




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## The open book: Open Source on IBM i

Jesse R. Gorzinski, MBA  
jgorzins@us.ibm.com  
Business Architect:  
Open Source on IBM i




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### Business value?

- Ease in finding skills
- Time to market
- May not have to change core business! Just use OSS to extend it to web services, mobile, etc.
- It's very easy to enable web and mobile technologies.



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### What is IBM i doing?



### Open Source on i – a new concept?

- First open-source IBM i project was JTOpen (1998)



- People have been using perl since at least 1998



- Apache HTTP server shipped since 2002



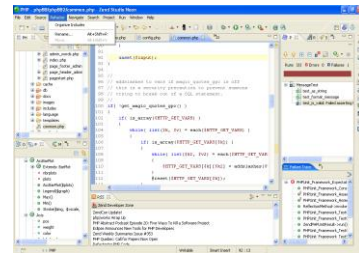
- Also shipped in the past/present:

- OpenSSL
- OpenSSH
- Apache Tomcat
- Samba



## What IBM i is doing –partnership with Zend (RogueWave)

- Zend Server for i
  - Preloaded with IBM i 7.1 and 6.1
  - One year of Silver Support from Zend
- Zend Server Development edition
  - Reduced cost – include Z-Ray and other dev tools
- Zend Server for i
  - Available from Zend
- Zend Studio for i
  - Eclipse-based development environment
  - One year of Silver support from Zend
- Zend DBi
  - MySQL implementation for IBM i
  - DB2 Storage Engine enables data storage in DB2



## IBM i Shops using



## What IBM i is doing – partnership with PowerRuby

- What is PowerRuby?
  - Freely available and commercially supported port of the Ruby language
  - Includes supporting infrastructure (i.e. Rails) for running Ruby web applications on IBM i
  - Available for download from [PowerRuby.com](http://PowerRuby.com)
  - Includes native DB2 database driver – MySQL not necessary
  - Integrates with XMLSERVICE for access to IBM i programs and objects
- Components
  - Ruby 2.0.0 and 1.9.3 (MRI implementation, a.k.a CRuby)
  - `ibm_db` (IBM supported - <http://rubyforge.org/projects/rubyibm/>)
  - Apache + Thin ← the web server stack (more Ruby app servers options coming)
  - Rails 3.2.x and 4.0.0 (CoffeeScript support in the works)
- Learn more
  - [PowerRuby.com](http://PowerRuby.com) for updates and news
  - [twitter.com/rubyonpower](https://twitter.com/rubyonpower)



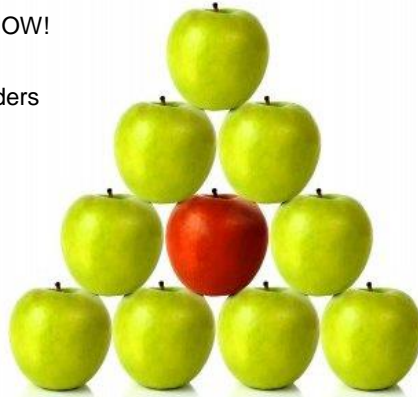
## Open Source for IBM i

- New LPO – 5733OPS Open Source for IBM i
  - New license program option
  - Designed for Open Source offerings on IBM i

## 5733-OPS: a bit unconventional?

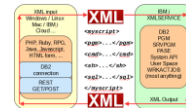
- 5733-OPS has 15 options available NOW!
- The options themselves are placeholders
- Function will be delivered via PTF
- We now have a PTF group for each IBM i release!!


SF99123 (7.1)  
 SF99223 (7.2)  
 SF99225 (7.3)



## Things we deliver with every new language/version

- FastCGI
  - Allows fast connection from HTTP server to backend PASE environment
- ILE Object Toolkit
  - Toolkit for each environment to easily allow connections to ILE objects and information – Built on XMLService
- SQL Connector
  - Easy integrated (from the open source language) way to transfer data to and from DB2 for i leveraging SQL



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## Node.JS – 5733OPS Option 1 (now deprecated)

```

graph TD
    A[JavaScript Code] --> B[Node.js]
    B --> C[Machine Code]
  
```

- What's Node.JS?
  - Simply put, Node.js is server-side JavaScript
  - Based on Google Chrome V8 Engine.
- Why Node.JS?
  - Great for web development!
    - JavaScript is already widely used on the client side of web development
    - Can now do both
  - High Performance
    - Node.js is designed to maximize throughput and efficiency.
  - Increasing popularity:
    - More than 70,000 third-party extensions are available on [www.npmjs.org](http://www.npmjs.org) now.

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## Node.JS: Leverage the community with Node Package Manager (npm)


```


$ npm install jshint
jshint@2.5.11 node_modules/jshint
├── strip-json-comments@1.0.2
├── underscore@1.6.0
├── exit@0.1.2
├── console-browserify@1.1.0 (date-now@0.1.4)
├── minimatch@1.0.0 (sigmund@1.0.0, lru-cache@2.5.0)
├── shelljs@0.3.0
├── cli@0.6.5 (glob@3.2.11)
├── htmlparser2@3.8.2 (domelementtype@1.1.3, domutils@1.5.0, entities@1.0.0,
domhandler@2.3.0, readable-stream@1.1.13)
└── jshint
$ ls node_modules/
jshint
$ ls node_modules/jshint/
README.md bin data dist node_modules package.json src
$ ls node_modules/jshint/node_modules/
cli exit minimatch strip-json-comments console-browserify htmlparser2
shelljs underscore
  
```

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
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5733 OPS – Lots delivered in June 2016!

- Option 1 – Node.JS 2.x
- Option 2 - Python 3  **Enhanced**
- Option 3 – GCC / chroot





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June 2016 enhancements to option 2 – Python 3.4

- Python v3.4 was initially delivered June 2015
- Key updates in June
  - Wheel (updated packaging mechanism)
  - Package add-ons as wheels
  - Rebuild with gcc technology to allow easier integration with community
  - Better support for Django, a powerful web framework for Python
    - Django requires a database
    - Only solution previously was to use Zend DBi (out of process), PyMySQL, and a spec of MySQL that doesn't meet Django requirements
    - Now we have a solution that goes straight to DB2

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## Python 3 – 5733OPS Option 2

- What's Python?
  - A powerful general-purpose language
  - Interpreted
- Why Python?
  - Easy to use
    - Language is designed to be a "fun" language
    - Can be considered the 'CL language for the modern programmer'
    - Easy for IBM i programmers to learn
  - Very, very popular
    - Over 85,000 third-party extensions are available on <http://pypi.org>





## Leverage the community with the Preferred Installer for Python (pip/pip3)

```










jgorzins@BEHEMOTH ~
$ ssh -Y lp13ut20.rch.stglabs.ibm.com
jgorzins@lp13ut20.rch.stglabs.ibm.com's password:
$ python3 --version
Python 3.4.2
$ pip3 install xlswriter
Downloading/unpacking xlswriter
  Downloading xlswriter-0.7.3-py2.py3-none-any.whl (132kB)
Installing collected packages: xlswriter
Successfully installed xlswriter
Cleaning up...
$ |

```





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## IBM i chroot (change '/' location), 5733OPS Option 3

	<b>Ranger</b> chroot /QOpenSys/ranger /usr/bin/bsh		'/' is ... /QOpenSys/ranger/(*)
	<b>Bobby</b> chroot /QOpenSys/bobby /usr/bin/bsh		'/' is ... /QOpenSys/bobby/(*)
	<b>Lefty</b> chroot /QOpenSys/lefty /usr/bin/bsh		'/' is ... /QOpenSys/lefty/(*)
	<b>Wild Bill</b> chroot /QOpenSys/wildbill /usr/bin/bsh		'/' is ... /QOpenSys/wildbill/(*)
	<b>admin</b> No problem, but you are not going to mess up my system, so chroot you.		No chroot, '/' is ... /(*)

( <http://yips.idevcloud.com/wiki/index.php/PASE/OpenSourceBeta> )

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## IBM i compilation environment, 5733OPS Option 3

- Scripts to set up gcc and other popular build tools
- PASE has XLC, not free, and not very compatible for Open Source

- Not only can you get a real build environment, you can do so inside a "chroot" and have isolated, sandboxed versions of the build environment!


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
5733 OPS – Lots delivered in June 2016 and beyond!

- Option 1 – Node.JS 2.x
- Option 2 - Python 3.4
- Option 3 – GCC / chroot
- Option 4 – Python 2.7
- Option 5 – Node.JS 4.x
- Option 6 – Git
- Option 7 – Tools
- Option 8 – Orion
- Option 9 – cloud-init
- Option 10 – Node.JS 6.x

**New**




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**Option 4 – Python 2.7**

- Python v2.7 (option 4) to be delivered 1H2015
  - initial delivery, built with GCC
  - Wheel
  - toolkit and database connector
- Why?
  - Python 2 and Python 3 are not fully compatible
  - Python 3 not fully accepted by the Python community
  - Many applications still built on Python 2



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## Option 5 – Node v4

## Option 10 – Node v6



- Previously shipped Node.js v0.x (option 1)
  - Now deprecated!
- Node v4 move is important
  - New Javascript engine (much better performance)
  - New Javascript language features (classes, among other things)

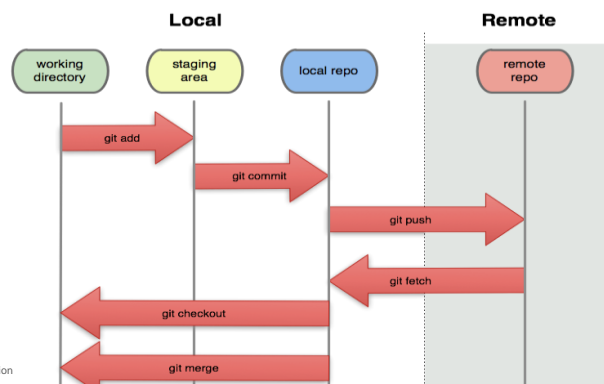
```

1 var Greeter = (function () {
2   function Greeter(message) {
3     this.greeting = message;
4   }
5   Greeter.prototype.greet = function () {
6     return "Hello" + this.greeting;
7   };
8   return Greeter;
9 })();
10 var greeter = new Greeter("world");
11 var button = document.createElement('button');
12 button.innerText = "Say Hello";
13 button.onclick = function () {
14   alert(greeter.greet());
15 };
16 document.body.appendChild(button);
17

```

## Option 6- Git

- Open Source distributed version control system
- Source control for virtually any language
- Powerful and flexible
- Can have hooks to perform custom actions when new code is integrated
- Already in use in the IBM i community



## 5733OPS Option 7 ("Tools") keeps growing...



- Some of the packages downloaded via GCC tool kit are core to the success of Open Source development for IBM i
- In June 2016, we shipped key packages: bash, zip, unzip
- Since then...
  - xz
  - gzip
  - bz2
  - GNU tar
  - perl
  - cURL
  - wget
  - rsync



## wget


- utility that lets you download files from the Internet or intranet locations.
- Supports:
  - HTTP, HTTPS, and FTP protocols
  - proxies
  - non-interactive use





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## curl

- Both a command and a shared library
- Robust interaction with HTTP or FTP URL's
- Supports
  - HTTP, HTTPS, and FTP protocols
  - proxies
  - non-interactive use
  - advanced HTTP operations like HTTP POST and GET requests
  - FTP upload
  - user authentication
  - much more!




