

FRESCHESOLUTIONS

Business uses for Python & IBM i

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A little background, please

What is Python, really?

- General purpose language
- Easy to get started
- Simple syntax
- Great for integrations (glue between systems)
- Access to C and other APIs
- Infrastructure first, but applications, too



Historically...

- Python was conceptualized by **Guido Van Rossum** in the late 1980's
- Rossum published the first version of Python code (0.9.0) in February of 1991 at the CWI(Centrum Wiskunde & Informatica) in the Netherlands, Amsterdam
- Python is derived from the ABC programming language, which is a general purpose language that was also developed at CWI.
- Rossum chose the name “Python” since he was a fan of Monty Python's Flying Circus.
- Python is now maintained by a core development team at the institute, although Rossum still holds a vital role in directing its progress and as leading “commitor”.



The Python programming language <https://www.python.org/>

99,953 commits 9 branches 331 releases 356 contributors

Branch: master New pull request Find file Clone

haypo committed on GitHub bpo-31234: Enhance test_thread.test_forkinthread() (#3516) Latest commit a15d155 5 hours ago

.github	Create PULL_REQUEST_TEMPLATE.md (GH-3404)	6 days ago
Doc	bpo-31421: Document how IDLE runs tkinter programs. (#3513)	10 hours ago

Python lineage

- Python 1 – 1994
- Python 2 – 2000 (Not dead yet...)
 - ▣ 2,7 – 2010
- Python 3 – 2008
 - ▣ 3.5 – 2015
 - ▣ 3.6.2 – July 2017
 - ▣ 3.7 ➔ ETA July 2018

Release version	Release date
Python 3.4.7	2017-08-09
Python 3.5.4	2017-08-08
Python 3.6.2	2017-07-17
Python 3.6.1	2017-03-21
Python 3.4.6	2017-01-17
Python 3.5.3	2017-01-17
Python 3.6.0	2016-12-23

Why use it?

Academia

- 1970's
 - ▢ COBOL, Basic
- 1980's
 - ▢ Pascal, Delphi
- 1990's
 - ▢ Java
- 2000
 - ▢ Python & Open Source



Carnegie Mellon

- School discovered that students understood OO
 - ▢ But could not build a logic loop to save their soul!
- Robert Harper, professor of CS writes:

"Object-oriented programming is eliminated entirely from the introductory curriculum, because it is both anti-modular and anti-parallel by its very nature, and hence unsuitable for a modern CS curriculum. A proposed new course on object-oriented design methodology will be offered at the sophomore level for those students who wish to study this topic."



Tiobe Index

Oct 2018	Oct 2017	Change	Programming Language	Ratings	Change
1	1		Java	17.801%	+5.37%
2	2		C	15.376%	+7.00%
3	3		C++	7.593%	+2.59%
4	5	⬆	Python	7.156%	+3.35%
5	8	⬆	Visual Basic .NET	5.884%	+3.15%
6	4	⬇	C#	3.485%	-0.37%
7	7		PHP	2.794%	+0.00%
8	6	⬇	JavaScript	2.280%	-0.73%
9	-	⬆	SQL	2.038%	+2.04%
10	16	⬆	Swift	1.500%	-0.17%

