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Welcome to the Waitless World IBM

The open book: Open Source on IBM i

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Business Architect:
Open Source on IBM i

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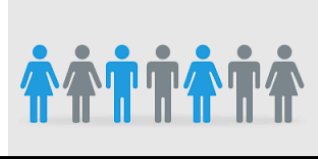
Business value?

- 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?

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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

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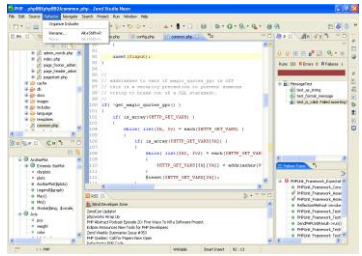
What IBM i is doing –partnership with Zend (RogueWave)

- 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



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IBM i Shops using php

Mission

Corvette America

VALUE DRUG MART

MFCD LLC

ALLIED BEVERAGE GROUP

MANAGE INCORPORATED Established in 1995

Curbstone Corporation

ACME TOOLS BUILDING • REMODELING • WOODWORKING • LANDSCAPING

microlease

LINK Computer Corporation

TROY

BAC | CREDOMATIC NETWORK

xerox

株式会社西井塗料産業 NISHI PAINT INDUSTRY CO.,LTD.

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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
  - 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 for updates and news
  - twitter.com/rubyonpower

PowerRuby

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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

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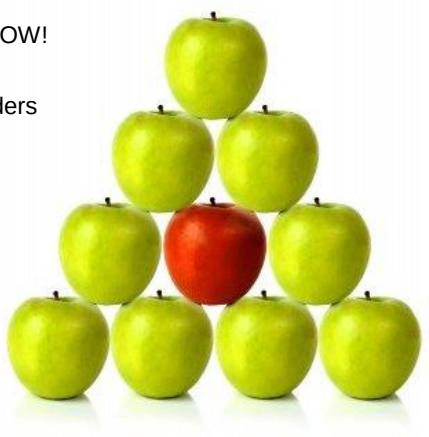
5733-OPS: a bit unconventional?

- 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)



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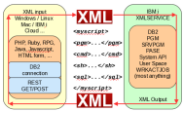
Things we deliver with every new language/version

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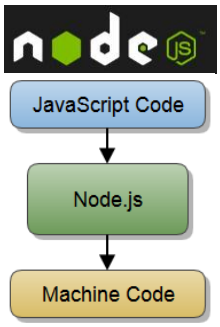
Node.JS – 5733OPS Option 1 (now deprecated)



- 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 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)
$ 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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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

python™

django

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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

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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 xlsxwriter
Downloading/unpacking xlsxwriter
  Downloading XlsxWriter-0.7.3-py2.py3-none-any.whl (132kB): 132kB downloaded
Installing collected packages: xlsxwriter
Successfully installed xlsxwriter
Cleaning up...
$
```

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

Ranger
chroot /QOpenSys/ranger /usr/bin/bsh

Bobby
chroot /QOpenSys/bobby /usr/bin/bsh

Lefty
chroot /QOpenSys/lefty /usr/bin/bsh

Wild Bill
chroot /QOpenSys/wildbill /usr/bin/bsh

admin
No problem, but you are not going to mess up my system, so chroot you.

'/' is … /QOpenSys/ranger/(*)

'/' is … /QOpenSys/bobby/(*)

'/' is … /QOpenSys/lefty/(*)

'/' is ... /QOpenSys/wildbill/(*)

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)

```
var Greeter = (function () {
    function Greeter(message) {
        this.greeting = message;
    }
    Greeter.prototype.greet = function () {
        return "Hello" + this.greeting;
    };
    return Greeter;
})();
var greeter = new Greeter("world");
var button = document.createElement('button');
button.innerText = "Say Hello";
button.onclick = function () {
    alert(greeter.greet());
};
document.body.appendChild(button);

```

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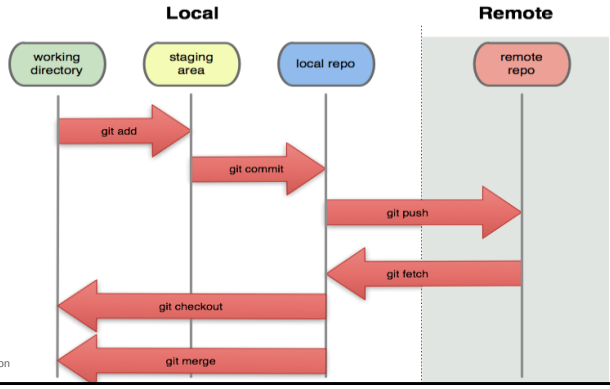
Option 6- Git

- 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



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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 June2016, we shipped key packages: bash, zip, unzip
- Since then…
  - xz
  - gzip
  - bz2
  - GNU tar
  - perl
  - cURL
  - wget
  - rsync

Bash

zip unZip

gzip

bzip2 tar

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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.

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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.
```

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More libraries, coming SOON!!!….

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

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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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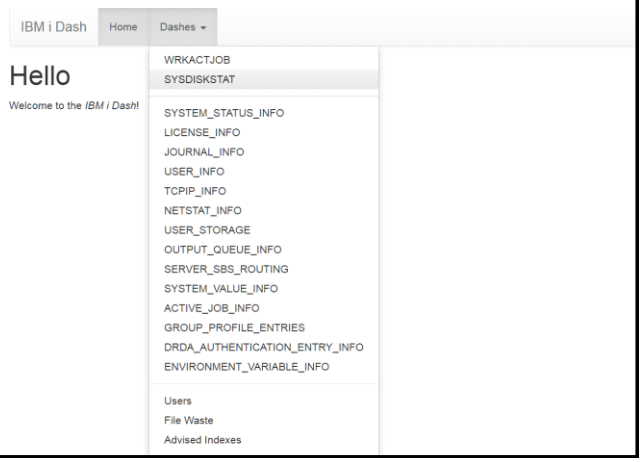
Dash for IBM i

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



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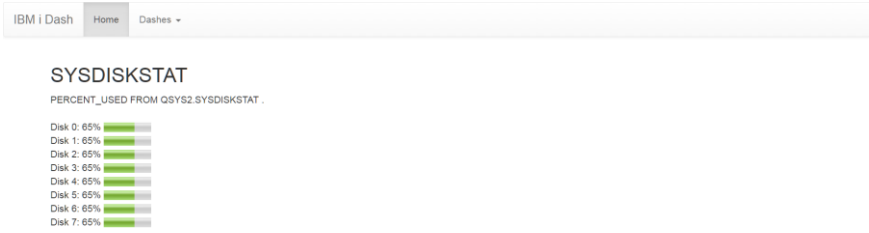
Dash for IBM i



