

Questions?

Feel free to contact me or any of the Hubzero team

[ehuebner@purdue.edu](mailto:ehuebner@purdue.edu)

# Demonstration: Web Rstudio and R Shiny



[https://youtu.be/tDhlB-rX\\_18](https://youtu.be/tDhlB-rX_18)



CREATED BY  
Erich Huebner

## Credits:

Created with images by Andy Do - "Palms Realm"