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## rsync

- Synchronize files and directories between systems
- Cross-platform
- Various techniques for determining if file needs update



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## SQLite

- Zero-configuration SQL database engine
- Easy to use
- Useful for open source software that uses this technology.



## Major git enhancement

- Ability to perform a 'git clone' of an HTTP/HTTPS repository
- Makes interacting with GitHub or BitBucket much easier!

```
bash-4.3$ git -c http.sslVerify=false clone http://github.com/OSSILE/OSSILE
Cloning into 'OSSILE'...
remote: Counting objects: 1608, done.
remote: Compressing objects: 100% (41/41), done.
remote: Total 1608 (delta 15), reused 0 (delta 0), pack-reused 1567
Receiving objects: 100% (1608/1608), 4.01 MiB | 1.57 MiB/s, done.
Resolving deltas: 100% (868/868), done.
Checking out files: 100% (253/253), done.
```

## More libraries, coming SOON!!!....

- Delivering also in Option 7
  - libpng
  - libjpeg
  - freetype2
  - libxslt
  - libxml2
- Why?

## More libraries, coming SOON!!!....

- Delivering also in Option 7
  - libpng
  - libjpeg
  - freetype2
  - libxslt
  - libxml2
- Why?
  - Identified as important for enterprise workloads
  - Enable Python libraries to be installed: Pillow, lxml, etc.



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# IBM i Open Source projects



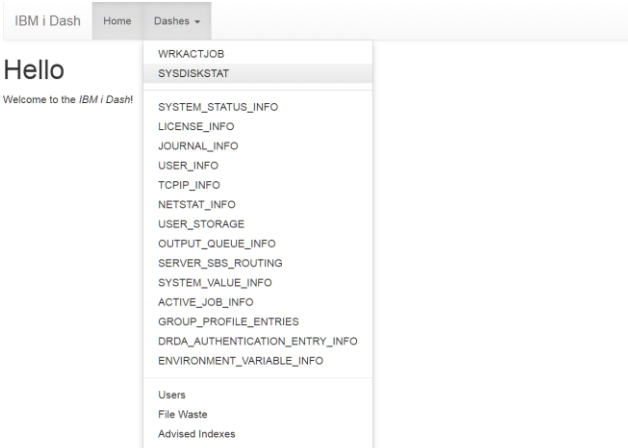
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## Dash for IBM i

- Written entirely in Node.JS
- Strongly leverages IBM i Services through the DB2 connector



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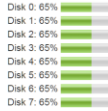
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## Dash for IBM i

IBM i Dash Home Dashes ▾



### SYSDISKSTAT

PERCENT\_USED FROM QSYS2.SYSDISKSTAT



Disk	Usage
Disk 0	65%
Disk 1	65%
Disk 2	65%
Disk 3	65%
Disk 4	65%
Disk 5	65%
Disk 6	65%
Disk 7	65%

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## Python toolkit for i

- Built on top of XMLService, like the other "toolkit" offerings
- Many other subcomponents of 5733OPS are open source (like the Python DB2 connector!)
- <https://bitbucket.org/litmis/python-itoolkit>

```

1 import config
2 from itoolkit import *
3 # modify iToolkit not include row node
4 itool = iToolkit(iparm=0, iret=0, ids=1, irow=0)
5 itool.add(iCmd('rtvjoba', 'RTVJOBA USRLIBL(?) SYSLIBL(?) CCSID(?N) OUTQ(?)'))
6 # xmlservice
7 itool.call(config.itransport)
8 # output
9 rtvjoba = itool.dict_out('rtvjoba')
10 if 'error' in rtvjoba:
11     print (rtvjoba['error'])
12 else:
13     print('USRLIBL = ' + rtvjoba['USRLIBL'])
14     print('SYSLIBL = ' + rtvjoba['SYSLIBL'])
15     print('CCSID = ' + rtvjoba['CCSID'])
16     print('OUTQ = ' + rtvjoba['OUTQ'])

```

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## Swift toolkit for i

- Talk to IBM i directly from Swift applications (yes, even your iPhone!)
- <https://t.co/RyCoQHT6ft>





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## Ublu

- A programming language, made for IBM i!
- An "object-disoriented" language
- implemented in Java, so runs anywhere with Java runtime
- <https://github.com/jwoehr/ublu>

```
# Show all jobs in a joblist
FUNC showJobs ( joblist ) $[
  LOCAL @j LOCAL @subsys LOCAL @type
  FOR @j in @@joblist $[
    put -n -s ${ job }$
    put -n -s -from @j
    job -job @j -get subsystem -to @subsys
    job -job @j -get type -to @type
    put -n -s -from @subsys put -n -s -from @type
    put -n -s ${ is owned by }$ job -job @j -get user
  ]$
] $
```

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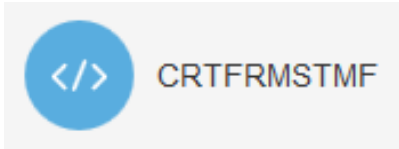
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## CRTFRMSTMF



- The desire:
  - store source in IFS
- The problem:
  - many CRT\_\_\_\_ commands don't support IFS paths! (e.g.: CRTCLMOD)

**Open source to the rescue!!** CRTFRMSTMF, written in RPG  
<https://bitbucket.org/BrianGarland/crtfrmstmf>

(by the way, also wired into the Relic package manager)



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## OSSILE

- Created with partnership to host more ILE open source code
- Already has:
  - UDTF's for cartridge info, machine info, and more (Christian Jorgenson)
  - CRTFRMSTMF  
Allows you to build CL and many others from IFS in one step! (even without STMF support on the CRT\_\_\_MOD command)
  - GETIPTF  
Allows you to fetch fixes from Fix Central, load them into an image catalog
  - A more robust FTP client!
  - Many more!

<https://github.com/OSSILE/OSSILE>

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## OSSILE

- What else is coming?
  - User-defined table functions (UDTF's). Nature of services includes:
    - Process Control Locks
    - Interrogate all kinds of IBM i object types
    - Activation group garbage collector
    - Table Spaces
    - XML Services
    - Block Fetching
  - Other handy utilities
    - **CLRPFMSBX** – Clear a physical file even if it has triggers or referential integrity constraints.
    - **ENDOBJLCK** – An interactive command that collects all the jobs that are holding locks on an object and ends them elegantly
    - **GENSRVLYR** – A template-based code generator that builds a service program for a table, providing all the basic CRUDE operations plus Table Space support



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## Many, many more.....

- Non-exhaustive list can be found here:
 




<https://bitbucket.org/ibmi/opensource/wiki/Home#markdown-header-ibm-i-open-source-repos-alphabetical>

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 opensource

**ACTIONS**

-  Clone
-  Compare
-  Fork



**NAVIGATION**

-  Overview
-  Source
-  Commits
-  Branches
-  Pull requests
-  Issues 1
-  Wiki
-  Downloads

### IBM i Open Source Repos (alphabetical)

IBM i Open Source falls into two broad categories: PASE based, Linux-like software, and QSYS.LIB based, RPG-like software.

- [activerecord-jdbcas400-adapter](#) - JRuby ActiveRecord DB2 for i Adapter
- [api2.py](#) - helper modules for iSeriesPython, primarily to make working with IBM system APIs easier
- [appserver4rpg](#) - Application Server to make Java Components available for IBM i RPG programs, runs on IBM i or any other database using all native SQL interfaces from IBM i.
- [bluepkg](#) - IBM i package manager
- [COMMON](#) - COMMON Open Source Solutions
- [cpytoxlsx.py](#) - iSeriesPython utility to copy physical files to Excel workbooks
- [crttrmsimf](#) - Compile source from IFS for commands that do not support stream files
- [db2sock](#) - PASE DB2 CLI asynchronous API driver (libdb400.a)
- [FFEDIT](#) - Simple source code editor for IBM i
- [FTPCLNT](#) - FTP client for IBM i
- [ibm\\_db for Python](#) - API description for the driver
- [IBM i Chroot](#) - Delivered as 5733OPS option 3
- [IBM i Dash](#) - Node.js dashboard web app demonstrating DB2 for i Service usage
- [IBM i Perzl](#) - Before IBM i Chroot there was IBM i Perzl.
- [ibmitoolkit](#) - PHP XMLSERVICE wrapper
- [ibm-i-enhanced](#) - Adds the AIX functionalities to IBM i
- [iiesc](#) - IBM i external storage calculator
- [ILEDocs](#) - Tool which helps software developers to document their programs in a convenient way.
- [ILEUnit](#) - ILE unit testing framework
- [image\\_catalog\\_details](#) - A SQL user defined table function to get the details for an image catalog.
- [iOpen](#) - Many RPGIC open source tools from Bob Cozzi
- [iseries\\_python27](#) - Source code for independent (non-IBM) port of Python to QSYS.LIB (see [iSeriesPython](#))
- [iSphere](#) - RDI plug-in with enhanced search and many other features.
- [iRPGEditor](#) - Graphical RPG source editor
- [iXMLService](#) - .Net XMLSERVICE wrapper
- [loopback](#) - LoopBack connector for DB2 for i
- [lstffd](#) - List File Field Descriptions (LSTFFD)
- [machine\\_attributes](#) - A SQL user defined table function to get machine attributes like system type, system model number etc
- [openssl-patches](#) - IBM (Kevin Adler) provides info on how to apply patches for OpenSSL for IBM i
- [python-itookit](#) - Python XMLSERVICE adapter
- [Relic Package Manager](#) - Package Manager for the ILE environment (QSYS.LIB)
- [rpg.vim](#) - RPG fixed/free vim syntax highlighting.
- [rpgleparser](#) - rpgleparser is an ANTLR v4 grammar for IBM's ILE RPG, capable of parsing both fixed- and free-format syntax


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## Is IBM i contributing to open source projects? YES!!