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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

```
import config
from itoolkit import *
# modify iToolKit not include row node
itool = iToolKit(iparm=0, iret=0, ids=1, irow=0)
itool.add(iCmd('rtvjoba', 'RTVJOBA USRLIBL(?) SYSLIBL(?) CCSID(?N) OUTQ(?)'))
# xmlservice
itool.call(config.itransport)
# output
rtvjoba = itool.dict_out('rtvjoba')
if 'error' in rtvjoba:
  print (rtvjoba['error'])
else:
  print('USRLIBL = ' + rtvjoba['USRLIBL'])
  print('SYSLIBL = ' + rtvjoba['SYSLIBL'])
  print('CCSID   = ' + rtvjoba['CCSID'])
  print('OUTQ    = ' + rtvjoba['OUTQ'])
```

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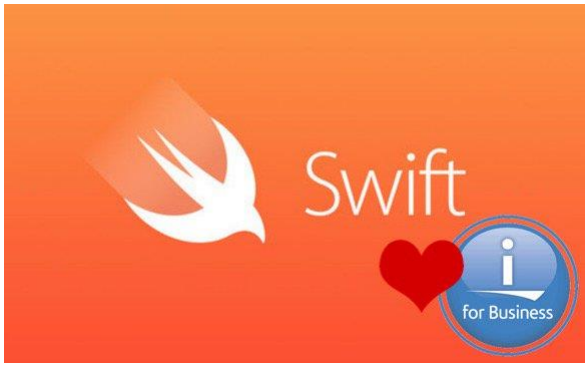
Swift toolkit for i

- 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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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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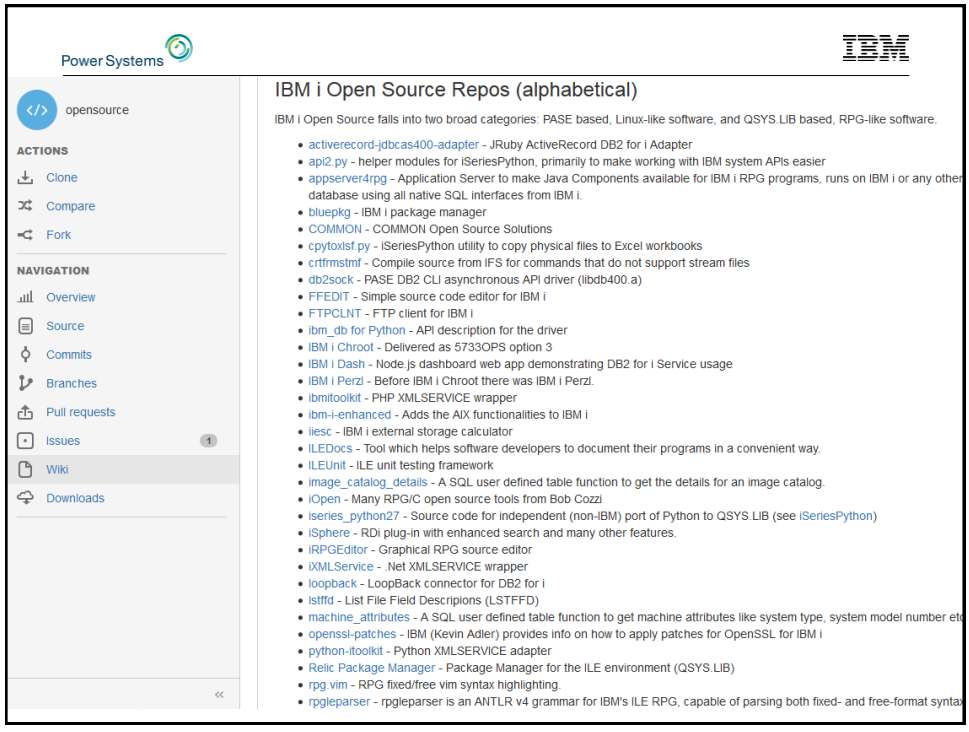

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Is IBM i contributing to open source projects? YES!!

- GNU tar
- OpenSSL
- OpenSSH
- git
- Bottle.py
- PumpkinLB
- python-itoolkit
- Dash for IBM i
- db2sock
- ibmichroot
- db2util
- Python
- personality-insights-python
- Python-ibm-db
- swift-itoolkit
- portlibfori
- ibmiperzl
- ruby-itoolkit
- nodejs-itoolkit
- ruby-ibm_db
- xmlservice_examples
- OSSILE
- -ibmi_netstat_py
- python-for-IBM-i-examples
- shellinabox
- vlang_rpg

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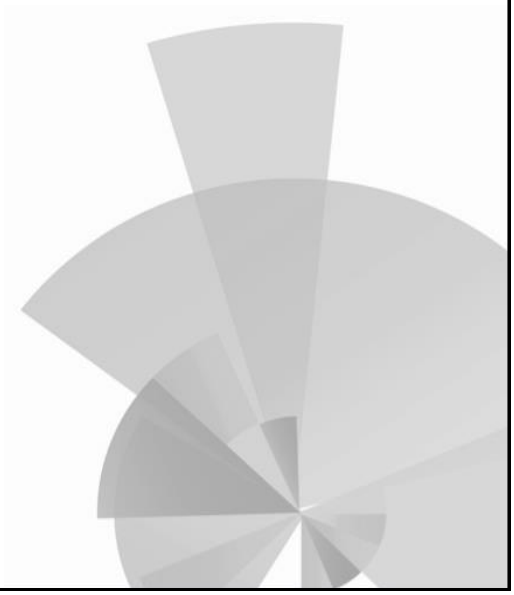
How can I contribute?



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Use it!

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Participate in the community!

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

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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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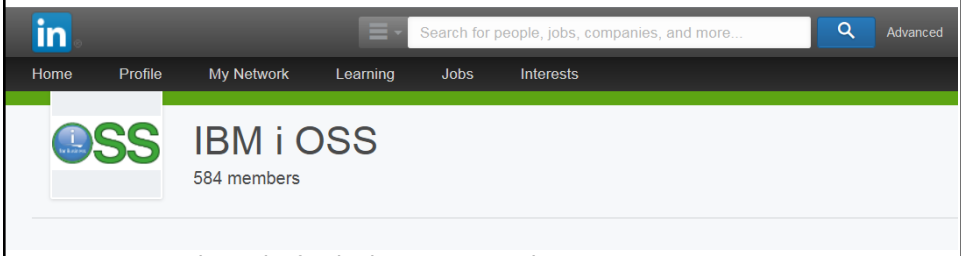
LinkedIn IBM i OSS group



- 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

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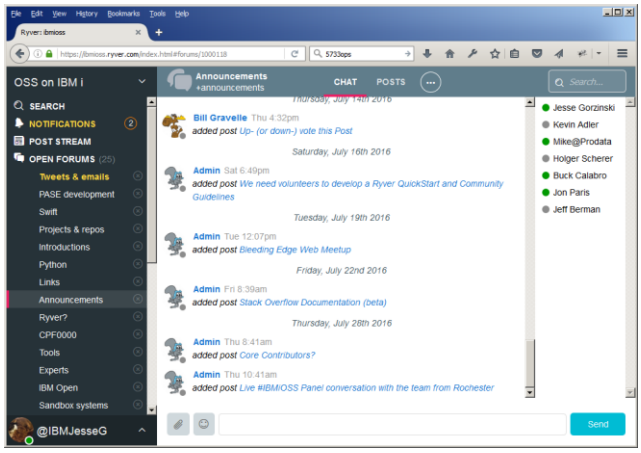
Ryver IBM i OSS team



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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!