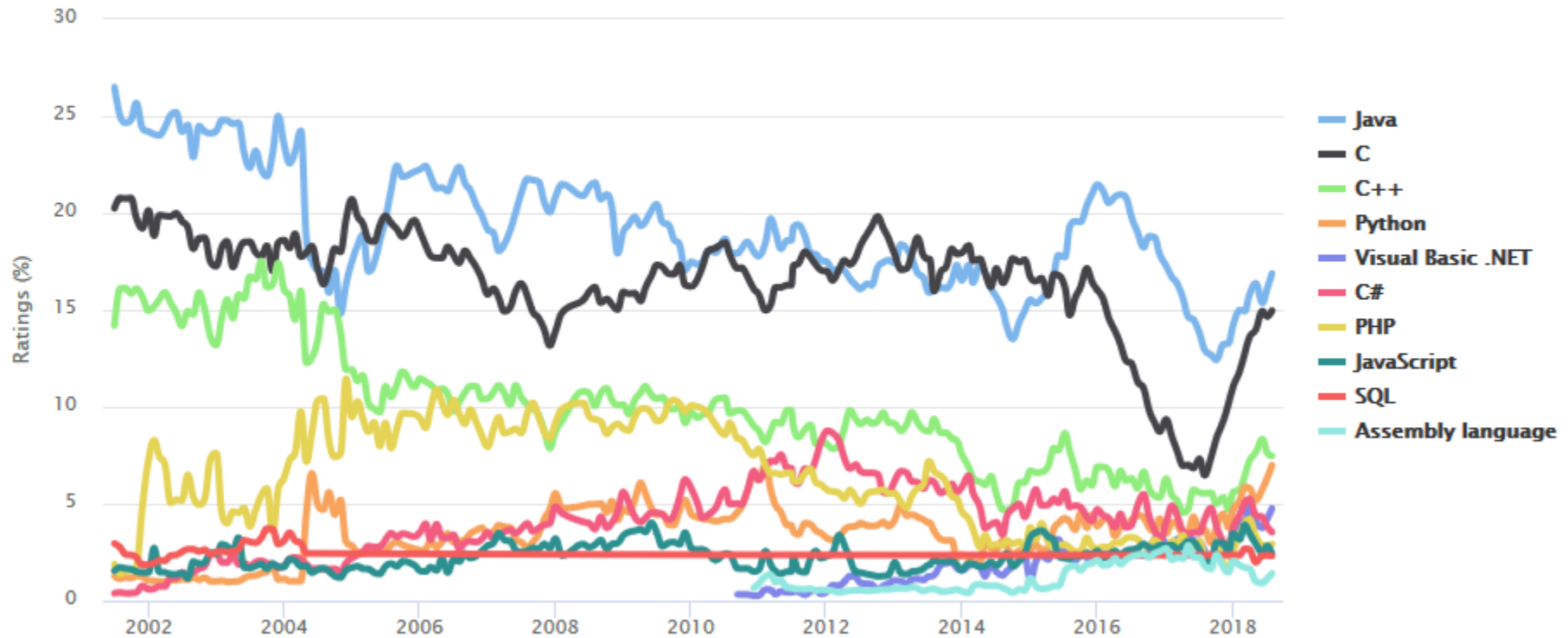
COBOL = 25

RPG > 50

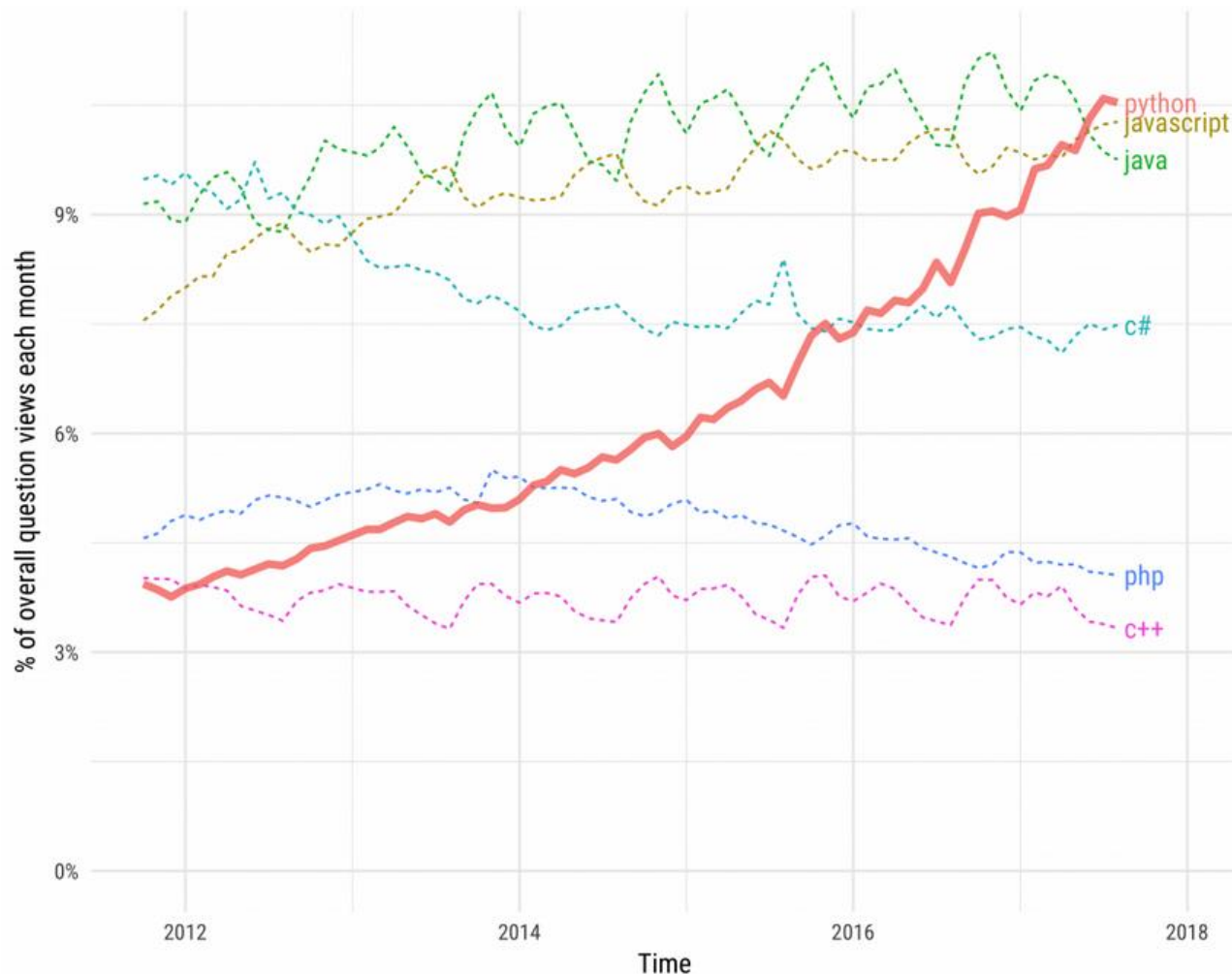
Tiobe top 10 trending

TIOBE Programming Community Index

Source: www.tiobe.com

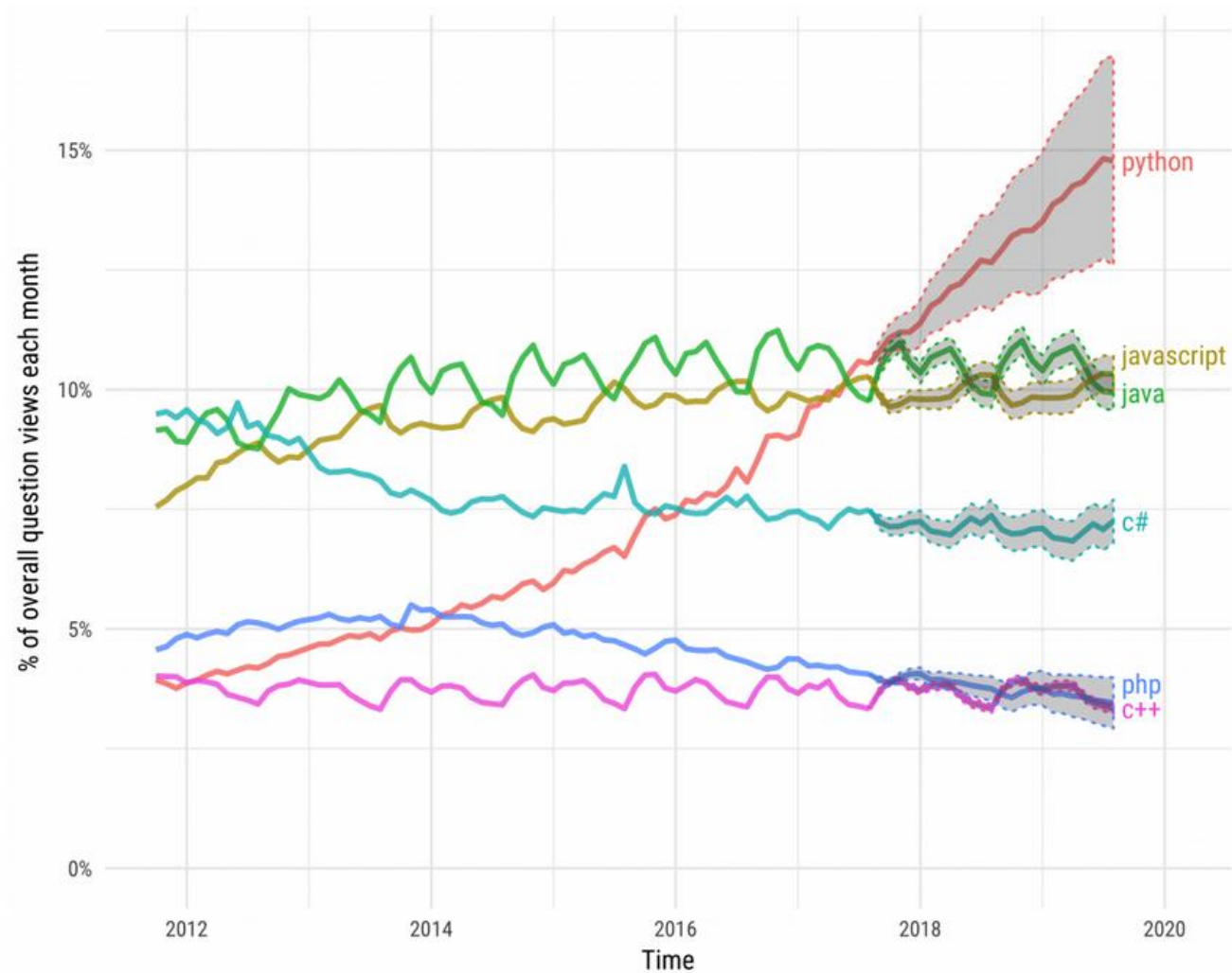


Explosive growth on Stack Overflow



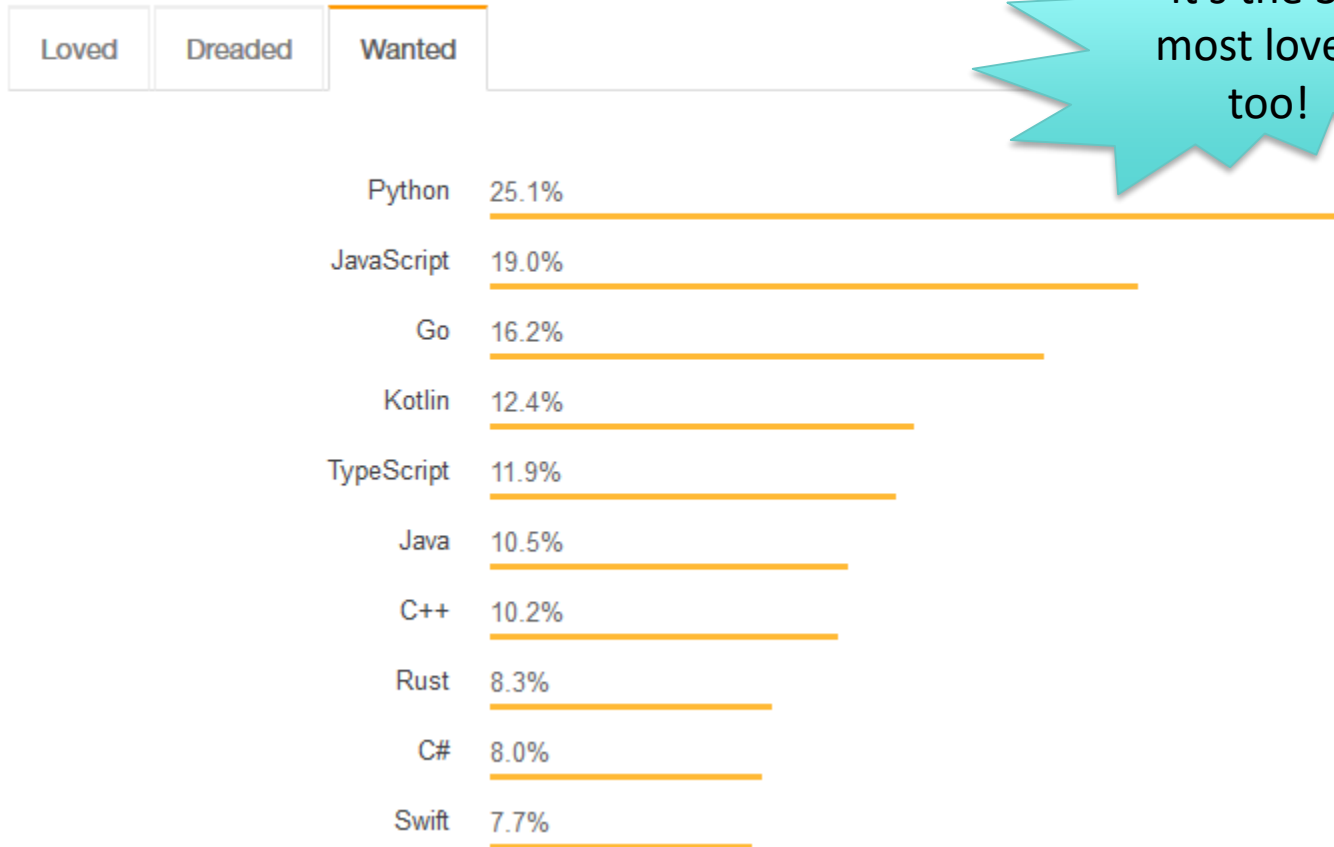
<https://stackoverflow.blog/2017/09/06/incredible-growth-python/>

Potential for growth?



Most wanted in 2018

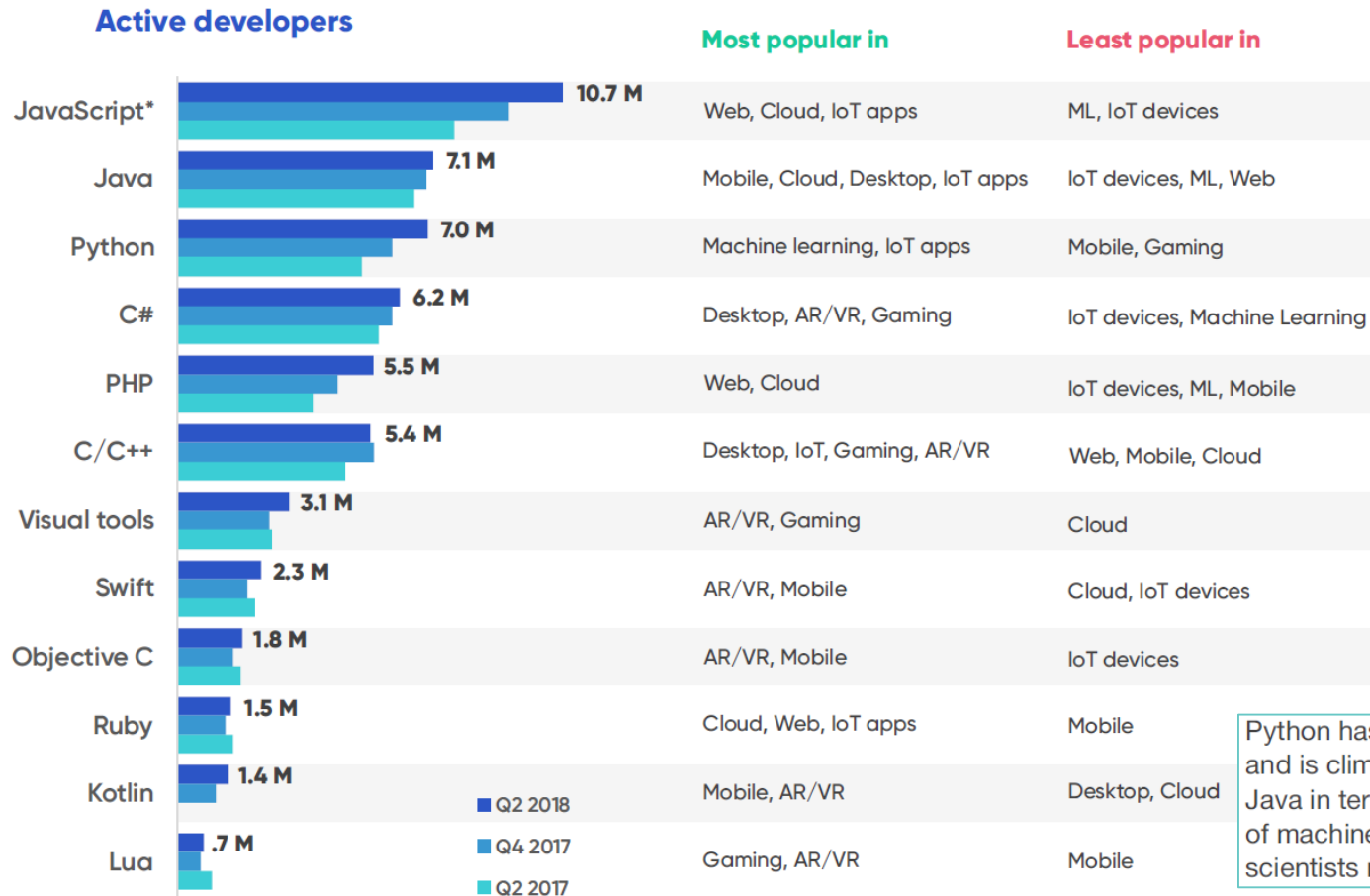
Most Loved, Dreaded, and Wanted Languages



It's the 3rd
most loved,
too!