- GNU tar
- OpenSSL
- OpenSSH
- git
- Bottle.py
- PumpkinLB
- python-itookit
- Dash for IBM i
- db2sock
- ibmichroot
- db2util
- Python
- personality-insights-python

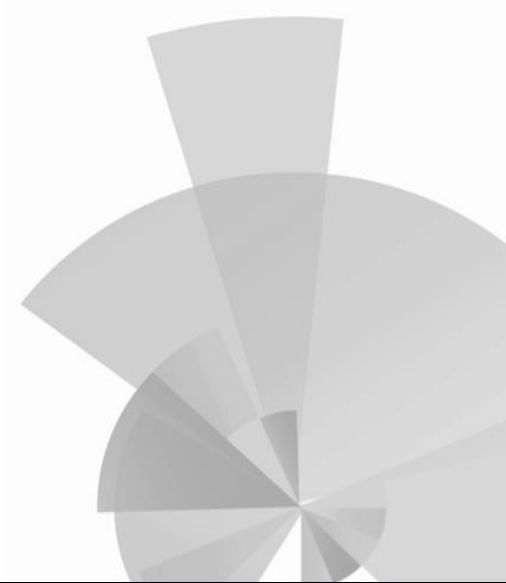
- Python-ibm-db
- swift-itookit
- portlibfori
- ibmiperzl
- ruby-itookit
- nodejs-itookit
- ruby-ibm\_db
- xmlservice\_examples
- OSSILE
- -ibmi\_netstat\_py
- python-for-IBM-i-examples
- shellinabox
- vlang\_rpg

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How can I contribute?



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Use it!



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## Participate in the community!



- Ask questions
- Give advice
- Share code, tips, tricks, etc!

## OPENSOURCE mailing list at Midrange



- midrange.com hosts a very well-established community covering a wide array of IBM i topics. There's an open source one!

<http://archive.midrange.com/opensource/>


*midrange.com*

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## LinkedIn IBM i OSS group

 Search for people, jobs, companies, and more...  Advanced



Home Profile My Network Learning Jobs Interests

 **IBM i OSS**  
584 members

- Great starting point for the latest news and events.
- Large member base


<https://www.linkedin.com/groups/8531863>

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## Ryver IBM i OSS team

- Forums, chat, links to social media
- Invite only!!
- Invite link (here you go):  
[https://ibmiOSS.ryver.com/application/signup/members/9tJsXDG7\\_iSSi1Q](https://ibmiOSS.ryver.com/application/signup/members/9tJsXDG7_iSSi1Q)

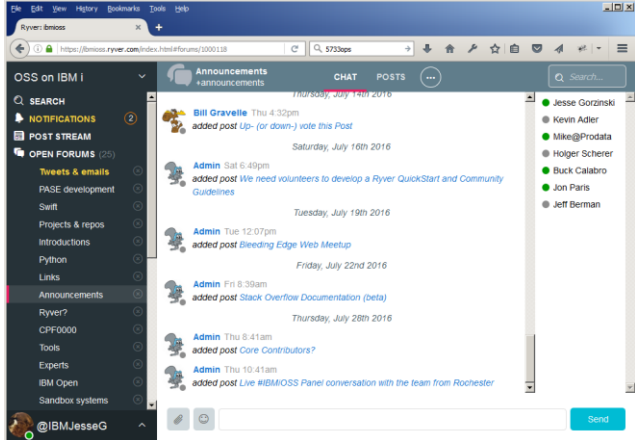


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## Ryver IBM i OSS team



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# twitter

- For the latest news:
  - watch **#IBMiOSS**
  - Follow **@IBMJesseG** and other community members
- Information or questions, just tweet with **#IBMiOSS!**

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## Write and contribute code

- Remember: lots of OSS repositories!
- Unsure how to help? Just ask!

## Spread the word!

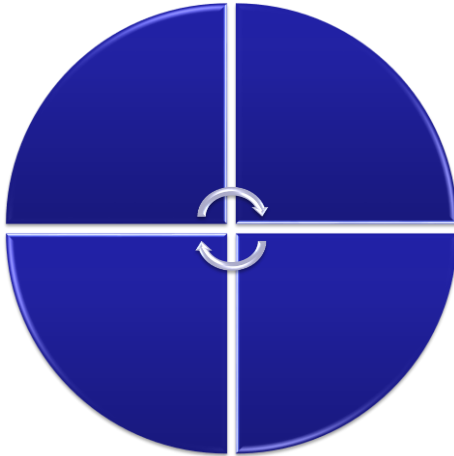
- Write or contribute to articles, blogs, etc.
- Speak at user groups and conferences
- Tweet with the #IBMiOSS hashtag!




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## Open Source on IBM i



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## Open Source on IBM i

- Apache
- OpenSSL
- OpenSSH
- JTOpen
- etc.

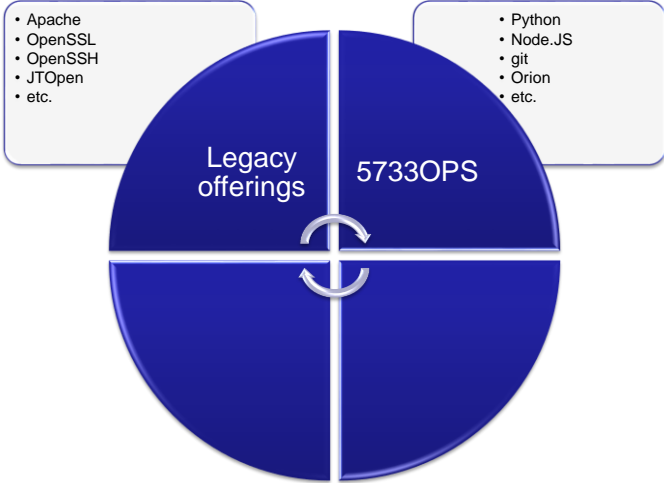
Legacy offerings



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## Open Source on IBM i



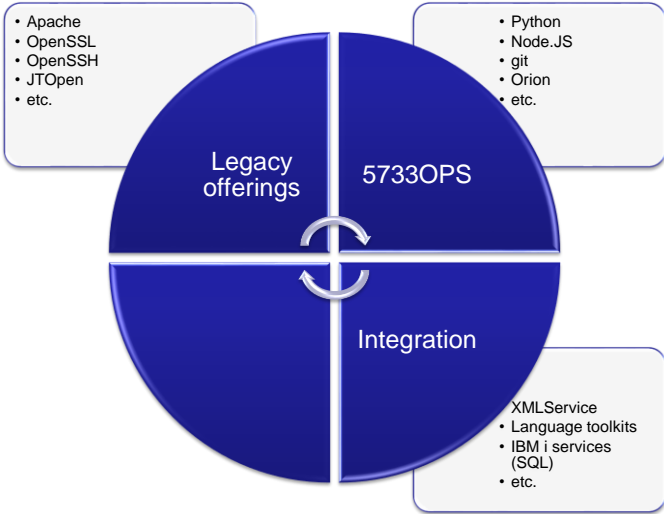
- Apache
- OpenSSL
- OpenSSH
- JTOpen
- etc.

- Python
- Node.JS
- git
- Orion
- etc.

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## Open Source on IBM i

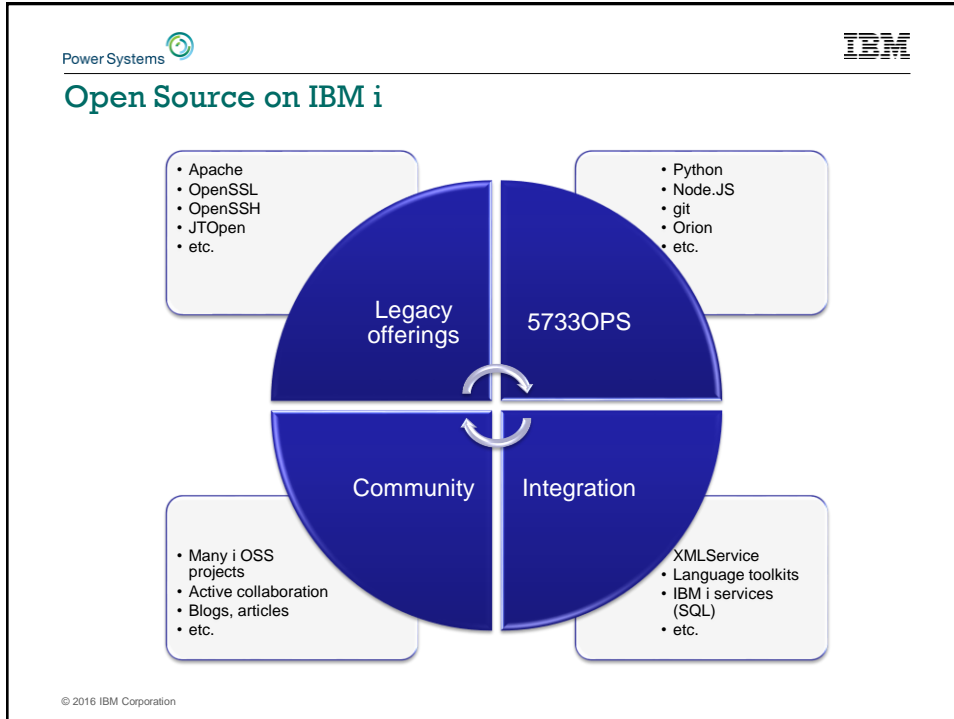




- Apache
- OpenSSL
- OpenSSH
- JTOpen
- etc.

- Python
- Node.JS
- git
- Orion
- etc.

- XMLService
- Language toolkits
- IBM i services (SQL)
- etc.