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Spread the word!

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

COMMON
A USERS GROUP

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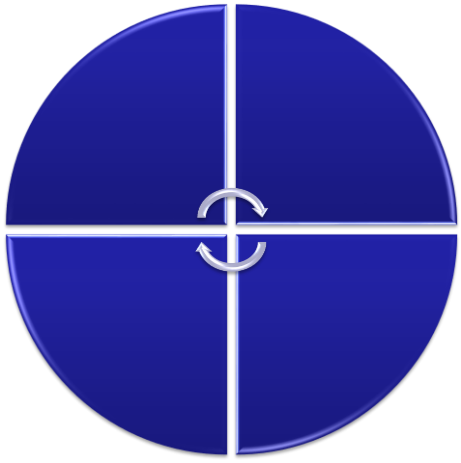
Open Source on IBM i



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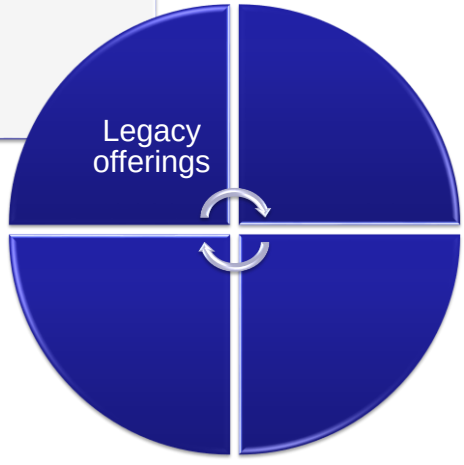
Open Source on IBM i

- Apache
- OpenSSL
- OpenSSH
- JTOpen
- etc.



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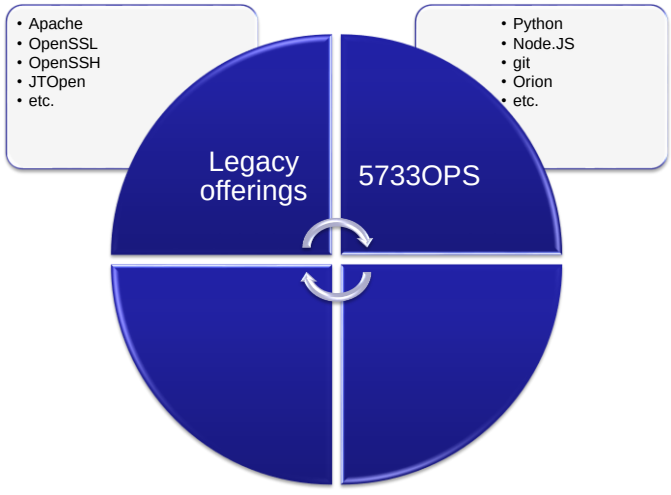

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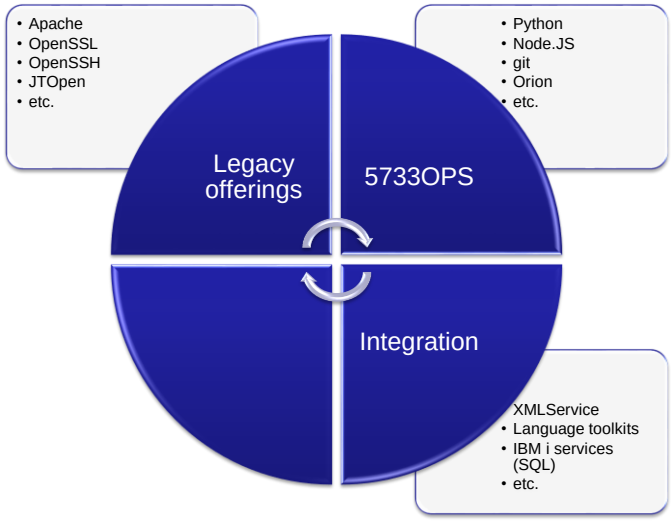

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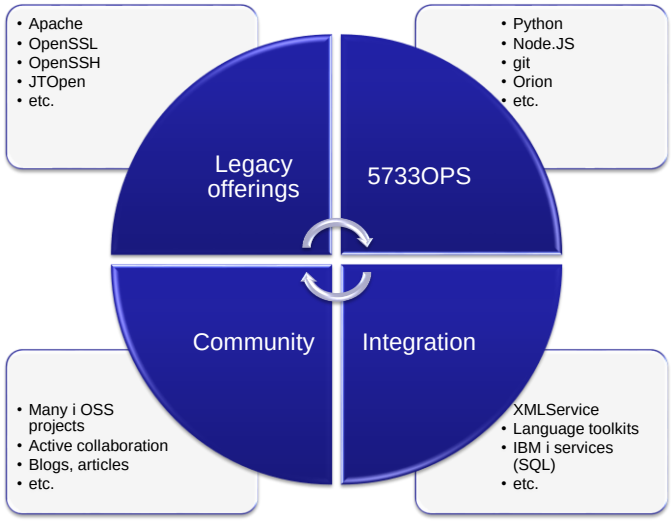
Open Source on IBM i



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Some useful links

- IBM Systems Mag blog ("Open your i")
  - http://www.ibmsystemsmag.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

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Welcome to the Waitless World IBM

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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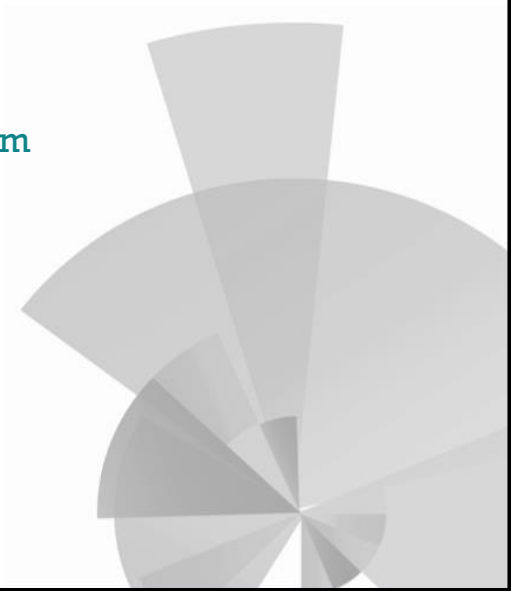
Accessing the filesystem



