Open-Source Software on IBM i

Your Questions Answered

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Outline

- Introduction
- What is open-source software?
- Why use open-source software on IBM i?
- What open-source software is available on IBM i?
- How can I get open-source software?
- How do I use open-source software?
- Conclusions

Introduction

Open-source software on IBM i

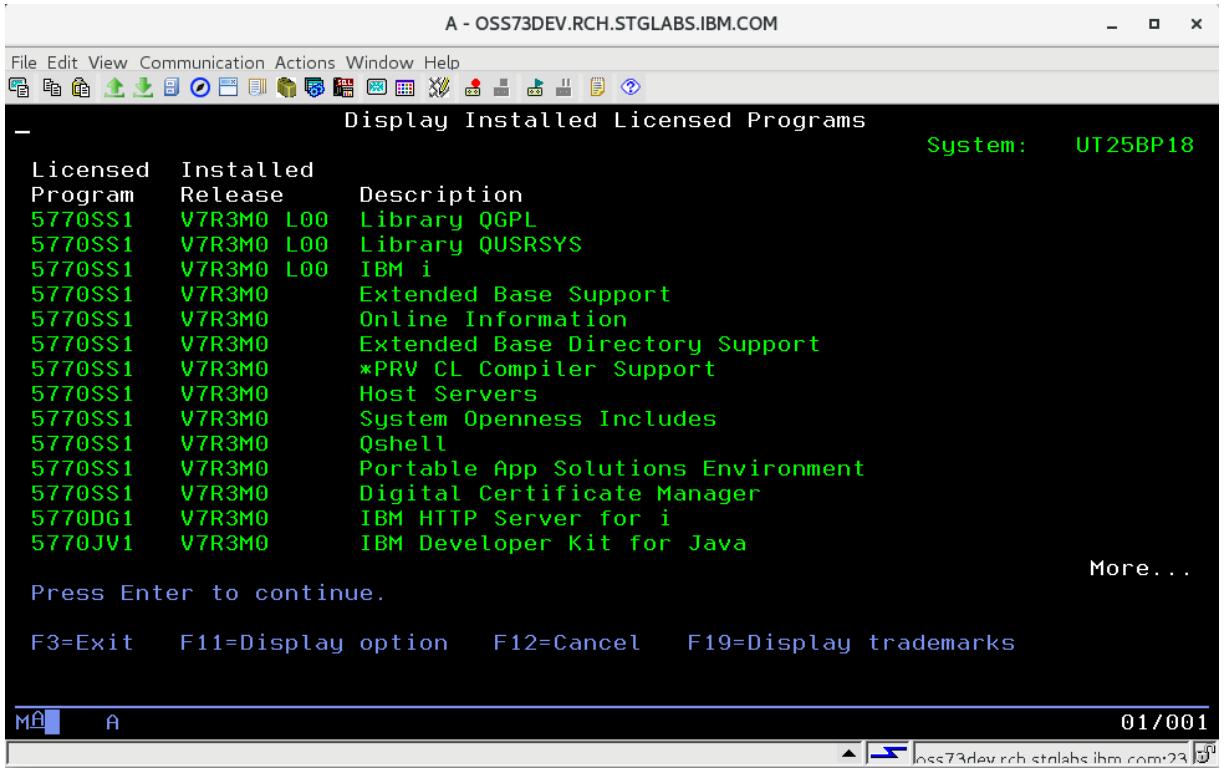
- Open-source software often draws some confusion from IBM i developers who are used to developing RPG, CL, and SQL programs in ILE using 5250
- Most open-source software is called through a shell (bash, QSH, etc.), which can feel different from calling software with CL commands
- The vast majority of open-source software on IBM i is ported and maintained by IBMers
- New open-source software is being delivered all the time