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## Some useful links

- IBM Systems Mag blog ("Open your i")
  - <http://www.ibmssystemsmag.com/Blogs/Open-Your-i/>
- 5733OPS offering (Open Source for i)
  - <http://ibm.co/2jgNvhY>
- IBM i Open Source wiki (community-managed)
  - <https://bitbucket.org/ibmi/opensource/wiki/>
- #IBMiOSS on Twitter
  - <https://twitter.com/hashtag/ibmiOSS?f=tweets>
- IBM i OSS on LinkedIn
  - <https://www.linkedin.com/groups/8531863>
- Join us on Ryver
  - [https://ibmiOSS.ryver.com/application/signup/members/9tJsXDG7\\_iSSi1Q](https://ibmiOSS.ryver.com/application/signup/members/9tJsXDG7_iSSi1Q)

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
---

# Tools for Open Source on IBM i

.... for Windows



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---

## Agenda

- Tools for three main tasks:
  - Access the filesystem
  - Edit source code
  - Use a shell
- Simple example

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## Accessing the filesystem




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## Accessing the filesystem

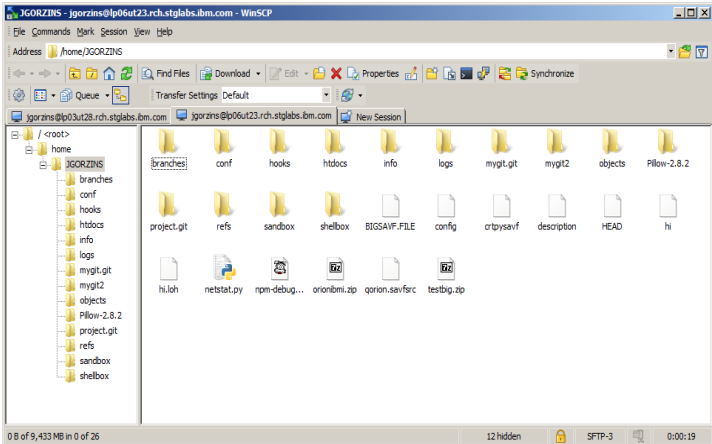
- Classic ways:
  - Mapped network drive (SMB)
  - i Navigator
  - WRKLNK
- Problems with these?


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## WinSCP

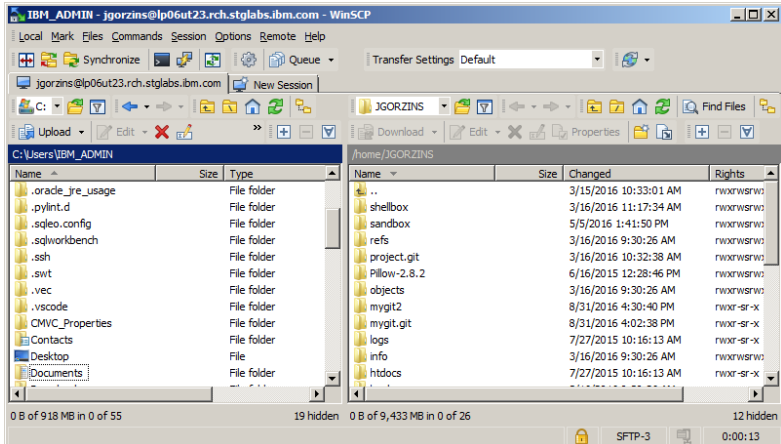
- Windows-only utility
- Uses SSH to connect to the system (STRTCPSVR \*SSHD)
  - Can use password- or key-based auth



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## WinSCP


- Defaults to a side-by-side view called “Commander” (ewh!)



Name	Size	Changed	Rights
..		3/15/2016 10:33:01 AM	rw-rw-rw-
shelbox		3/16/2016 11:17:34 AM	rw-rw-rw-
sandbox		5/5/2016 1:41:50 PM	rw-rw-rw-
refs		3/16/2016 9:30:26 AM	rw-rw-rw-
project.git		3/16/2016 10:32:38 AM	rw-rw-rw-
Pillow-2.8.2		6/16/2015 12:28:46 PM	rw-rw-rw-
objects		3/16/2016 9:30:26 AM	rw-rw-rw-
mygit2		8/31/2016 4:30:40 PM	rw-rw-rw-
mygit.git		8/31/2016 4:02:38 PM	rw-rw-rw-
logs		7/27/2015 10:16:13 AM	rw-rw-rw-
info		3/16/2016 9:30:26 AM	rw-rw-rw-
htdocs		7/27/2015 10:16:13 AM	rw-rw-rw-

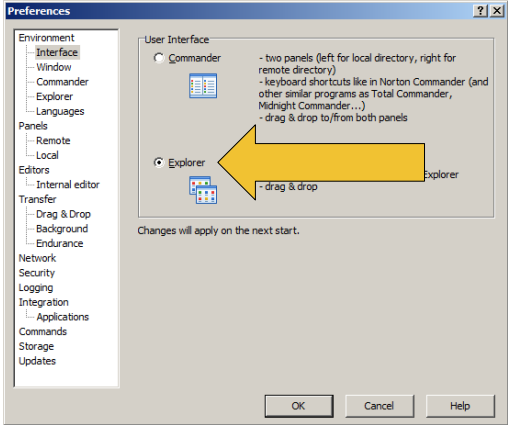
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
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## WinSCP

- To change interface, go to Options->Preferences, navigate to the “interface” section,

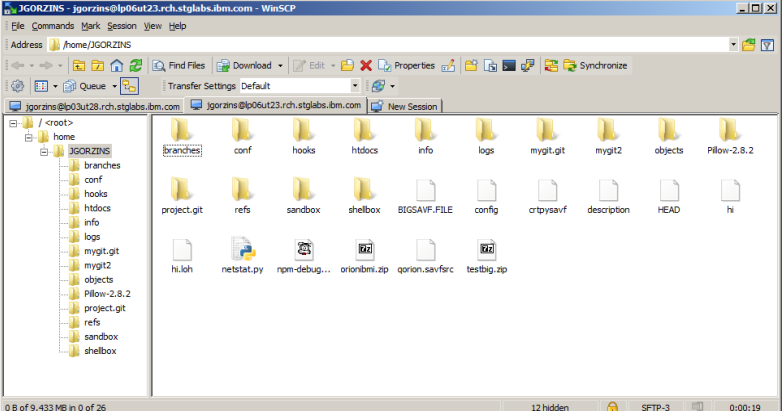


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## WinSCP

- Allows you to use your editor of choice
- Supports drag-and-drop of files, double-click to edit, transfer files to a different system, and much more
- As you save a file, it will implicitly upload the file via SSH connection



0 B of 9,433 MB in 0 of 26      12 hidden      SFTP-3      0:00:19

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JGORZINS - jgorzins@lp06ut23.rch.stglabs.ibm.com - WinSCP

File Commands Mark Session View Help

Address /home/JGORZINS

Find Files Download Edit Properties Synchronize

Transfer Settings Default

jgorzins@lp06ut23.rch.stglabs.ibm.com New Session

/ <root>


- home
  - JGORZINS
    - branches
    - conf
    - hooks
    - htdocs
    - info
    - logs
    - mygit.git
    - mygit2
    - objects

branches conf hooks htdocs info logs mygit.git mygit2 objects Pillow-2.8.2

project.git refs sandbox shellbox BIGSAVF\_FILE config crtpysavf description HEAD hi

hi.loh netstat.py npm-debug... orionbmi.zip qorion.savfsrc testbig.zip


Queue (1)

Operation	Source	Destination	Transferred	Time	Speed	Progress
	netstat.py	/home/JGORZINS/				Connecting...

2,125 B of 9,433 MB in 1 of 26

12 hidden SFTP-3 0:01:08

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JGORZINS - jgorzins@lp06ut23.rch.stglabs.ibm.com - WinSCP

File Commands Mark Session View Help

Address /home/JGORZINS

Find Files Download Edit Properties Synchronize

Transfer Settings Default

jgorzins@lp06ut23.rch.stglabs.ibm.com New Session

/ <root>


- home
  - JGORZINS
    - branches
    - conf
    - hooks
    - htdocs
    - info
    - logs
    - mygit.git
    - mygit2
    - objects

branches conf hooks htdocs info logs mygit.git mygit2 objects Pillow-2.8.2

project.git refs sandbox shellbox BIGSAVF\_FILE config crtpysavf description HEAD hi