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Accessing the filesystem

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

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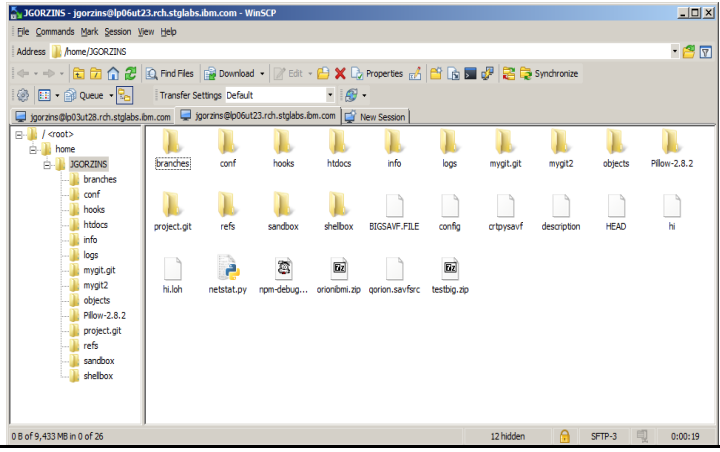
WinSCP

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



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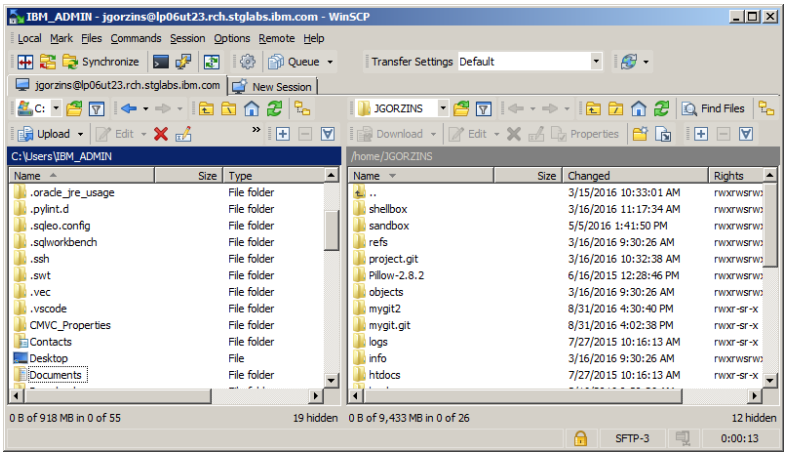
WinSCP

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



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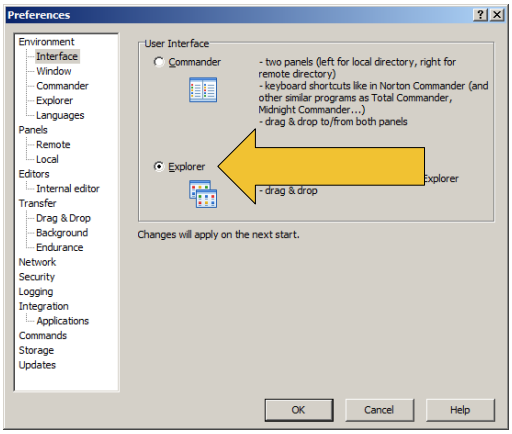
WinSCP

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



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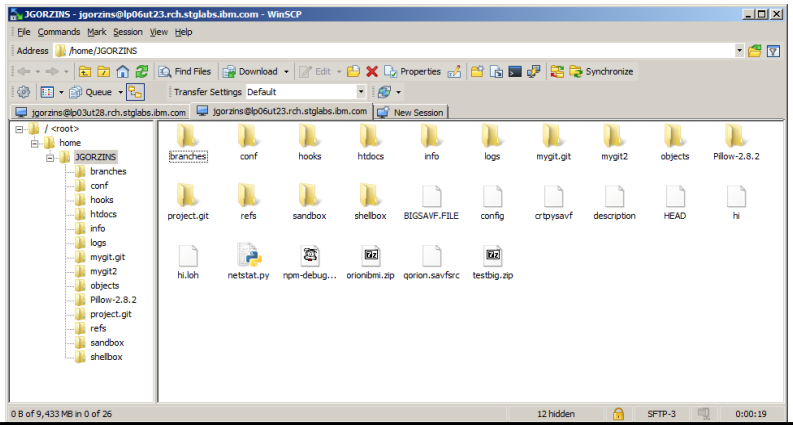
WinSCP

- 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



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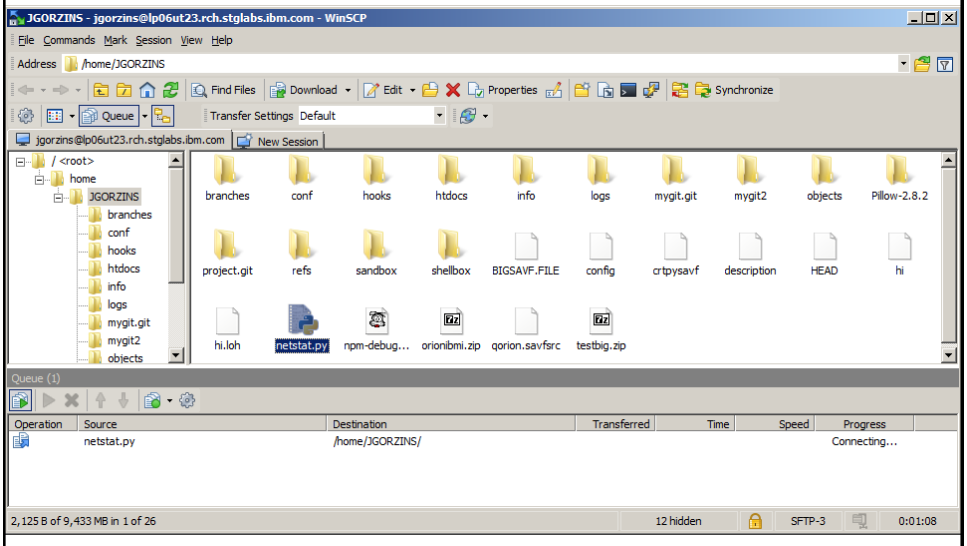

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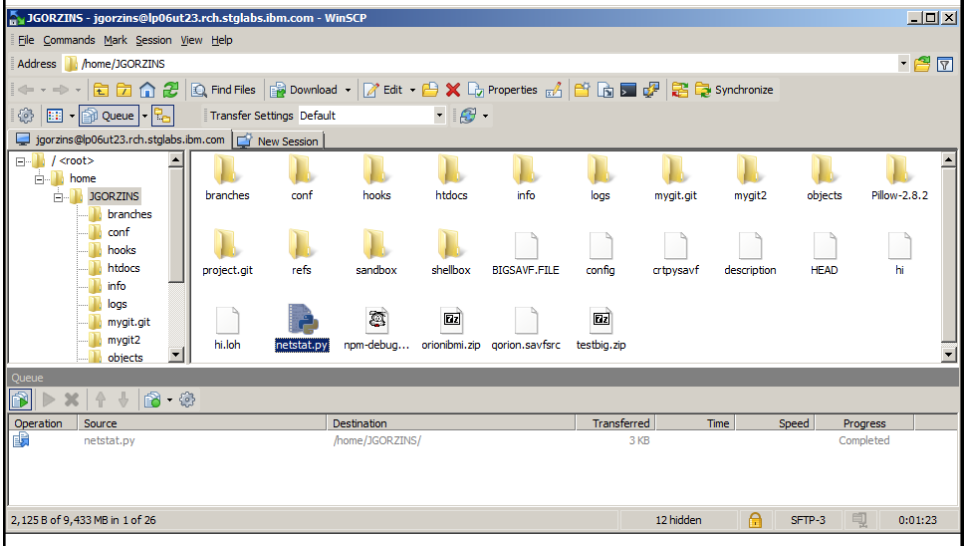