<https://insights.stackoverflow.com/survey/2018>

/ Data survey 40,000 developers, worldwide



DEVELOPER ECONOMICS
STATE OF THE
DEVELOPER
NATION
15TH EDITION

Python has reached 7M active developers and is climbing up the ranks, closing in on Java in terms of popularity. Sixty two percent of machine learning developers and data scientists now use Python.

(*) JavaScript includes CoffeeScript, TypeScript

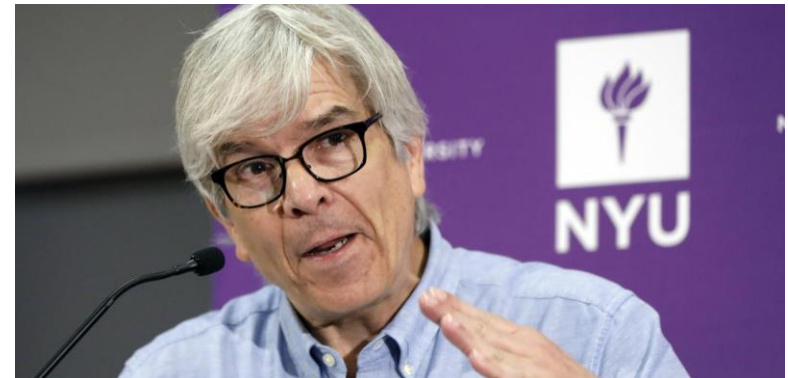
(*) The 'least popular' column only includes sectors for which we have data on the language in question.