hi.loh netstat.py npm-debug... orionbmi.zip qorion.savfsrc testbig.zip

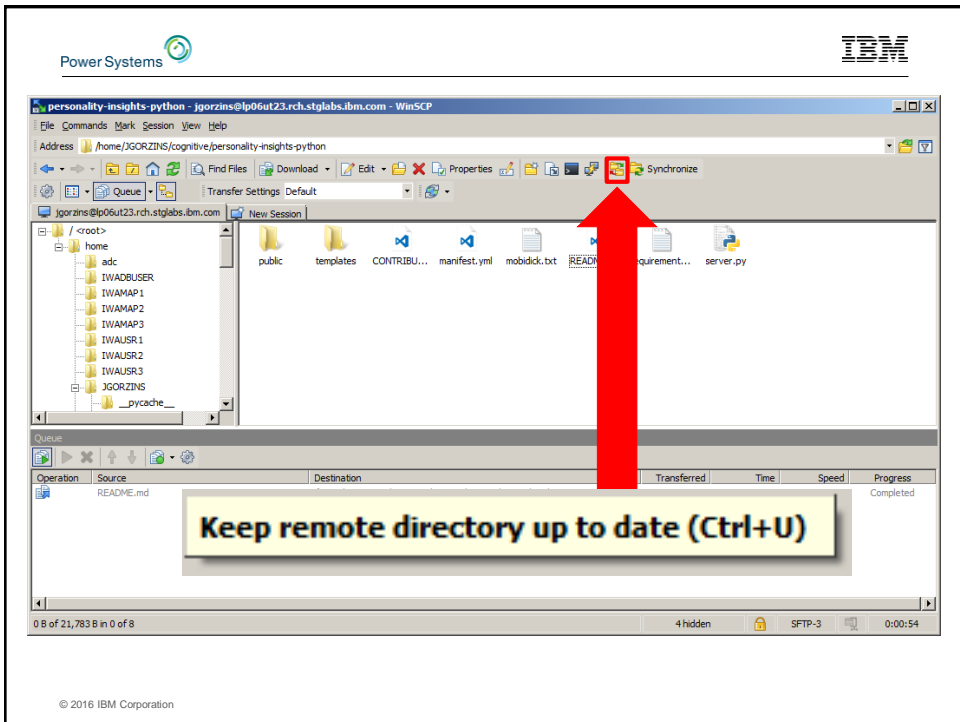
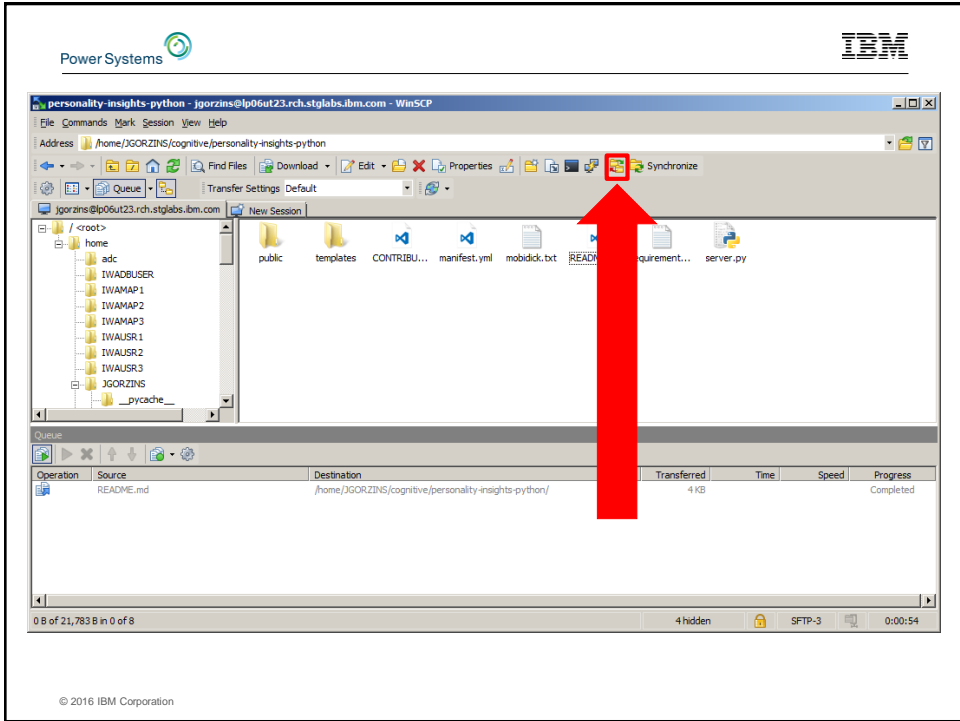
Queue

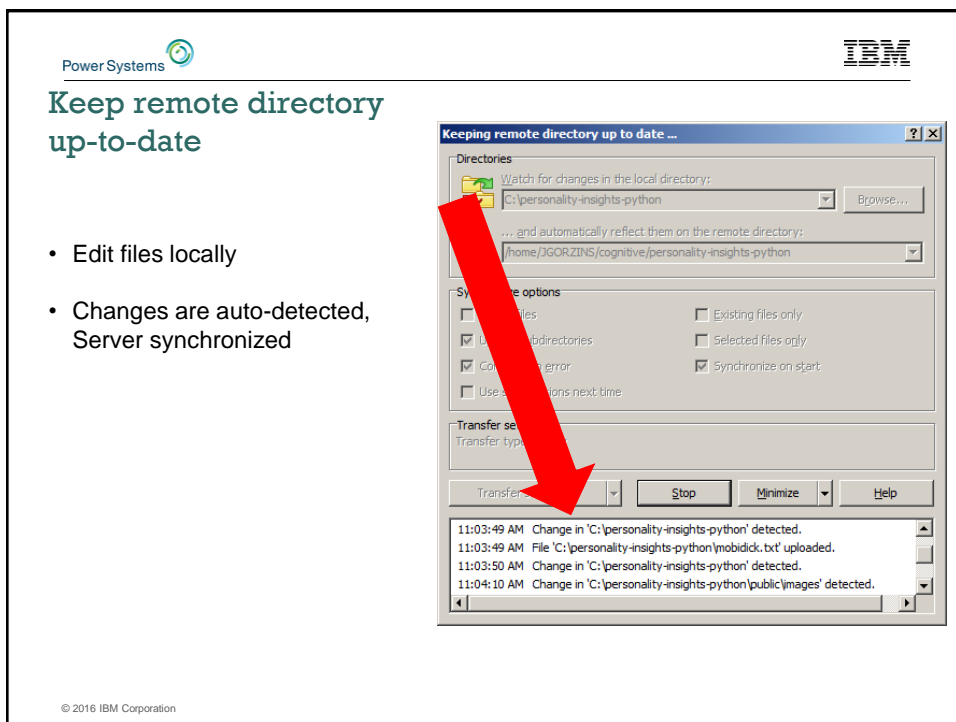
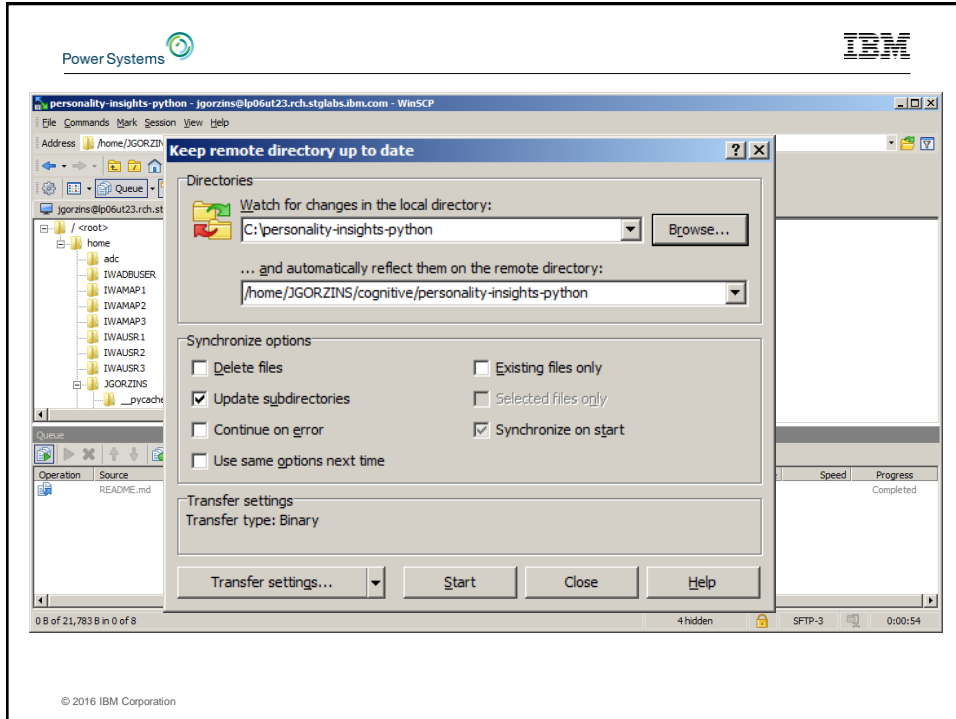
Operation	Source	Destination	Transferred	Time	Speed	Progress
	netstat.py	/home/JGORZINS/	3 KB			Completed

2,125 B of 9,433 MB in 1 of 26

12 hidden SFTP-3 0:01:23

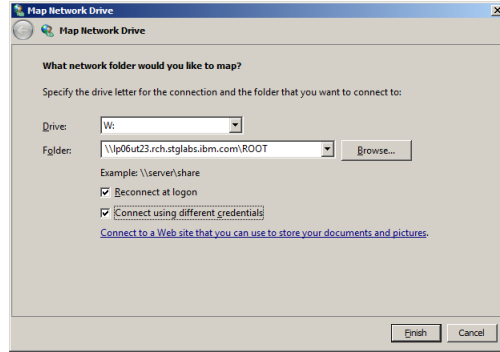
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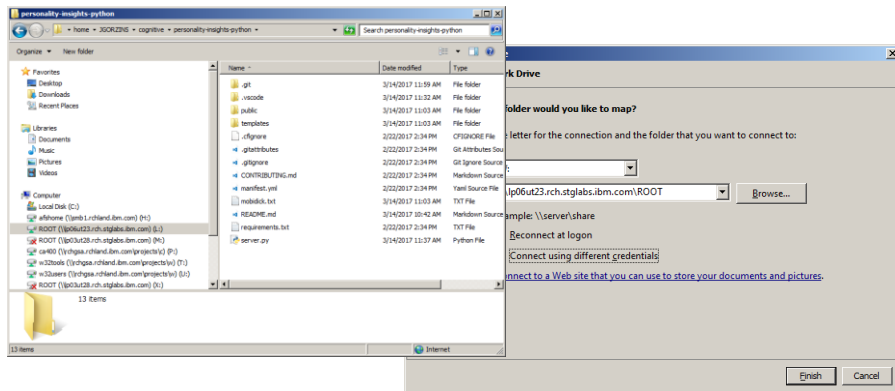
## NetServer (mapping a network drive)

- Still a viable option
- Uses SMB protocol (STRTCPSVR \*NETSVR)




```
C:\Users\IBM_ADMIN>net use L: \\lp06ut23.rch.stglabs.ibm.com\ROOT /user:JGORZINS
Enter the password for 'JGORZINS' to connect to 'lp06ut23.rch.stglabs.ibm.com':
The command completed successfully.
```


## NetServer (mapping a network drive)





```
C:\Users\IBM_ADMIN>net use L: \\lp06ut23.rch.stglabs.ibm.com\ROOT /user:JGORZINS
Enter the password for 'JGORZINS' to connect to 'lp06ut23.rch.stglabs.ibm.com':
The command completed successfully.
```

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## Editing source code (stream files)