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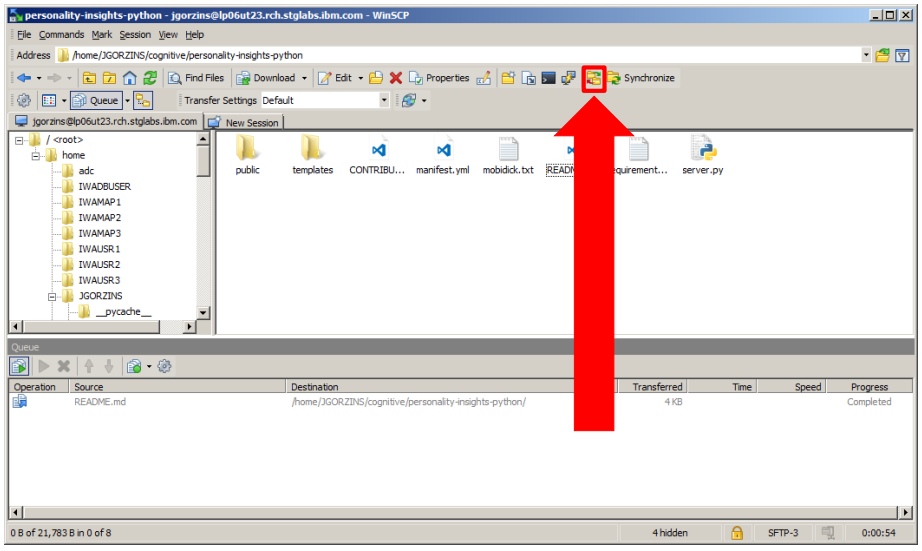

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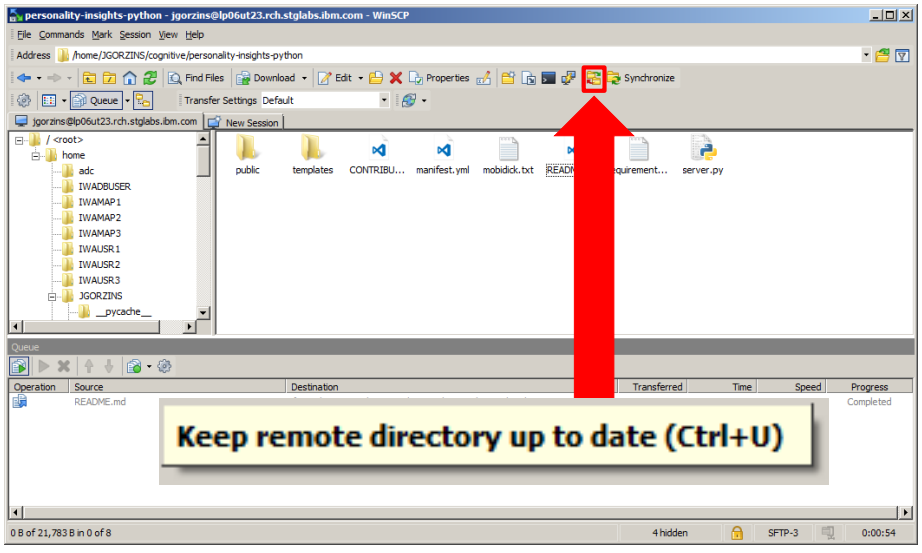

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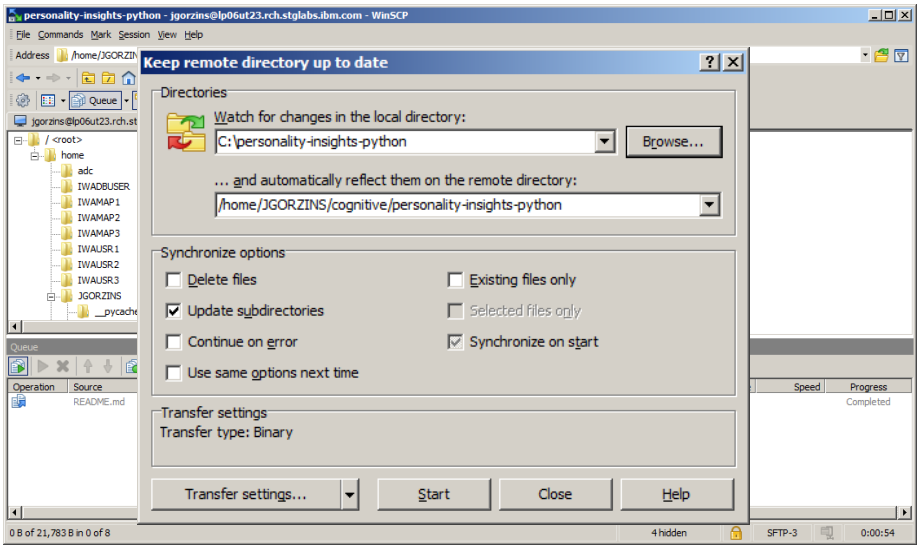

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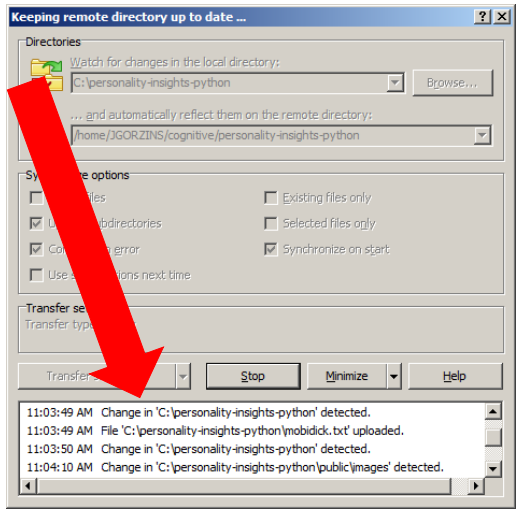
Keep remote directory up-to-date

- Edit files locally
- Changes are auto-detected, Server synchronized



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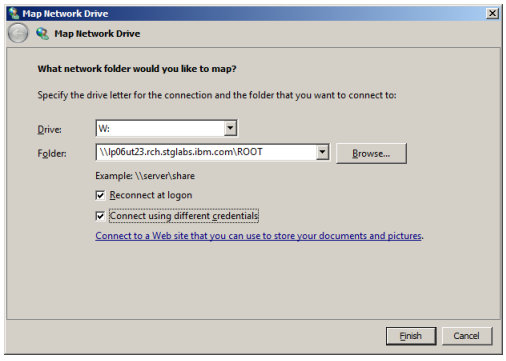
NetServer (mapping a network drive)