2018 Nobel Laureate

This year's Nobel Prize in economics was awarded to a Python convert

Economist Paul Romer, a co-winner of the [2018 Nobel Prize in economics](#), is many things.

He is one of most important theorists on the drivers of economic growth. He is an ex-World Bank chief economist. He is a supporter of [clear academic writing](#). He is the chief evangelist for [charter cities](#)—small jurisdictions within a country that operate autonomously of the national government—as a way to encourage better governance. But perhaps most notably for a 62-year-old economist of his distinction, he is a user of the [programming language Python](#).



The tie-breaker is social, not technical. The more I learn about the open source community, the more I trust its members. The more I learn about proprietary software, the more I worry that objective truth might perish from the earth.

<https://paulromer.net/jupyter-mathematica-and-the-future-of-the-research-paper/>

Some reasons folks like Python

- Open source is free, right?
 - ▶ Yes, no...well – sort of...
 - ▶ No charge LP on IBM i – 5733OPS & RPM model
- Only scripting language to support multiple inheritance
- Multi-threading
 - ▶ Stateful, not Async like Node
 - ▶ But same motivation as Node, non-blocking
- Applications develop faster
 - ▶ Extensive standard library that is constantly evolving
 - ▶ Frameworks such as Bottle

```
from multiprocessing.dummy import Pool as ThreadPool  
pool = ThreadPool(4)  
results = pool.map(my_function, my_array)
```


One more reason folks like Python



Industries using Python

- Technology
 - ▶ Geospatial, Machine Learning
 - ▶ Honeywell - Build automation
- Manufacturing
 - ▶ D-Link updates – Multithreaded
 - ▶ Phillips – Robot programming and sequencing
- Entertainment
 - ▶ ILM – Scripting CGI Intensive films
 - ▶ Video gaming
- Transportation
 - ▶ Airports – Frequentis for weather info
 - US, Denmark, Iceland, Hong Kong, etc.

Companies using Python

- YouTube - Backend
- Facebook – (see next slide)
- Dropbox
- NASA – Weather and more
- IBM
- Mozilla
- Instagram
- Red
- Quora



Adam D'Angelo, wrote a lot of Python for Quora

Updated Sep 12, 2014 · Upvoted by Charlie Cheever, [One of the founders of Quora](#) and Scott Danzig, avid Quora user since 2012, and a Quora Top Writer

Python was a language that Charlie and I both knew reasonably well (though I know it a lot better now than I did when we started). We also briefly considered C#, Java, and Scala. The biggest issues with Python are speed and the lack of typechecking.

▶ Why python?

Facebook in detail

■ Top three languages

▶ Hack (fork of PHP)

▶ C++

▶ Python

- Millions of lines of code, thousands of libraries and binaries
- 2016 to date: average 5,000 commits per month, 1,000+ committers
- 5 percent Py3 (as of May 2016)

■ Infrastructure management

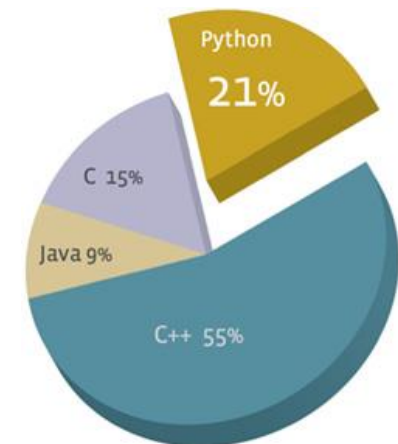
▶ Network switch setup

▶ Core services (DNS, etc,)

▶ Server imaging, burnin-in.

■ Platform services: Job Engine, team workflow management

<https://code.facebook.com/posts/1040181199381023/python-in-production-engineering/>



Notes...

- Why is Python so odd for IBM i?
 - ▢ No apparent clear use case
 - ▢ Not a lot of IBM i Python developers...yet.

- We'll get to this...

The right hammer, please

- Java – Device programming
- PHP – Web programming
- COBOL & RPG – business programming and batch language
- Python – General purpose
 - ▢ Dang, no “specific” purpose or...
 - ▢ A place EVERYWHERE!
 - ▢ Possibly the NEW batch solution...

Platform for Modernization

Web2py

- Open source application framework project
- Dedicated to backward compatability
 - ▣ But what happens when the language changes?
 - ▣ Python2 → Python3
 - BC Breaks!
- Massimo DiPierro –
 - ▣ CDM Director of the master of Science in Computational Finance at DePaul University.
 - ▣ Lead developer of project

Web2py - Features

- Database abstraction
- Hello World in seconds
- No lengthy learning curve
- Designed by business people for business people



Massimo: *I believe that the ability to easily build high quality web applications is of critical importance for the growth of a free and open society.*

Documentation

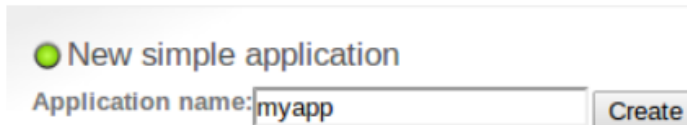
■ Clear and easy to read

Simple examples

Say hello

Here, as an example, we create a simple web app that displays the message "Hello from MyApp" to the user. We will call this application "myapp". We will also add a counter that counts how many times the same user visits the page.


You can create a new application simply by typing its name in the form on the top right of the **site** page in **admin**.






After you press [create], the application is created as a copy of the built-in welcome application.







Web2py


[web2py / web2py](#)

 Watch
 237
  Star
 1,471
  Fork
 709


[Code](#)
[Issues 146](#)
[Pull requests 3](#)
[Projects 0](#)
[Wiki](#)
[Insights](#)

Free and open source full-stack enterprise framework for agile development of secure database-driven web-based applications, written and programmable in Python. <http://www.web2py.com>