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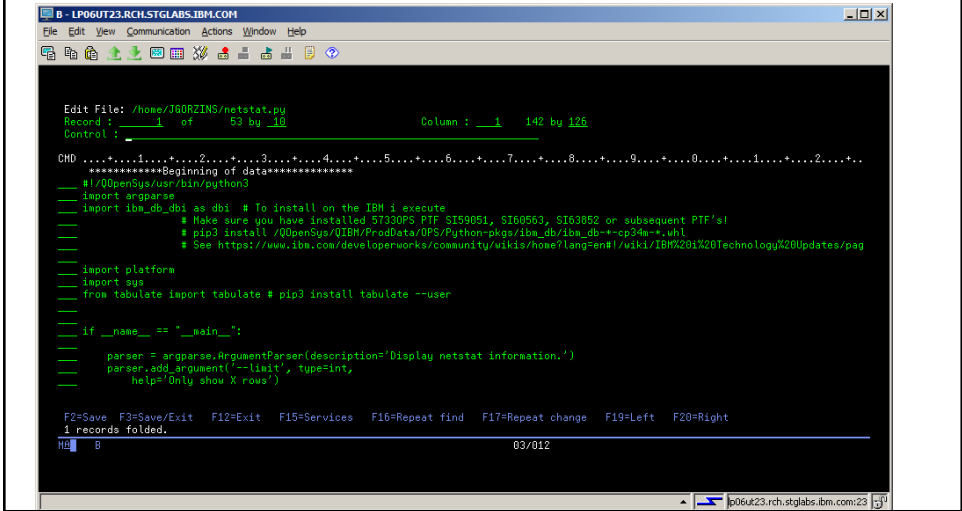
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## Editing source code

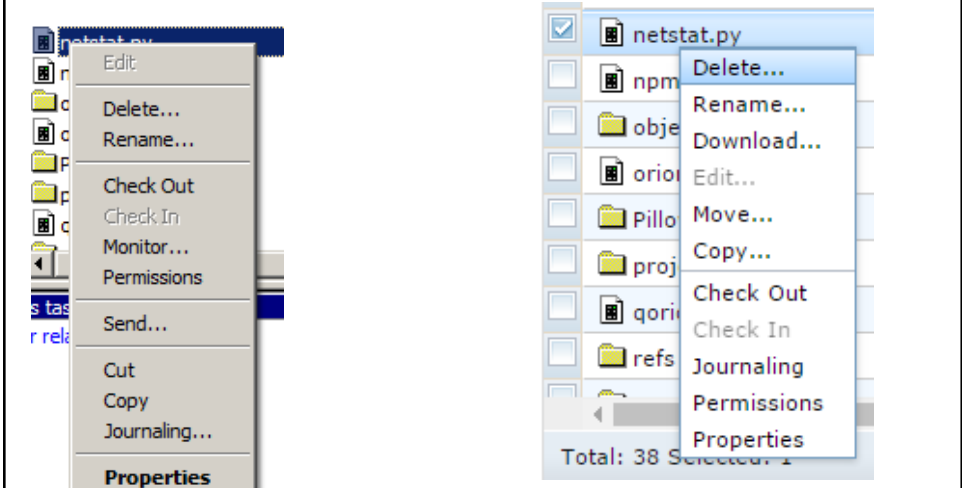
- Classic tools:
  - EDTF?
  - i Navigator / Navigator for i?
- Problems with these?

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# Why not EDTF?



# i Navigator / Navigator for i



## i Navigator / Navigator for i?

```

edit - [netstat.py.txt]
# //QOpenSys/user/bin/python3
import argparse
import ibm_db_dbi as dbi # To install on the IBM i execute
                        # Make sure you have installed 57330PS PTF S159051, S1
                        # pip3 install /QOpenSys/QIBM/ProdData/OPS/Python-pkg:
                        # See https://www.ibm.com/developerworks/community/wiki

import platform
import sys
from tabulate import tabulate # pip3 install tabulate --user

if __name__ == "__main__":
    parser = argparse.ArgumentParser(description='Display netstat info.')
    parser.add_argument('--limit', type=int,
                        help='Only show X rows')
    parser.add_argument('--offset', type=int,
                        help='Skip first X rows')
    parser.add_argument('--port', type=int,
                        help='Look for only local port')
    args = parser.parse_args()

    try:
        # The connect() with no parameters will connect to database *LOCAL
        # requires ibm_db 2.0.5.5, which you get via S163852 and the foll:
        # pip3 install /QOpenSys/QIBM/ProdData/OPS/Python-pkg:ibm_db/
        conn = dbi.connect()

        cur = conn.cursor()

```

```

edit - /home/S160ZINS/netstat.py.txt
# //QOpenSys/user/bin/python3
import argparse
import ibm_db_dbi as dbi # To install on the IBM i execute
                        # Make sure you have installed 57330PS PTF S159051, S160563, S163852 or subsequent PTF's!
                        # pip3 install /QOpenSys/QIBM/ProdData/OPS/Python-pkg:ibm_db/ibm_db-*cp34m*.whl
                        # See https://www.ibm.com/developerworks/community/wiki/home?
                        lang=en#<\/a>ibm%2F%2Ftechnology%2Fupdates%2Fpage%2Fpython3%2Fptf

import platform
import sys
from tabulate import tabulate # pip3 install tabulate --user

if __name__ == "__main__":
    parser = argparse.ArgumentParser(description='Display netstat information.')
    parser.add_argument('--limit', type=int,
                        help='Only show X rows')
    parser.add_argument('--offset', type=int,
                        help='Skip first X rows')
    parser.add_argument('--port', type=int,
                        help='Look for only local port')
    args = parser.parse_args()

    try:

```



## VSCode

```

Visual Studio Code
netstat.py
1 //QOpenSys/user/bin/python3
2 import argparse
3 import ibm_db_dbi as dbi # To install on the IBM i execute
4 # Make sure you have installed 57330PS PTF S159051, S160563, S163852 or subsequent PTF's!
5 # pip3 install /QOpenSys/QIBM/ProdData/OPS/Python-pkg:ibm_db/ibm_db-*cp34m*.whl
6 # See https://www.ibm.com/developerworks/community/wiki/home?lang=en#<\/a>ibm%2F%2Ftechnology%2F
7
8 import platform
9 import sys
10 from tabulate import tabulate # pip3 install tabulate --user
11
12
13 if __name__ == "__main__":
14
15     parser = argparse.ArgumentParser(description='Display netstat information.')
16     parser.add_argument('--limit', type=int,
17                         help='Only show X rows')
18     parser.add_argument('--offset', type=int,
19                         help='Skip first X rows')
20     parser.add_argument('--port', type=int,
21                         help='Look for only local port')
22     args = parser.parse_args()
23
24
25 try:
26     # The connect() with no parameters will connect to database *LOCAL
27     # requires ibm_db 2.0.5.5, which you get via S163852 and the following command to install:
28     # pip3 install /QOpenSys/QIBM/ProdData/OPS/Python-pkg:ibm_db/ibm_db-*cp34m*.whl
29     conn = dbi.connect()
30
31     cur = conn.cursor()
32     sql = '''
33     SELECT
34         REMOTE_ADDRESS as RemoteAddr, REMOTE_PORT as RmtPort, REMOTE_PORT_NAME as RmtPortName,
35         LOCAL_ADDRESS, LOCAL_PORT as Port, LOCAL_PORT_NAME as PortName,

```





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## Notepad++

```

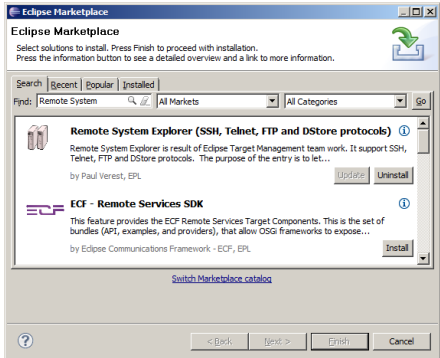
C:\Users\IBM_ADMIN\AppData\Local\Temp\scp12059\home\JGORZINS\netstat.py - Notepad++ [Administrator]
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
change.log x netstat.py x
1 #!/QOpenSys/user/bin/python3
2 import argparse
3 import ibm_db_dbi as dbi # To install on the IBM i execute
4
5 # Make sure you have installed 57330PS PTF SI59051, SI60563, SI63852 or su
6 # pip3 install /QOpenSys/QIBM/ProdData/OPS/Python-pkgs/ibm_db/ibm_db--cp3
7 # See https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wi
8
9 import platform
10 import sys
11 from tabulate import tabulate # pip3 install tabulate --user
12
13 if __name__ == "__main__":
14
15     parser = argparse.ArgumentParser(description='Display netstat information.')
16     parser.add_argument('--limit', type=int,
17                         help='Only show X rows')
18     parser.add_argument('--offset', type=int,
19                         help='Skip first X rows')
20     parser.add_argument('--port', type=int,
21                         help='Look for only local port')
22     args = parser.parse_args()
23
24 try:

```

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## Access and Edit, all in one?

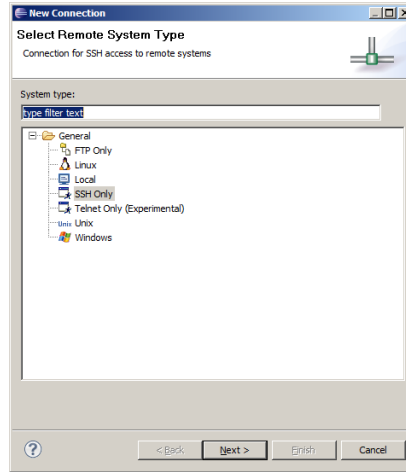
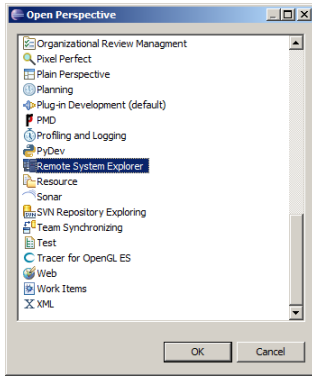
- RDi or Eclipse have a plugin available called “Remote Systems Explorer”
  - Pre-installed with RDi (uses JTOpen protocol)
- Eclipse version
  - Findable on Eclipse Marketplace
  - Recommended protocol is SSH



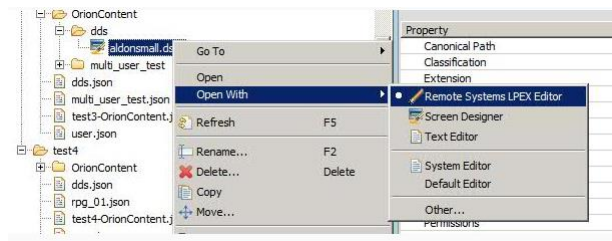
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
## Remote System Explorer