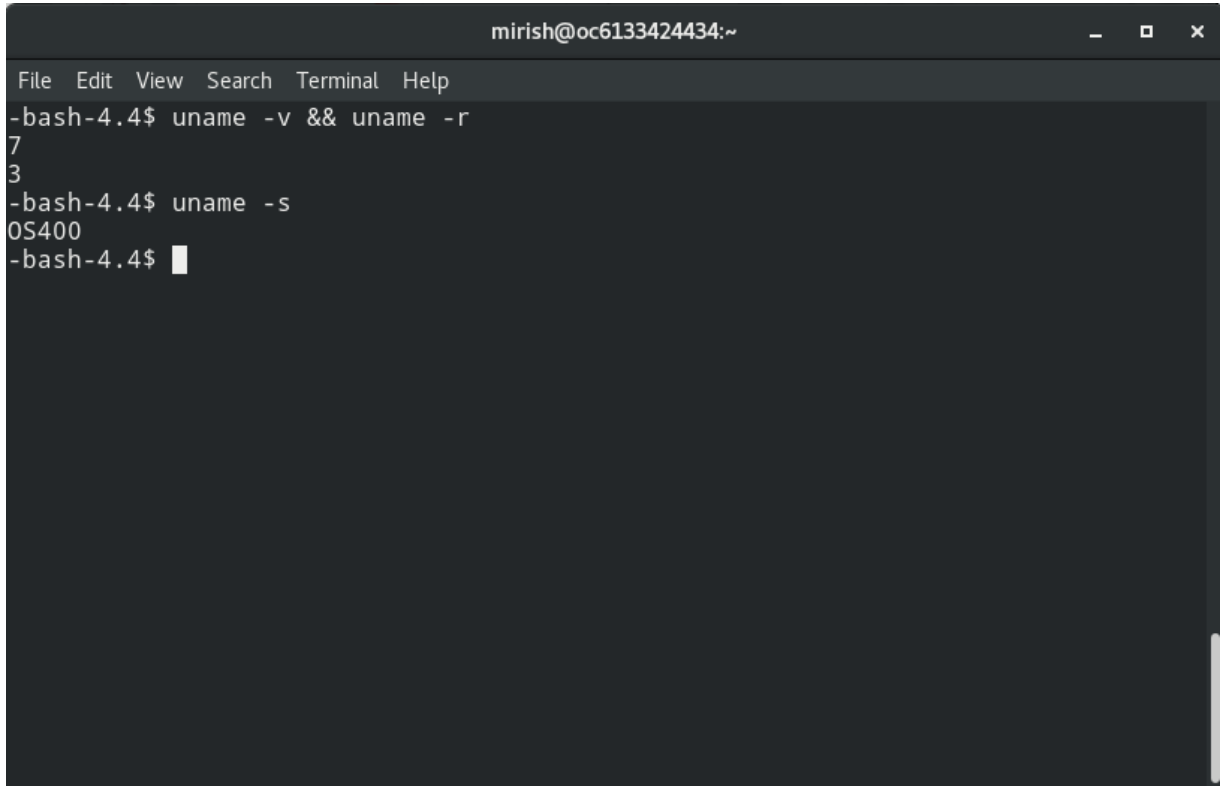
PASE

- Unlike IBM i-native programs, open-source software on the system runs in the Portable Application Solutions Environment (PASE), an AIX-like environment that runs beside ILE
  - PASE is a Unix environment, will be comfortable to Unix and Linux developers
- PASE needs to be installed on IBM i before you can use it
  - Licensed Program: 5770-SS1
  - I’ve never seen a system without PASE on it, but they may be out there

5250 v. bash terminal

- Most open-source software is not called with 5250, so this is a paradigm you should get comfortable with





What is open-source software?

What is open-source software?