 7,354 commits
  5 branches
  66 releases
  136 contributors

Branch: **master**
New pull request

Find file
Clone or download

 mdipierro committed on GitHub Merge pull request #1766 from abastardi/tsv_export

Latest commit 5975e47 5 days ago

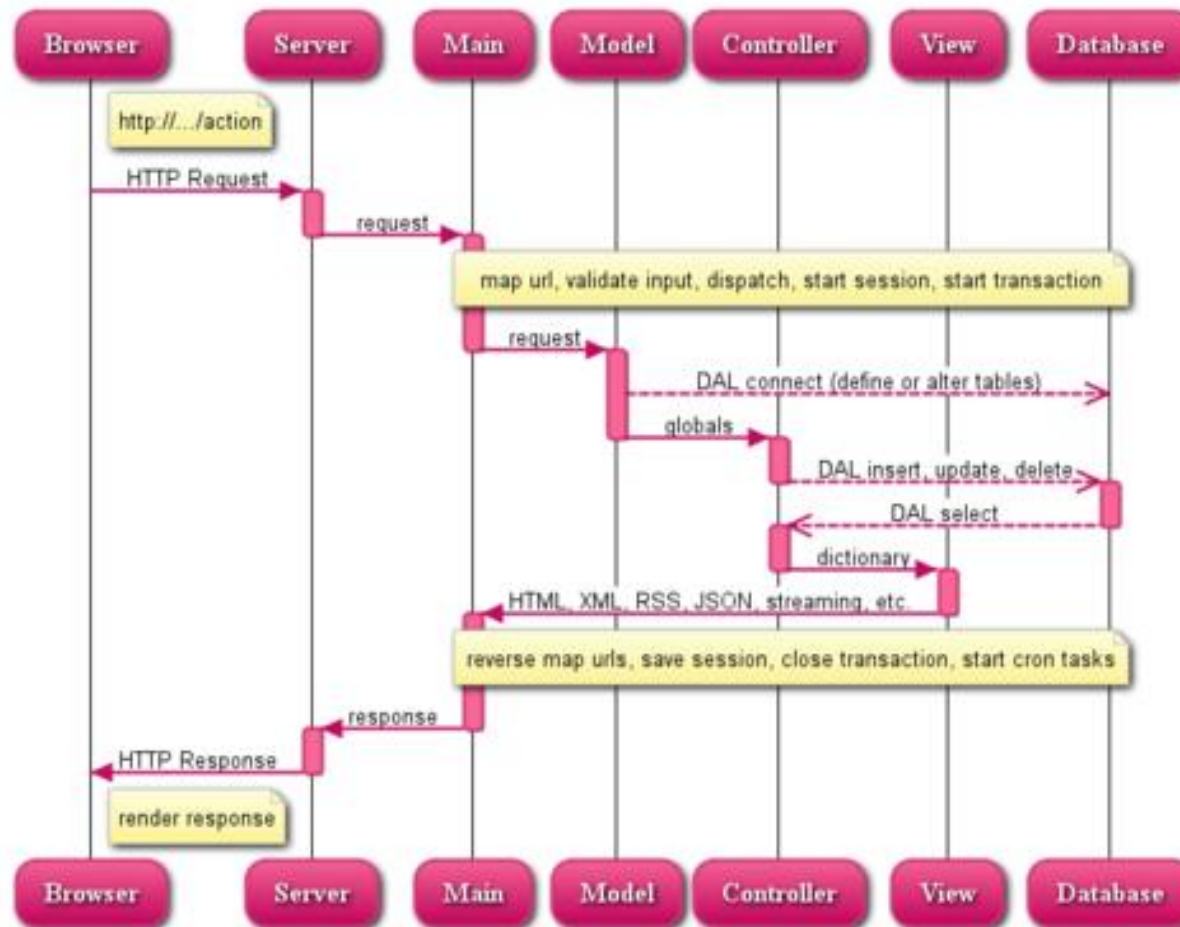
 applications	Fix submit button disable bug	a month ago
 docs	adjusted docs to newer structure	3 years ago
 examples	better support for -f	2 years ago
 extras	R-2.9.12	3 years ago
 gluon	Merge pull request #1766 from abastardi/tsv_export	5 days ago

Web2py & Python 3

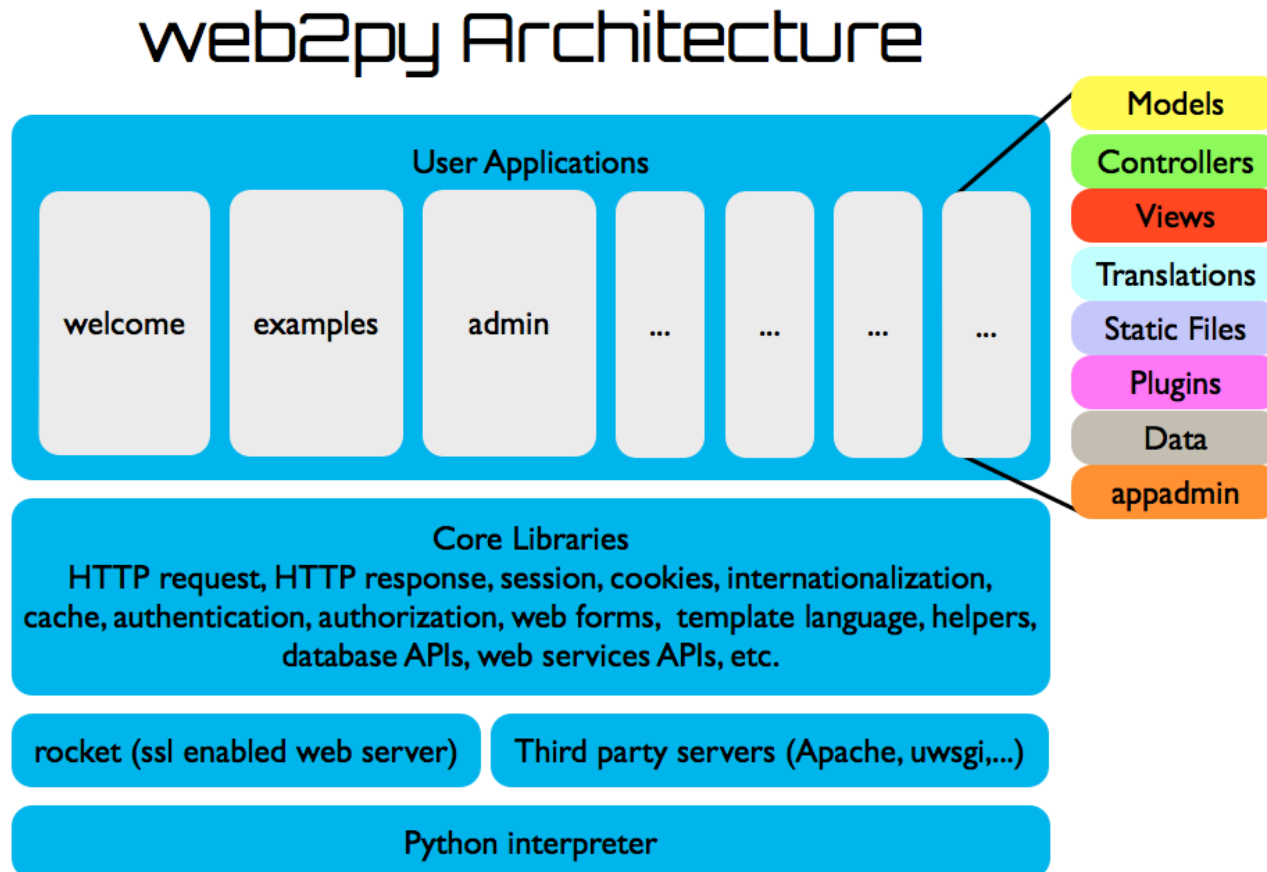
- Currently under development
- Function reformatting
- New database engine

Logic flow

- Sacrifice religion for easy to use



Web2py - Architecture



PHP example of data access

```
1      <html><body><h1>Records</h1><?
2      mysql_connect(localhost,username,password);
3      @mysql_select_db(database) or die( "Unable to select database");
4      $query="SELECT * FROM contacts";
5      $result=mysql_query($query);
6      mysql_close();
7      $i=0;
8      while ($i < mysql_numrows($result)) {
9          $name=mysql_result($result,$i,"name");
10         $phone=mysql_result($result,$i,"phone");
11         echo "<b>$name</b><br>Phone:$phone<br /><br /><hr /><br />";
12         $i++;
13     }
14     ?></body></html>
```

Same thing in Python with web2py

```
1     def index():  
2         return HTML(BODY(H1('Records'), db().select(db.contacts.ALL)))
```


Other Python Frameworks

Some formidable candidates

- Django
- Pyramid
- TurboGears
- Dash
- Microframeworks
 - ▶ Flask
 - ▶ Bottle
 - ▶ CherryPy
- Asynchronous Frameworks
 - ▶ Sanic
 - ▶ Tornado

The Django logo, featuring the word "django" in a lowercase, green, sans-serif font.