- Window->Open Perspective

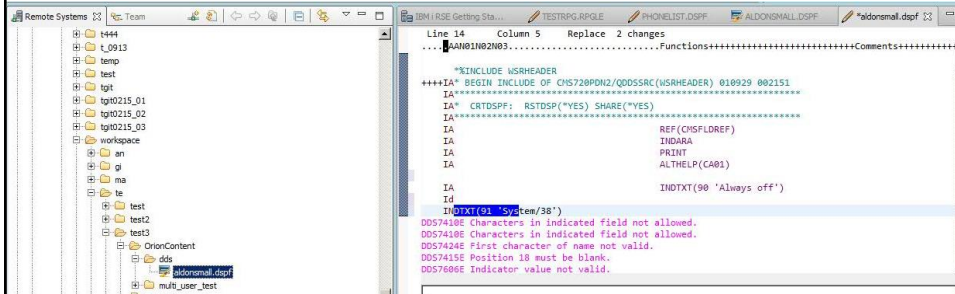


## RD*i*




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## RDi with RSE

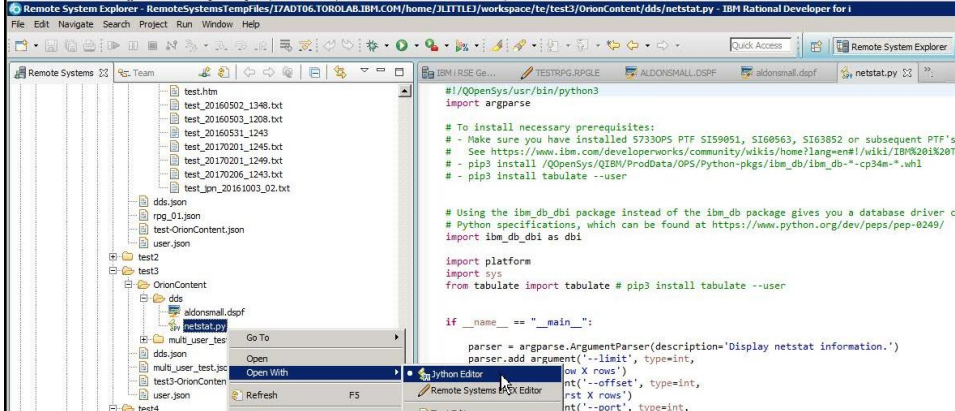


The screenshot shows the IBM Rational Developer for System z interface. On the left, the Remote Systems Explorer displays a tree view of a project structure including folders like 'test', 'OrionContent', and 'dds'. The main editor window shows a JCL program named 'ALDONSMAIL.DSPF'. The code includes a header section with '\*\*\*\*\*' markers and a main section with 'INDDX(01 SYSTEST/38\*)'. Below the code, several error messages are displayed in red text, such as 'D057418E Characters in indicated field not allowed.' and 'D057415E Position 18 must be blank.'

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
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## RDi with RSE



The screenshot shows the IBM Rational Developer for System z interface. The Remote Systems Explorer on the left shows a project structure with files like 'test\_20160502\_1346.txt' and 'netstat.py'. The main editor window displays a Python script named 'netstat.py'. The script includes comments about prerequisites and installation instructions for 'tabulate' and 'ibm\_db\_dbi'. The code defines a command-line parser using 'argparse' and includes a main function that calls 'platform' and 'sys' modules.

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## RD*i* with RSE

COM/home/JLITTLE/workspace/te/test3/OrionContent/dds/netstatL.py - IBM Rational Developer for i

```
#!/QOpenSys/usr/bin/python3
import argparse


# To install necessary prerequisites:
# - Make sure you have installed 57330PS PTF SI59051, SI60563, SI63852 or subsequent PTF's!
# - See https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20Te
# - pip3 install /QOpenSys/QIBM/ProdData/OPS/Python-pkgs/ibm_db/ibm_db-3-cp34m-*.whl
# - pip3 install tabulate --user

# Using the ibm_db_dbi package instead of the ibm_db package gives you a database driver co
# Python specifications, which can be found at https://www.python.org/dev/peps/pep-0249/
import ibm_db_dbi as dbi

import platform
import sys
from tabulate import tabulate # pip3 install tabulate --user


if __name__ == "__main__":
    parser = argparse.ArgumentParser(description='Display netstat information.')
    parser.add_argument('--limit', type=int,
                        help='Show X rows')
    parser.add_argument('--offset', type=int,
                        help='Start X rows')
    parser.add_argument('--port', type=int,
```

Python Editor  
Remote Systems Editor


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## Why RD*i*?


- RD*i* has in-depth knowledge and capability with RPG
- Eclipse knows open source





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## Accessing a shell




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## What is a “shell”? Why do I care?

- A shell is a program that allows you to run commands and perform scripting
- PASE shell is needed for running many commands important to open source
- Popular ways to access a PASE shell:
  - CALL QP2TERM (similar to STRQSH)
  - SSH terminal (best way)
    - Need SSH daemon running on IBM i  
STRTCsvr \*SSH



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## Why not green-screen QSH interface?

- Not a friendly command-entry solution
- Doesn't remember your history
- copy/paste of long commands painful
- Doesn't understand colors, highlights, etc

## Why not green-screen QSH interface?

- Not a friendly command-entry solution
- Doesn't remember your history
- copy/paste of long commands painful
- Doesn't understand colors, highlights, etc
- Oh... and it doesn't work!

```

> node
node[2164]: pthread_create: Resource temporarily unavailable
[16 [0J> [3Gqsh: 001-0078 Process ended by signal 5.
$
==>

```

## What do I do in a ssh session?

- Same things you'd do from 5250 for RPG...
- Run a program (i.e. `$ python mypgm.py`)
- Start/stop web servers (i.e. `rails server -p 444`)
- Check logs (i.e. `cat /path/to/log.txt` or `tail -n 30 /path/to/log.txt`)
- Quick code edits (i.e. `joe my_pgm.js`)
- Debug

## A number of shells to choose from

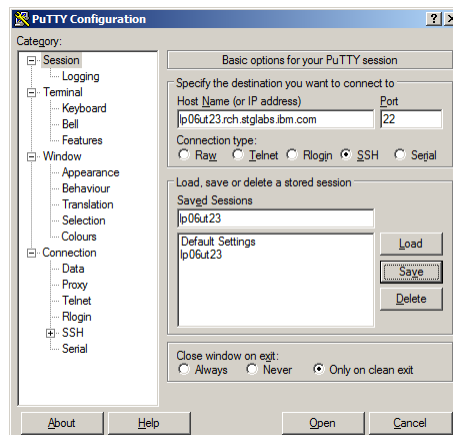
- qsh (both a shell and an interface to the shell)
- sh
- bsh
- ksh
- bash

## Most powerful shell?

- Our vote: bash
- As a scripting language, more features (and more widely used) than others
- Most user-friendly features for command entry
  - Tab-completion of file and directory names
  - Up and Down arrows to recall previous commands (even from past sessions)
- Shipped with 5733-OPS (option 7)

## PuTTY (Windows)

- Free download at <http://www.putty.org>
- Configuration can be done in UI





## Cygwin (Windows)





- For information on the project, visit <http://www.cygwin.org>
- Cygwin is (in their words) “a large collection of GNU and Open Source tools which provide functionality similar to a Linux distribution on Windows.”
- Among this set of many tools: SSH!

Tip:

Cygwin has MANY packages. Make sure you install “openssh”

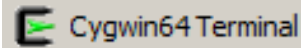
## Installing openSSH during Cygwin install

- Filter text “openssh”
- Make sure that the “bin” column is checked

Search [openssh] <input type="button" value="Clear"/>		Current	New	Bin?	Src?	Size	Package
<input type="checkbox"/>	All  Default						
<input type="checkbox"/>	Debug  Default						
<input type="checkbox"/>	Net  Default						
	6.8p1-1	 7.4p1-1	<input checked="" type="checkbox"/>	<input type="checkbox"/>		754k	openssh: The OpenSSH server and client programs

## Cygwin quickstart (after install)

- Look for "Cygwin64 Terminal" in start menu



- Run "ssh -Y <user>@<hostname>"

```

jgorzins@BEHEMOTH ~
$ ssh -Y jgorzins@lp03ut28.rch.stglabs.ibm.com
jgorzins@lp03ut28.rch.stglabs.ibm.com's password:
$ hostname
lp03ut28.rch.stglabs.ibm.com



```

```


[24/Mar/2017:10:07:10] ENGINE Stopped thread '_TimeoutMonitor'.
[24/Mar/2017:10:07:10] ENGINE Stopped thread 'Autoreloader'.
[24/Mar/2017:10:07:10] ENGINE Bus STOPPED
[24/Mar/2017:10:07:10] ENGINE Bus EXITING
[24/Mar/2017:10:07:10] ENGINE Bus EXITED
[24/Mar/2017:10:07:10] ENGINE waiting for child threads to terminate.
bash-4.2$ pip3 install pip --upgrade
Requirement already up-to-date: pip in /QOpenSys/QIBM/ProdData/OPS/Py
bash-4.2$ ls
CONTRIBUTING.md  manifest.yml      public          server.py
README.md        mobidick.txt     requirements.txt templates
bash-4.2$ python3 ./server.py
Listening on 0.0.0.0:1984
[24/Mar/2017:10:08:59] ENGINE Listening for SIGUSR1.
[24/Mar/2017:10:08:59] ENGINE Listening for SIGHUP.
[24/Mar/2017:10:08:59] ENGINE Listening for SIGTERM.
[24/Mar/2017:10:08:59] ENGINE Bus STARTING
CherryPy Checker:
The application mounted at '' contains the following config entries,
n and pass them to cherrypy.config.update() instead of tree.mount().
[/] engine.autoreload.on = False

[24/Mar/2017:10:08:59] ENGINE Started monitor thread '_TimeoutMonitor'
[24/Mar/2017:10:08:59] ENGINE Started monitor thread 'Autoreloader'.
[24/Mar/2017:10:09:00] ENGINE Serving on http://0.0.0.0:1984
[24/Mar/2017:10:09:00] ENGINE Bus STARTED



```

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# Thank you!