- 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.
```

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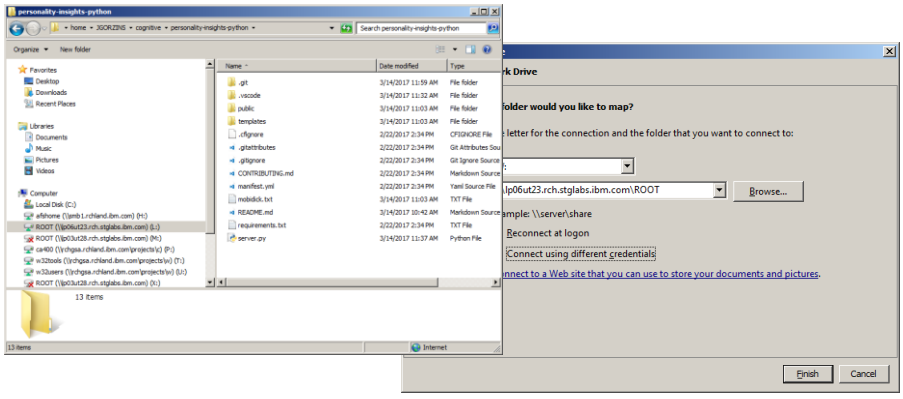
NetServer (mapping a network drive)

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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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Editing source code

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

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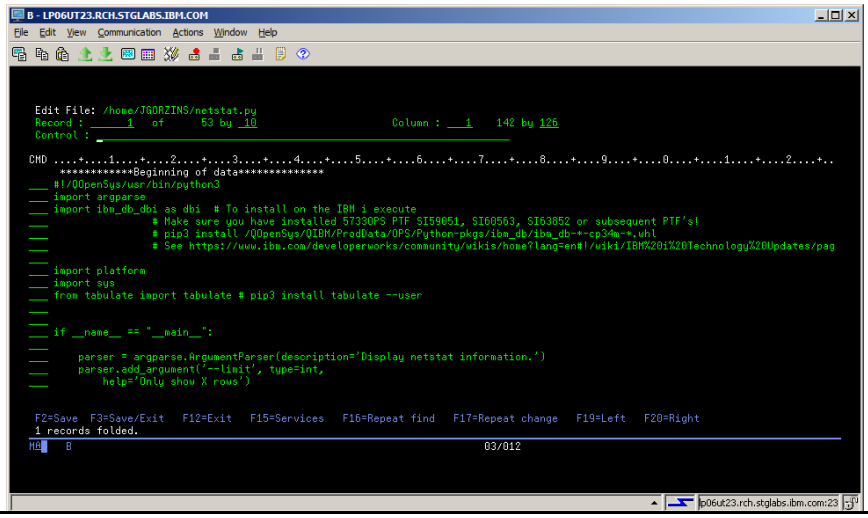
Why not EDTF?



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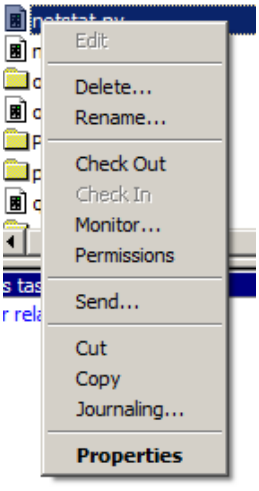
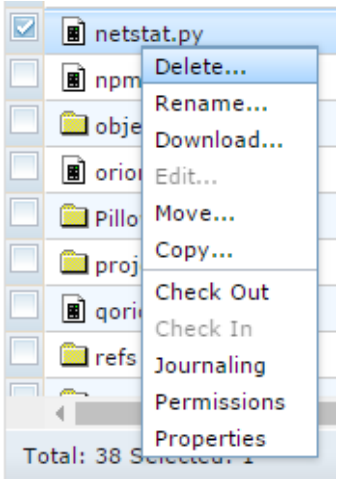
i Navigator / Navigator for i?





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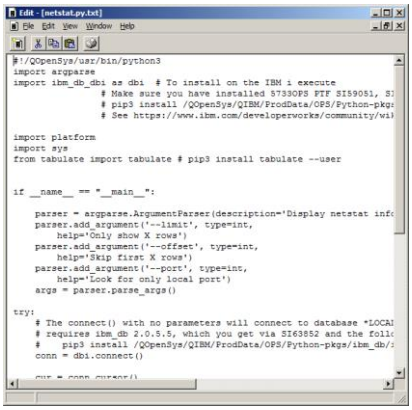
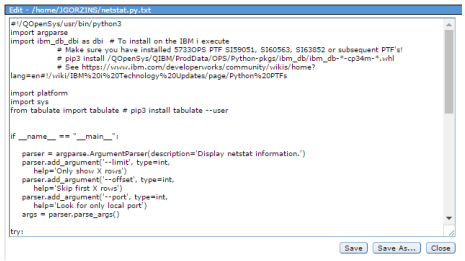
i Navigator / Navigator for i?





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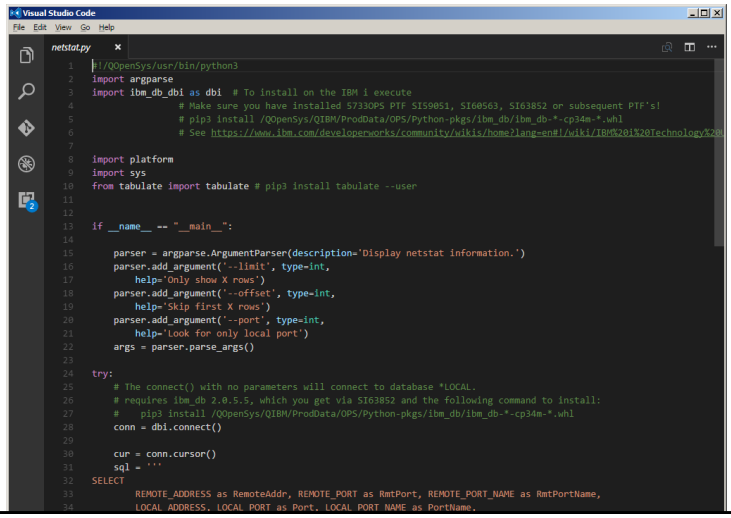
VSCode



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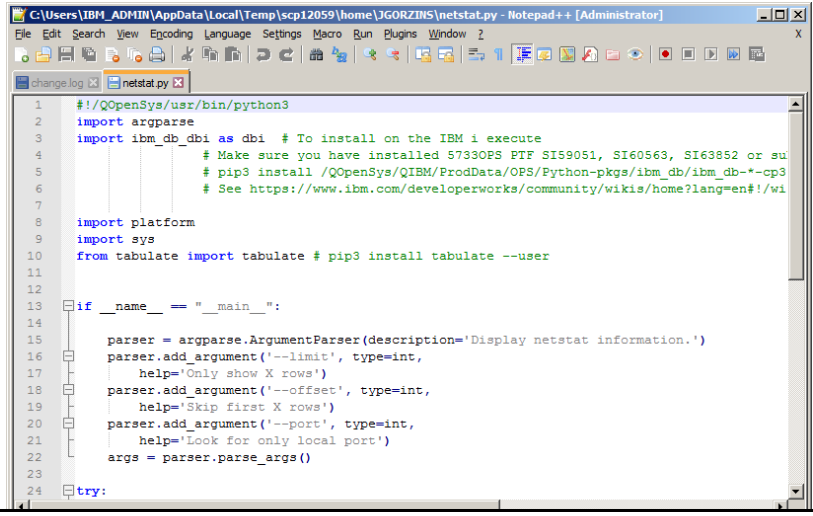
Notepad++