Why choose a framework

■ Pros

- ▶ Pre built hunks of code, easier Productivity(\$\$\$)
- ▶ Tested/supported by community
- ▶ Established Frameworks represent experience

■ Cons

- ▶ Learning curve
- ▶ Difficult to select the right one (maybe more than one)
- ▶ Time investment / value proposition

Common Framework Functionality

- Application routing (URL...think menus)
- Form handling (Input/validation/output)
- Support for standard output templates
 - ▣ HTML, JSON, XML, etc.
- Web Security
- Session information management

What's the difference?

- Design patterns
- Familiarity
- Features
- Religion

A New ERP?

odoo

- Open Source ERP application
- Includes
 - ▶ CRM
 - ▶ Point of Sale
 - ▶ Helpdesk
 - ▶ Manufacturing
 - ▶ Accounting
 - ▶ Event management
 - ▶ HRIS
 - ▶ More...




odoo Mission




To be very easy to use and fully integrated





■ Timeline

- ▶ 2005 – Initial release (TinyERP)
- ▶ 2008 - OpenERP
- ▶ 2013 – odoo Community Association established
- ▶ 2014 Company renamed to odoo

Stats for ODOO?





 **odoo / odoo**

 Watch 1,233  Star 7,574  Fork 6,841


 Code  Issues 2,665  Pull requests 1,300  Wiki Insights ▾






Odoo. Open Source Apps To Grow Your Business. <https://www.odoo.com>

[odoo](#) [python](#) [business](#) [management](#) [odoo-apps](#) [erp](#) [apps](#)

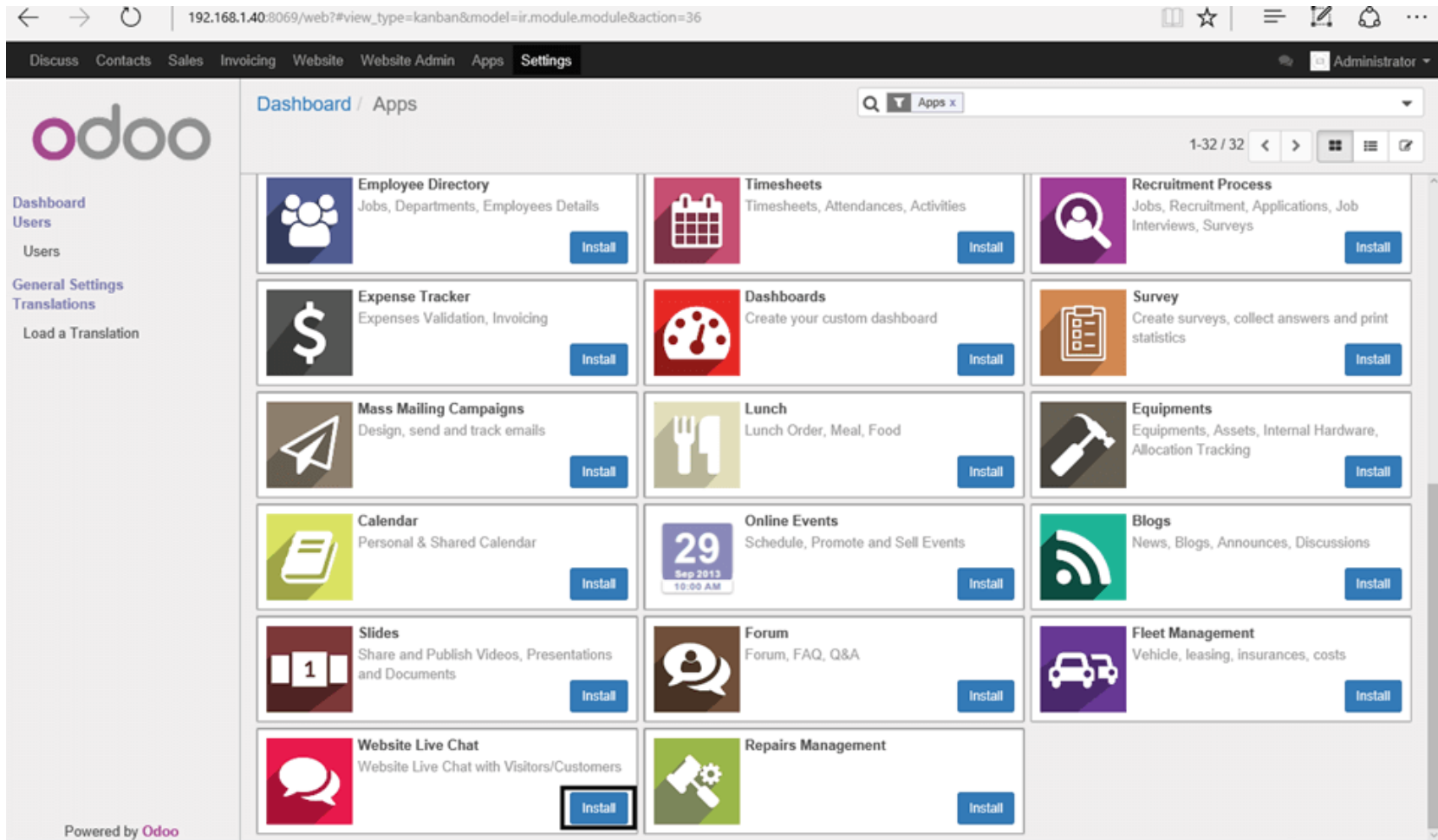
 108,749 commits  26 branches  78 releases  633 contributors

Branch: 10.0 ▾ [New pull request](#) [Find file](#) [Clone or download ▾](#)

 **C3POdoo** [I18N] Update translation terms from Transifex Latest commit 682b2c0 21 hours ago

 .github	[ADD] Github template files for issues and PR	2 years ago
 .tx	[I18N] update source terms	3 months ago
 addons	[I18N] Update translation terms from Transifex	21 hours ago
 debian	[MERGE] forward port branch saas-12 up to 6f8e40c	11 months ago
 doc	[MERGE] forward port branch 9.0 up to 1970761	5 days ago

Does this look like your typical – IBM i ERP?



Who is using odoo?

■ Toyota

Country: France

Industry: Automotive/Material Handling

Apps Implemented: CRM, Sales, Purchase, Manufacturing, Inventory, Accounting

Implementing Partner: Smile

Number of Users: 10 Users

■ Aggressive competition

▶ Could not afford long ramp up/risk

■ Up and running in 6 months



Who is using odoo?

■ FYG

- ▣ Selling, delivering, installing, and maintaining components and systems, focused on industrial and commercial markets

Company: Frew Process Group/A.B. Young/Gasco or FGY Team

Country: Indiana, USA

Industry: Industrial Equipment Supplier

Apps Implemented: CRM, Sales, Accounting, Purchase, Inventory

Implementing Partner: Ursa Information Systems

■ SAP Proves too Rigid for FGY



Why did so many companies come to IBM i?

- Why did so many companies come to IBM i?
- 1980's
 - ▢ Affordable over mainframe
- 1990's
 - ▢ Established ERP's and Y2K
- 21st Century
 - ▢ ???



Who is using odoo?

■ Florida Iron Doors

- ▶ Selling, delivering, installing, and maintaining components and systems, focused on industrial and commercial markets

Location: Deerfield Beach, Florida, United States of America

Industry: Manufacturer of Iron Doors

Apps Implemented: CRM, Sales, Inventory, Accounting, Invoicing, Studio

Number of Users: 10 Users

Implementation Time: 8 Weeks in Production + 50 Hours with a Consultant



This can't be free...

FREE PLAN	ONLINE	ENTERPRISE
Free for One App	from USD 25.0 /user/month	USD 30.0 /user/month
< 50 users self-service	< 50 users service by Odoo	> 50 users service by partner
START NOW	VIEW PRICING	BUY NOW
1 App	Pay as you grow	All Apps
Free	Monthly	Annually
✓	✓	×

odoo Community

■ Partners

- ▶ All over the US
- ▶ Little to no IBM i experience

United States

68

novobi

steersman
URSA

mobius

confianz

bista

vCloud9
IT SIMPLIFIED

PROCESSES • TECHNOLOGY
gadgroup™
PEOPLE

cloudioteca

OpenERP4You
"change begins"

What about PHP?