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## Reference: Debugging Python code



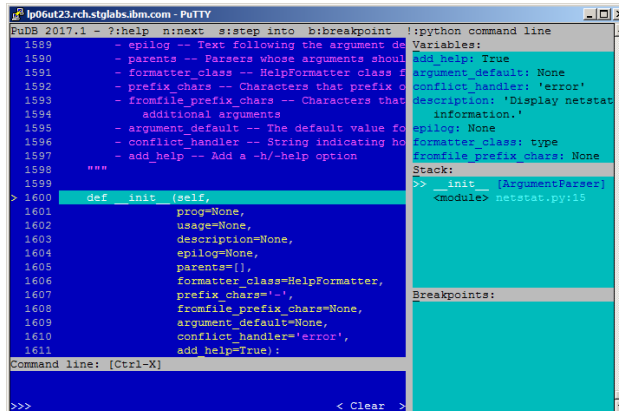
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## Debugging a python program in a terminal

- There's an included command-line debugger, pdb
- There's a free terminal graphic debugger, pudb
- From a shell:
 

```
pip3 install pudb
python3 -m pudb ./myfile.py
```


## Debugging a python program in a terminal



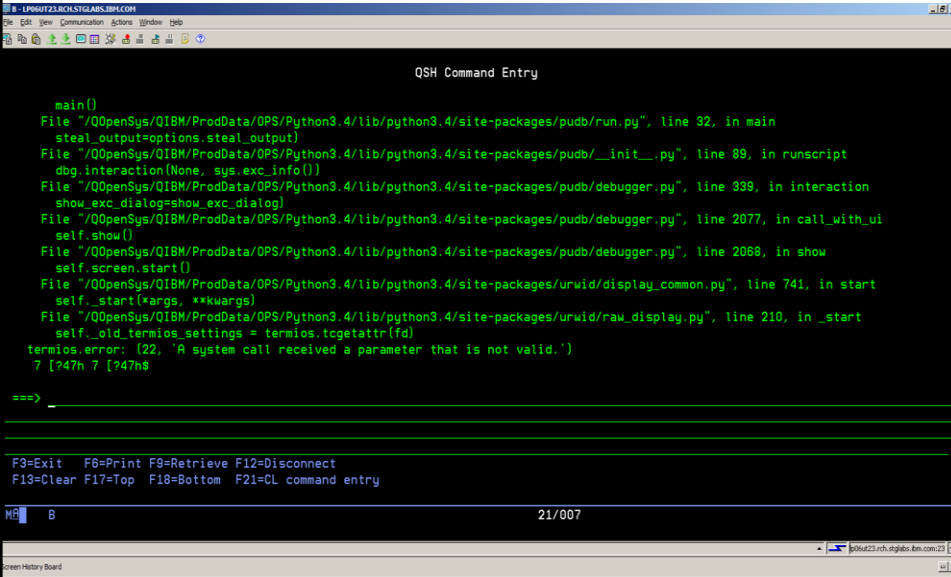
```

PuTTY
lp06out23.rch.stglabs.ibm.com - PuTTY
PuDB 2017.1 - ?:help n:next s:step into b:breakpoint !:python command line
1589 - epilog -- Text following the argument de Variables:
1590 - parents -- Parents whose arguments shoul Add Help: True
1591 - formatter_class -- HelpFormatter class c argument_default: None
1592 - prefix_chars -- Characters that prefix c conflict_handler: 'error'
1593 - fromfile_prefix_chars -- Characters that description: 'Display netstat
1594 additional arguments information.'
1595 - argument_default -- The default value fo epilog: None
1596 - conflict_handler -- String indicating ho formatter_class: type
1597 - add_help -- Add a -h/--help option fromfile_prefix_chars: None
1598 """ Stack:
1599 >> __init__ [ArgumentParser]
1600 def __init__(self, <module> netstat.py:15
1601 prog=None,
1602 usage=None,
1603 description=None,
1604 epilog=None,
1605 parents=[],
1606 formatter_class=HelpFormatter,
1607 prefix_chars='-',
1608 fromfile_prefix_chars=None,
1609 argument_default=None,
1610 conflict_handler='error',
1611 add_help=True:
Command line: [Ctrl-X]
>>> < Clear >

```

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## Debugging a python program in 5250



```

main()
File "/QOpenSys/QIBM/ProdData/OPS/Python3.4/lib/python3.4/site-packages/pudb/run.py", line 32, in main
  steal_output=options.steal_output)
File "/QOpenSys/QIBM/ProdData/OPS/Python3.4/lib/python3.4/site-packages/pudb/__init__.py", line 89, in runscrip
  dbg.interaction(None, sys.exc_info())
File "/QOpenSys/QIBM/ProdData/OPS/Python3.4/lib/python3.4/site-packages/pudb/debugger.py", line 339, in interaction
  show_exc_dialog=show_exc_dialog)
File "/QOpenSys/QIBM/ProdData/OPS/Python3.4/lib/python3.4/site-packages/pudb/debugger.py", line 2077, in call_with_ui
  self.show()
File "/QOpenSys/QIBM/ProdData/OPS/Python3.4/lib/python3.4/site-packages/pudb/debugger.py", line 2068, in show
  self.screen.start()
File "/QOpenSys/QIBM/ProdData/OPS/Python3.4/lib/python3.4/site-packages/urwid/display_common.py", line 741, in start
  self._start(*args, **kwargs)
File "/QOpenSys/QIBM/ProdData/OPS/Python3.4/lib/python3.4/site-packages/urwid/raw_display.py", line 210, in _start
  self._old_termios_settings = termios.tcgetattr(fd)
termios.error: (22, 'A system call received a parameter that is not valid.')
7 [?47h 7 [?47h$


===> _

```

F3=Exit F6=Print F9=Retrieve F12=Disconnect  
F13=Clear F17=Top F18=Bottom F21=CL command entry

MP B 21/007

Screen History Board


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
## Python in VSCode


### Install Python Extension


VS Code is a fast editor and ships with many of the basic features. Add Python language support to VS Code by installing one of the popular Python extensions.


1. Select an extension.
2. Install the extension by typing `ext install` into the Command Palette `Ctrl+Shift+P`.





**Python**  
donjayamane  1563.9K  
Linting, Debugging (multi-threaded, remote), Inte...




**Code Runner**  
formulahendry  275.4K  
Run code snippet/file for C, C++, Java, JS, PHP, ...



**MagicPython**  
magicstack  219.4K  
Syntax highlighter for cutting edge Python.



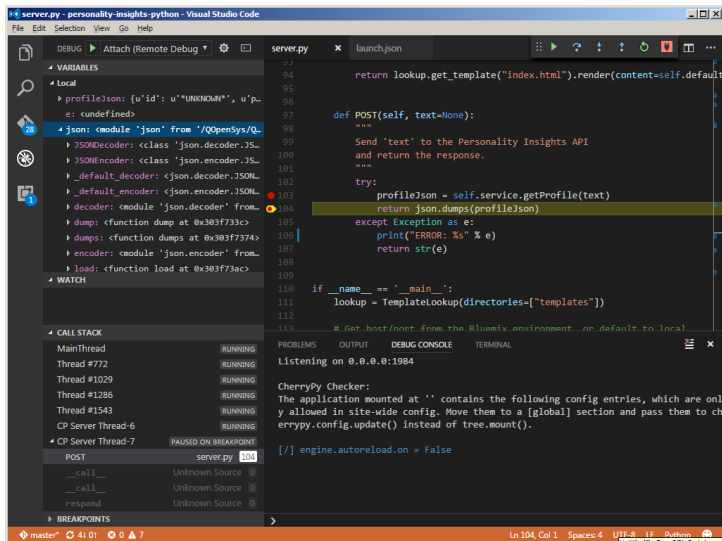
**Python for VSCode**  
tht13  153.2K  
Python language extension for vscode

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## Python in VSCode

- General documentation  
<https://code.visualstudio.com/docs/languages/python>
- Documentation on Python plugin  
<https://marketplace.visualstudio.com/items?itemName=donjayamanne.python>
- Remote debug instructions  
<https://github.com/DonJayamanne/pythonVSCode/wiki/Debugging:-Remote-Debuging>

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The screenshot shows the Visual Studio Code interface with a Python file named `server.py` open. The editor is displaying the following code:

```

94     return lookup.get_template("index.html").render(content=self.default
95
96
97     def POST(self, text=None):
98         """
99         Send 'text' to the Personality Insights API
100         and return the response.
101         """
102         try:
103             profileJson = self.service.getProfile(text)
104             return json.dumps(profileJson)
105         except Exception as e:
106             print("ERROR: %s" % e)
107             return str(e)
108
109
110 if __name__ == '__main__':
111     lookup = TemplateLookup(directories=["templates"])
112
113 # Get host/port from the Bluenix environment, or default to local

```

The left sidebar shows the VARIABLES pane with the following content:

```

VARIABLES
├── Local
│   ├── profileJson: {u'id': u'UNKNOWN*', u'p-
│   └── e: <undefined>
├── json: <module 'json' from '/OpenSys/Q
│   ├── JSONDecoder: <class 'json.decoder.JS
│   ├── JSONEncoder: <class 'json.encoder.JS
│   ├── _default_decoder: <json.decoder.JSON
│   ├── _default_encoder: <json.encoder.JSON
│   ├── decoder: <module 'json.decoder' from
│   ├── dumps: <function dumps at 0x303f733c>
│   ├── dumps: <function dumps at 0x303f7374>
│   ├── encoder: <module 'json.encoder' from
│   └── load: <function load at 0x303f73ac>
└── WATCH

```

The bottom pane shows the CALL STACK with the following entries:



```

CALL STACK
├── MainThread RUNNING
│   ├── Thread #772 RUNNING
│   ├── Thread #1029 RUNNING
│   ├── Thread #1286 RUNNING
│   ├── Thread #1343 RUNNING
│   ├── CP Server Thread-6 RUNNING
│   └── CP Server Thread-7 PAUSED ON BREAKPOINT
│       ├── POST server.py 104
│       ├── _call_ Unknown Source 0
│       ├── _call_ Unknown Source 0
│       └── respond Unknown Source 0


```

The bottom status bar shows the current file is `server.py` at line 104, column 1, with 4 spaces and 7 characters. The terminal output shows the application is listening on `0.0.0.0:1984`.



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