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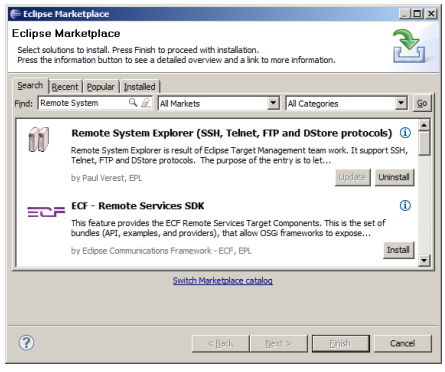
Access and Edit, all in one?

- 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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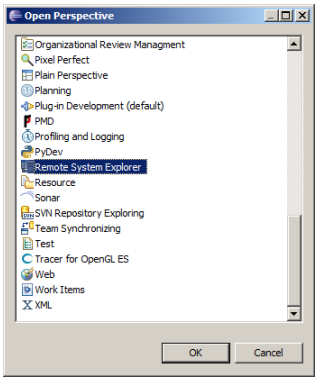
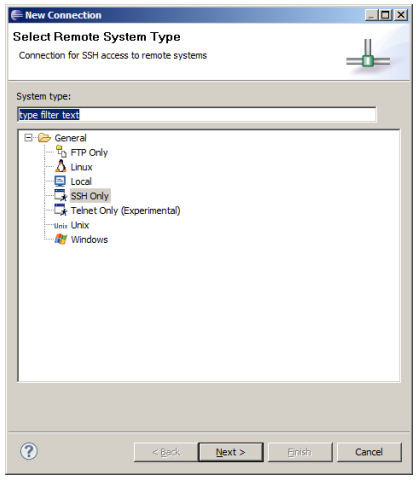
Remote System Explorer

- Window->Open Perspective





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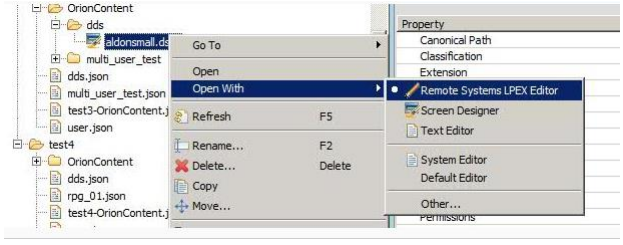
RDi



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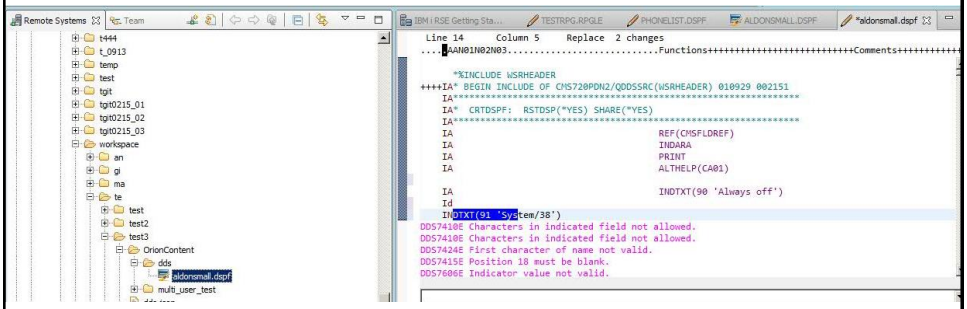
RDi with RSE



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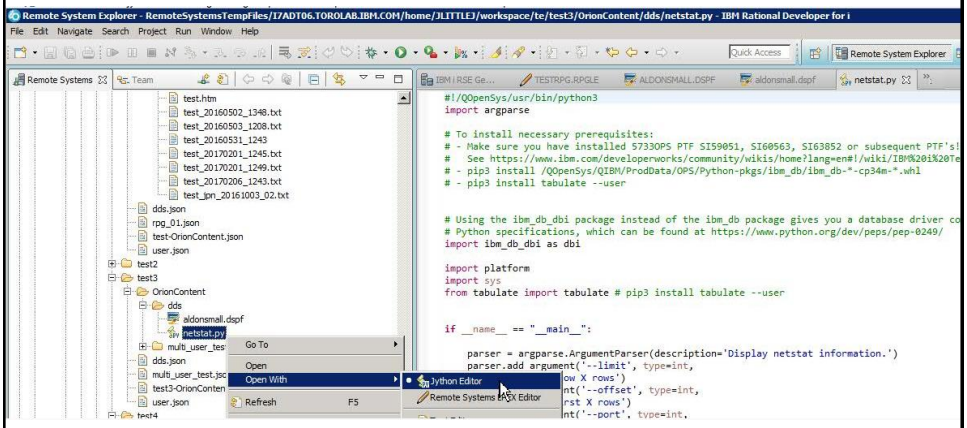
RDi with RSE



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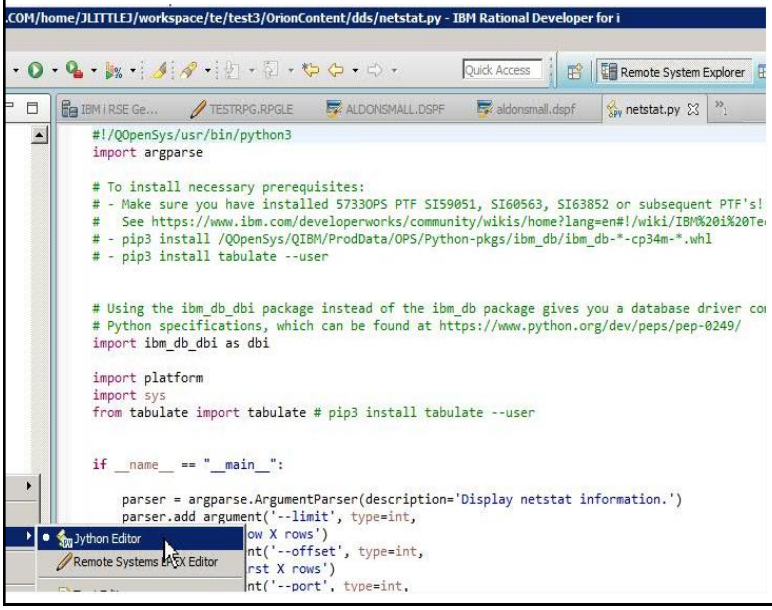
RDi with RSE



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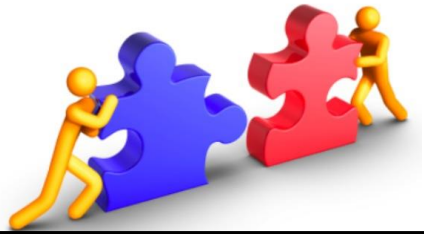
Why RDi?

- RDi 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 comm 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

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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

- Oh… and it doesn't work!