- Open-source software is software where the source code is published for everyone to see and use
- Allows developers to build binaries on their own (sometimes unique) systems instead of relying on pre-built binaries
- Open-source software has no common theme or use-case, the only thing it has in common is that its source code is open
- Open-source software is often **published under a license** that dictates what you can and cannot do with the code

Popular open-source software

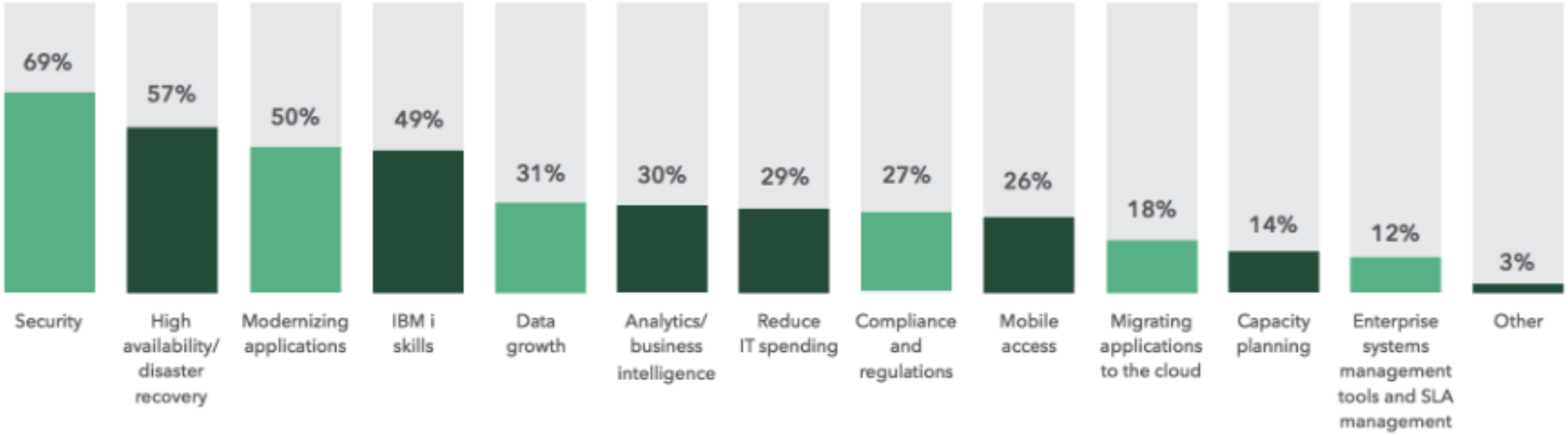
What is open-source software on IBM i?

- On IBM i, the Open-Source Software Team takes popular open-source software and ensures that it works on IBM i
  - Can only be done because we can see the source code and figure out how to patch it to work with PASE/AIX and IBM i
- 99% of open-source software on IBM i runs in PASE, but there are some packages (e.g. curl) that run in ILE.
- All open-source software that runs in PASE is delivered through **yum**