- PHP is a great solution
- Designed for web pages and content management
- odoo was conceived to be a business application

The screenshot shows the GitHub repository for inoERP. At the top, it displays the repository name 'inoerp / inoERP' and statistics: 88 Watchers, 301 Stars, and 378 Forks. Below this, there are tabs for 'Code', 'Issues' (27), 'Pull requests' (3), 'Projects' (0), and 'Insights'. The main description states: 'inoERP is a PHP-based open source enterprise management system that can be used with several databases - such as Oracle 12c, MariaDB, MySQL. The ERP system contains all the functionalities required for running any manufacturing, service or distribution organization. The features are very similar to Oracle R12/ Fusion Application and SAP. It also... <http://inoideas.org>'. Below the description, there are statistics: 965 commits, 8 branches, 13 releases, 2 contributors, and MPL-2.0 license. A progress bar shows the commit history. At the bottom, there is a table of recent commits:

Commit	Message	Time
inoerp 0.6.1		Latest commit f24d02d 25 days ago
inoerp	0.6.1	25 days ago
COPYRIGHT.txt	Update COPYRIGHT.txt	9 months ago
LICENSE.txt	Update LICENSE.txt	9 months ago

Where do I go for help?

Python is popular with startups!

- Open source creates tremendous opportunities

The screenshot shows the Clutch website interface. At the top, the Clutch logo is followed by the tagline 'Firms that deliver'. To the right, there is a search bar and a dropdown menu labeled 'More in Web & Software Development'. Below this, a dark blue banner features the text '2017 Reviews' (highlighted with a red box) and 'Top Python & Django Developers'. Underneath the banner, a navigation bar includes a '218 Firms' button, a 'Reviews' link (highlighted with a red underline), a 'Leaders Matrix' link, a 'Sort by' dropdown menu set to 'Sponsored', and a 'Filter' button.

GADgroup.

- Consulting firm based in Chicago area
- 10-20 local consultants

GAD Group Technology, Inc. was established to meet the demand for cutting edge technology and sophisticated software applications by small and medium sized businesses, government municipalities and non-for-profit organizations with limited budgets for full time "IT Resource."



GAD GROUP TECHNOLOGY INC.

"Integrating people, processes and technology,
the RIGHT way!"

Gregory Dover – GAD Group

- Specializes in SMB companies
- Uses Python to modernize legacy
 - ▣ IBM i
 - ▣ SQL Server
 - ▣ VB
 - ▣ HP UX
- Build custom
- ODOO business practice.
- WEB2PY for integration

A new twist...risk?

Python lineage

- Python 1 – 1994
- Python 2 – 2000 (Not dead yet...)
 - ▣ 2.7 – 2010
- Python 3 – 2008
 - ▣ 3.5 – 2015
 - ▣ 3.6.2 – July 2017
 - ▣ 3.7 ➔ ETA July 2018

Release version	Release date
Python 3.4.7	2017-08-09
Python 3.5.4	2017-08-08
Python 3.6.2	2017-07-17
Python 3.6.1	2017-03-21
Python 3.4.6	2017-01-17
Python 3.5.3	2017-01-17
Python 3.6.0	2016-12-23

Python 2 or 3?

The screenshot shows a web browser window titled "Python 2.7 Countdown" with the URL "pythonclock.org". The page has a yellow background and features a large green countdown timer. The timer consists of six boxes, each containing a number and a unit: 1 Year, 8 Months, 5 Days, 1 Hour, 4 Minutes, and 17 Seconds. Below the timer, there is a link "Enable Guido Mode: huh?". The page is divided into three sections: "What's all this, then?", "How do I get started?", and a footer with various links. The "What's all this, then?" section explains that Python 2.7 will not be maintained past 2020 and provides contact information for the website. The "How do I get started?" section provides advice on transitioning from Python 2 to Python 3. The footer contains links to IBM i Technology U, Python 2.7 Countdown, Book-O-Rama Catalog, Contact: Emmanuel, TIOBE Index | TIOBE, Python 2.7 Countdown, repl.it - EmptyDullTi, and a trash icon. The browser's address bar shows the URL "pythonclock.org" and a search bar with "Search Google". The browser's taskbar at the bottom shows several open tabs, including "IBM i Technology U", "Python 2.7 Countdown", "Book-O-Rama Catalog", "Contact: Emmanuel", "TIOBE Index | TIOBE", "Python 2.7 Countdown", and "repl.it - EmptyDullTi". The browser's status bar at the bottom shows a zoom level of 100%.

Python 2.7 Countdown

pythonclock.org

Search Google

Python 2.7 will retire in...

1	8	5	1	4	17
Year	Months	Days	Hour	Minutes	Seconds

[Enable Guido Mode: huh?](#)

What's all this, then?

Python 2.7 [will not be maintained past 2020](#). Originally, there was no official date. Recently, that date has been updated to [January 1, 2020](#). This clock has been updated accordingly. My original idea was to throw a Python 2 Celebration of Life party at PyCon 2020, to celebrate everything Python 2 did for us. That idea still stands. (If this sounds interesting to you, email pythonclockorg@gmail.com).

Python 2, thank you for your years of faithful service.

Python 3, your time is now.

How do I get started?

If the code you care about is still on Python 2, that's totally understandable. Most of PyPI's popular packages now [work on Python 2 and 3](#), and more are being added every day. Additionally, a number of critical Python projects have [pledged to stop supporting Python 2 soon](#). To ease the transition, the [official porting guide](#) has advice for running Python 2 code in Python 3.

IBM i Technology U Python 2.7 Countdown Book-O-Rama Catalog Contact: Emmanuel TIOBE Index | TIOBE Python 2.7 Countdown repl.it - EmptyDullTi

Reset 100 %

What's the diff of 2 vs. 3?

■ Example:

▣ Python 2 print statement replaced by function

- Python 2 – print “Hello World!”
- Python 3 – print(“Hello World!”)

■ *Many more differences, tho...*

■ *Which one?*

▣ Correct answer: It depends...

- New Development → Python 3
- Some existing libraries are Python 2 but 90%+ are also Python 3 compliant, or on their way

PEP-572

- PEP == Python Enhancement Proposal
- BDFL == Benevolent Dictator for Life
 - ▣ Guido Van Rossum
 - ▣ Final design authority for the Python language
- 572 is a proposal for creating a way to assign to variables within an expression using the notation `NAME := expression`.
- There was a GREAT deal of passion, both for and against this enhancement...

<https://www.python.org/dev/peps/pep-0572/>

PEP-572 examples

```
# Handle a matched regex
if (match := pattern.search(data)) is not None:
    # Do something with match

# A loop that can't be trivially rewritten using 2-arg iter()
while chunk := file.read(8192):
    process(chunk)

# Reuse a value that's expensive to compute
[y := f(x), y**2, y**3]
```

Python Civil War part 2: Age of Assignment

[python-committers] Transfer of power

Guido van Rossum [guido at python.org](mailto:guido@python.org)

Thu Jul 12 10:57:35 EDT 2018

- Previous message (by thread): [\[python-committers\] A different way to do discussions](#)
- Next message (by thread): [\[python-committers\] Transfer of power](#)
- Messages sorted by: [\[date \]](#) [\[thread \]](#) [\[subject \]](#) [\[author \]](#)

Now that PEP 572 is done, I don't ever want to have to fight so hard for a PEP and find that so many people despise my decisions.