```
> node
  node[2164]: pthread_create: Resource temporarily unavailable
   [1G [0J>  [3Gqsh: 001-0078 Process ended by signal 5.
  $

===>
```

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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

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A number of shells to choose from

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

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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)

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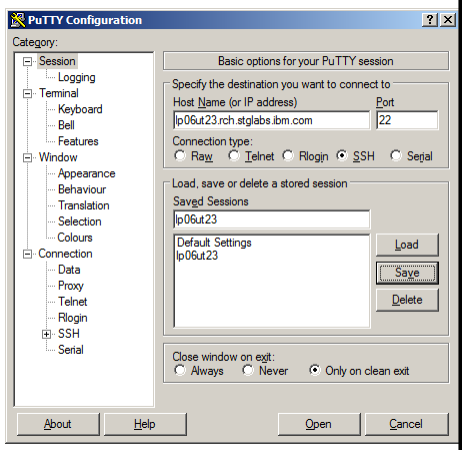
PuTTY (Windows)

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



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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”

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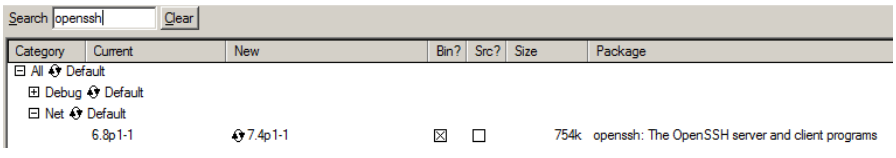
Installing openSSH during Cygwin install

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



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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
```

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```
[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

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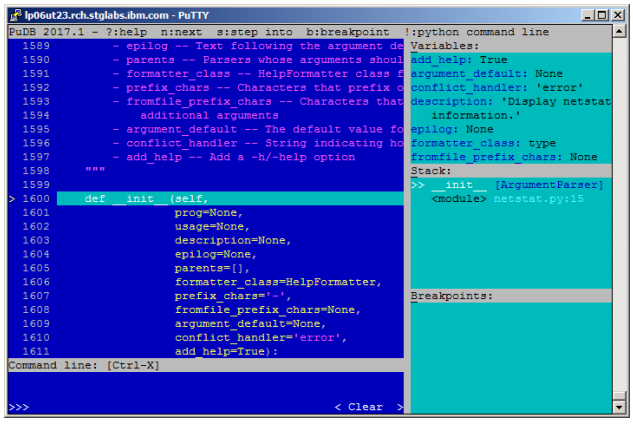
Debugging a python program in a terminal



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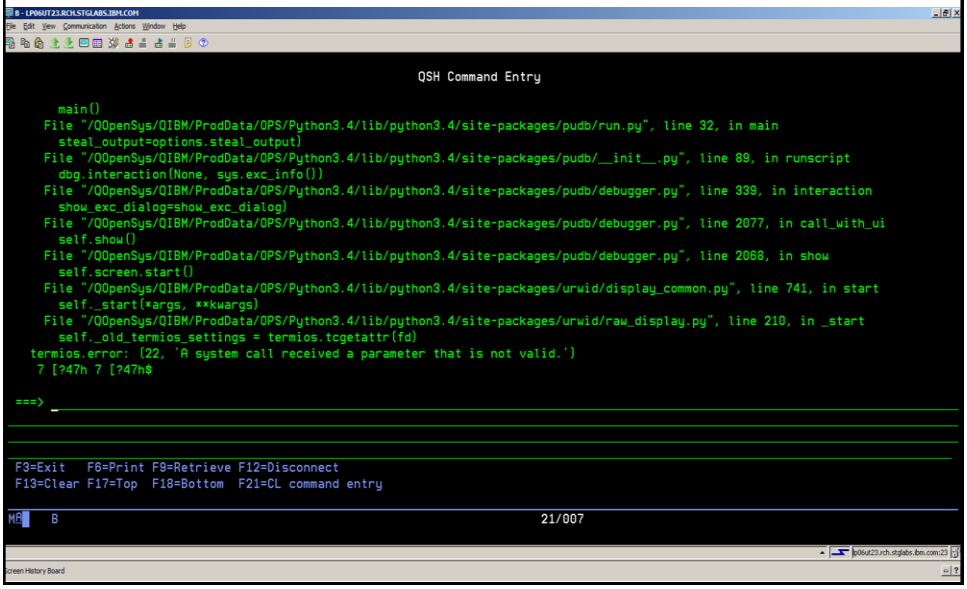
Debugging a python program in 5250



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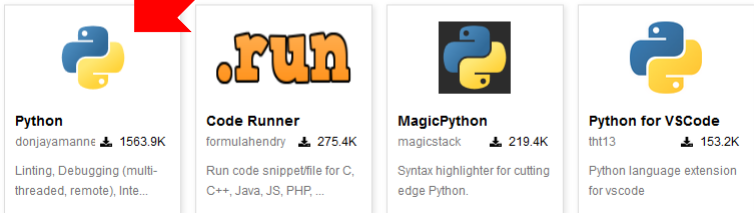
Python in VSCode

Install Python Extensio

VS Code is a fast editor and ships w… the basic features. Add Python language support to VS Code by installing one of the popular P… xtensions.

1. Select an extension
2. Install the extensi… ping `ext install` into the Command Palette `Ctrl+Shift+P`.



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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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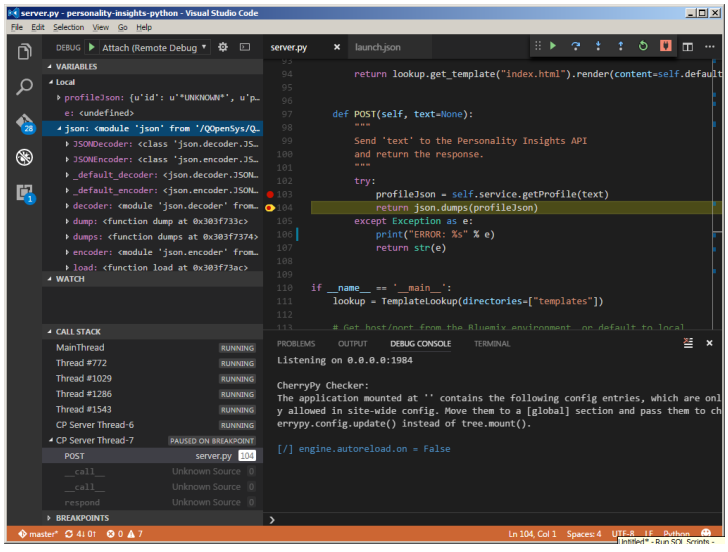

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