I would like to remove myself entirely from the decision process. I'll still be there for a while as an ordinary core dev, and I'll still be available to mentor people -- possibly more available. But I'm basically giving myself a permanent vacation from being BDFL, and you all will be on your own.

After all that's eventually going to happen regardless -- there's still that bus lurking around the corner, and I'm not getting younger... (I'll spare you the list of medical issues.)

I am not going to appoint a successor.

So what are you all going to do? Create a democracy? Anarchy? A dictatorship? A federation?

BDFL?

"I'm tired, and need a very long break."

Guido as of August...

InfoWorld: Are you concerned that your departure as the BDFL might scare away some Python devotees?

van Rossum: I don't think so. Python has a very healthy community. The core team has a very healthy dynamic. I wouldn't have resigned if I thought that they wouldn't get over this and be able to guide the language forward for decades to come. I would say that this is a minor hiccup despite appearances, and we're looking forward to very successful future releases and an appropriate gradual evolution of the development process.

InfoWorld: What will your involvement in the project be going forward?

van Rossum: I will leap into the role of a regular contributor or a regular core developer. I will occasionally write some code and review code. I will try to focus on mentoring core developers, especially new core developers, especially women and minorities because diversity in the core developer group is one of my goals.

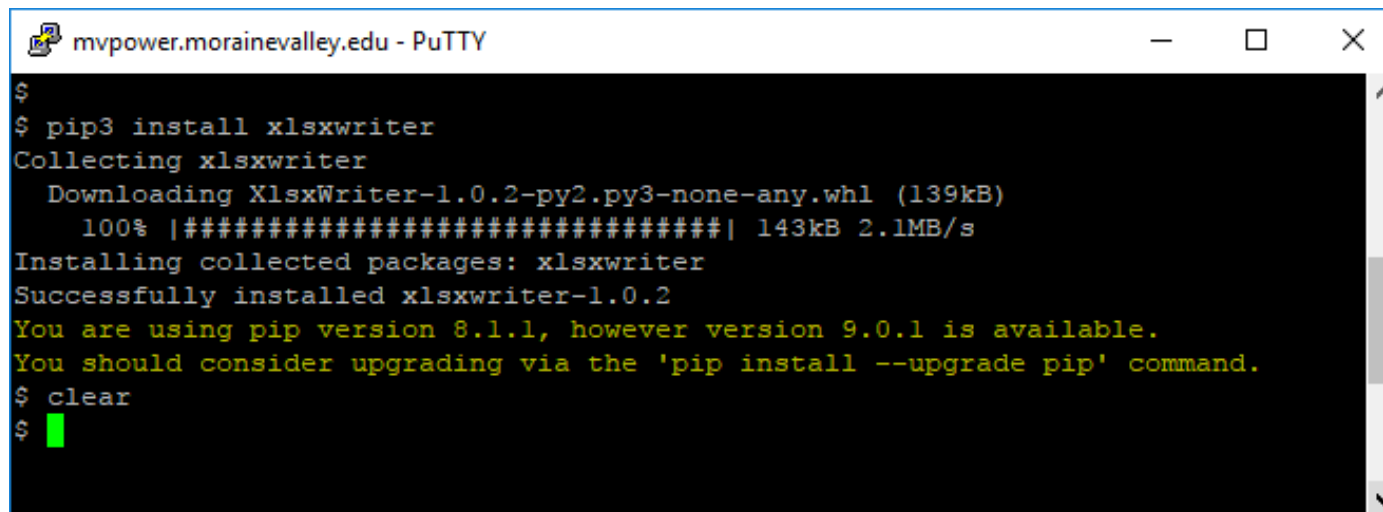
Is this a good thing?

- Without question, this is a good thing...
- Healthy for leadership to transition (think term limits?)
- PHP release managers
 - ▢ PHP 1 & 2 – Rasmus Lerdorf
 - ▢ PHP 3 & 4 – Zeev and Andy
 - ▢ PHP 5 – Ilia Alshanetsky
- Zend Framework
 - ▢ ZF1 – Walter
 - ▢ ZF2 & 3 Matthew O’Phinney
 - Component managers help

Release	Release Managers
PHP 5.6	Ferenc Kovacs ✉ tyrael@php.net
	Julien Pauli ✉ jpauli@php.net
PHP 7.0	Anatol Belski ✉ ab@php.net
	Ferenc Kovacs ✉ tyrael@php.net
PHP 7.1	Davey Shafik ✉ davey@php.net
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Spreadsheet from Python

Had to install xlswriter



A screenshot of a PuTTY terminal window titled 'mvpower.morainevalley.edu - PuTTY'. The terminal shows the following commands and output:

```
$  
$ pip3 install xlswriter  
Collecting xlswriter  
  Downloading XlsxWriter-1.0.2-py2.py3-none-any.whl (139kB)  
    100% |#####| 143kB 2.1MB/s  
Installing collected packages: xlswriter  
Successfully installed xlswriter-1.0.2  
You are using pip version 8.1.1, however version 9.0.1 is available.  
You should consider upgrading via the 'pip install --upgrade pip' command.  
$ clear  
$
```


Got doc?

<http://xlsxwriter.readthedocs.io/chart.html>

XlsxWriter

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The Chart Class

The `Chart` module is a base class for modules that implement charts in XlsxWriter. The information in this section is applicable to all of the available chart subclasses, such as Area, Bar, Column, Doughnut, Line, Pie, Scatter, Stock and Radar.

A chart object is created via the Workbook `add_chart()` method where the chart type is specified:

```
chart = workbook.add_chart({'type': 'column'})
```

It is then inserted into a worksheet as an embedded chart using the `insert_chart()` Worksheet method:

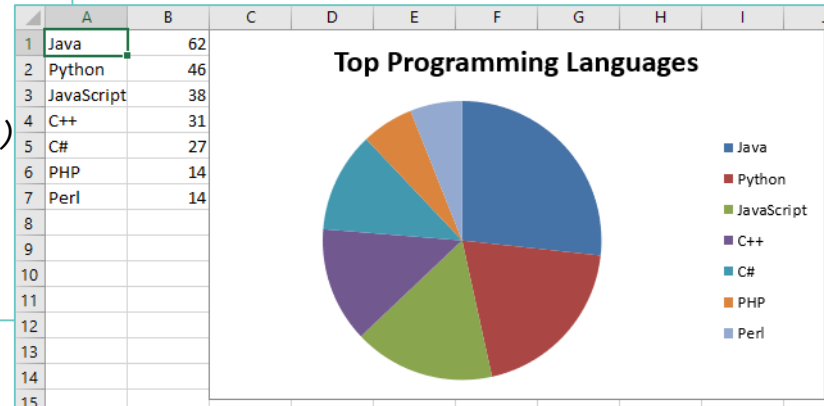
```
worksheet.insert_chart('A7', chart)
```

Now let's do something cool

```
from xlswriter import Workbook

with Workbook('test.xlsx') as workbook:
    ws = workbook.add_worksheet()
    ws.write_column('A1', ['Java', 'Python', 'JavaScript',
                          'C++', 'C#', 'PHP', 'Perl'])
    ws.write_column('B1', [62, 46, 38, 31, 27, 14, 14])
    #chart = workbook.add_chart({'type': 'line'})
    chart = workbook.add_chart({'type': 'pie'})
    chart.set_title({'name': 'Top Programming Languages'})
    chart.add_series({'categories': '=Sheet1!$A$1:$A$7',
                     'values': '=Sheet1!$B$1:$B$7'})

    ws.insert_chart('C1', chart)
```



Summary

- Python may be better positioned for business than any other open source language
- It is mature, just not on IBM i.
- Database expectations mostly agnostic, getting better.
- Start slow and grow into it!

THANK YOU

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