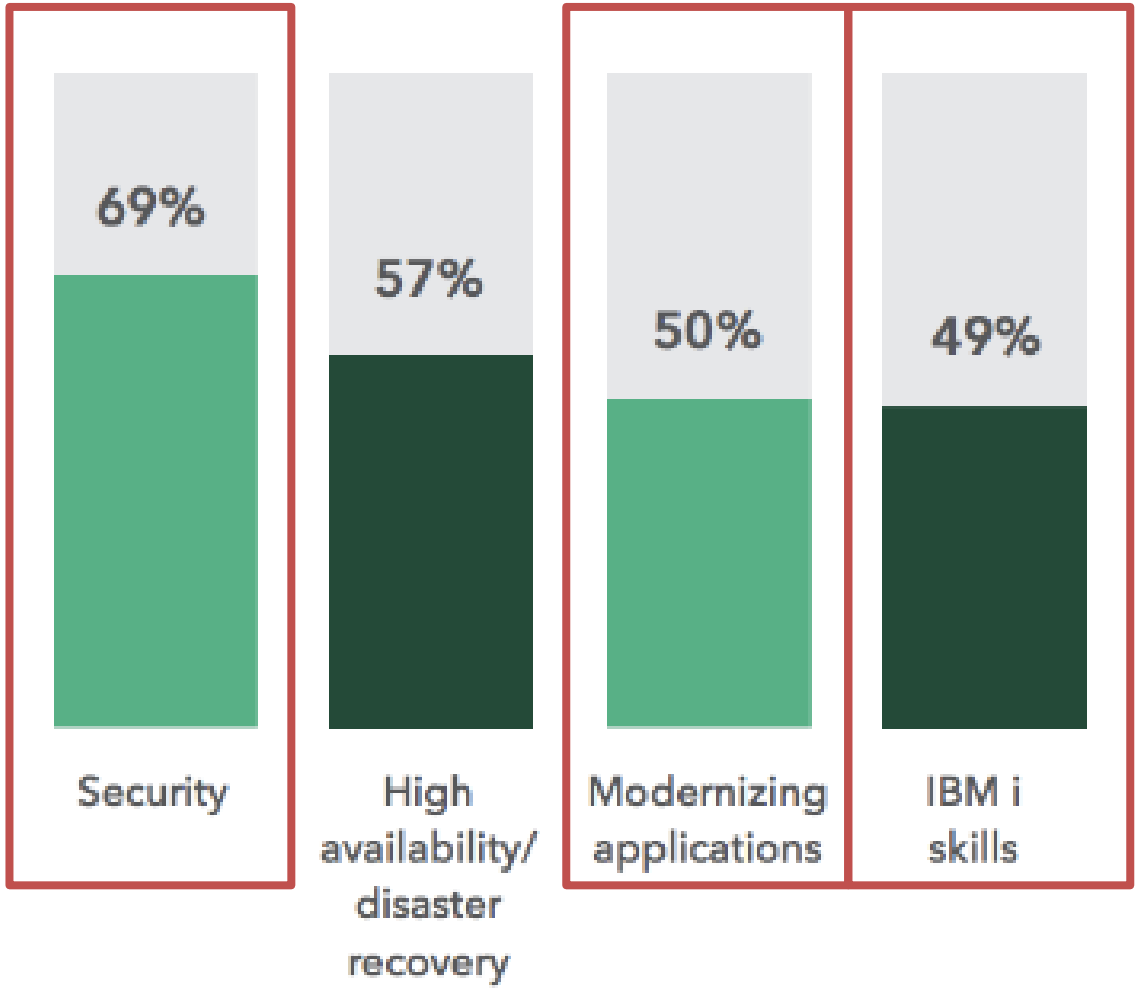
Why use open-source software?

IBM i Marketplace Survey

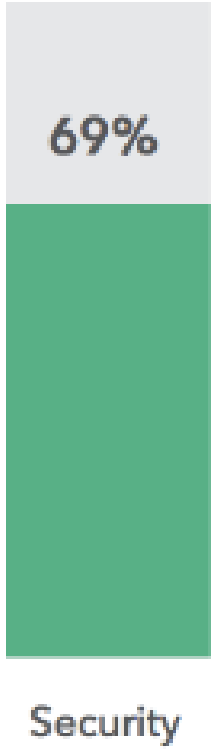
What are your top concerns as you plan your IT environment?



IBM i Marketplace Survey



Open-source software and security

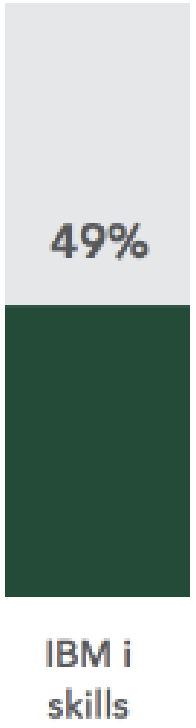


- Open-source software isn’t less secure than proprietary software, especially when widely used
- Many large open-source projects have bug bounties that find vulnerabilities by white-hats
- Open-source software often fixes known vulnerabilities much faster than closed-source software
- More eyes on code generally means higher quality code

Open-source software and modernization

- Open-source software adds features much quicker than proprietary software
  - As new technology is created, developers often want to integrate it with existing popular open-source projects
- There are open-source projects for nearly everything you need to do in your business
- The standard for new technology is to make it open source, and find another method of profiting off of it

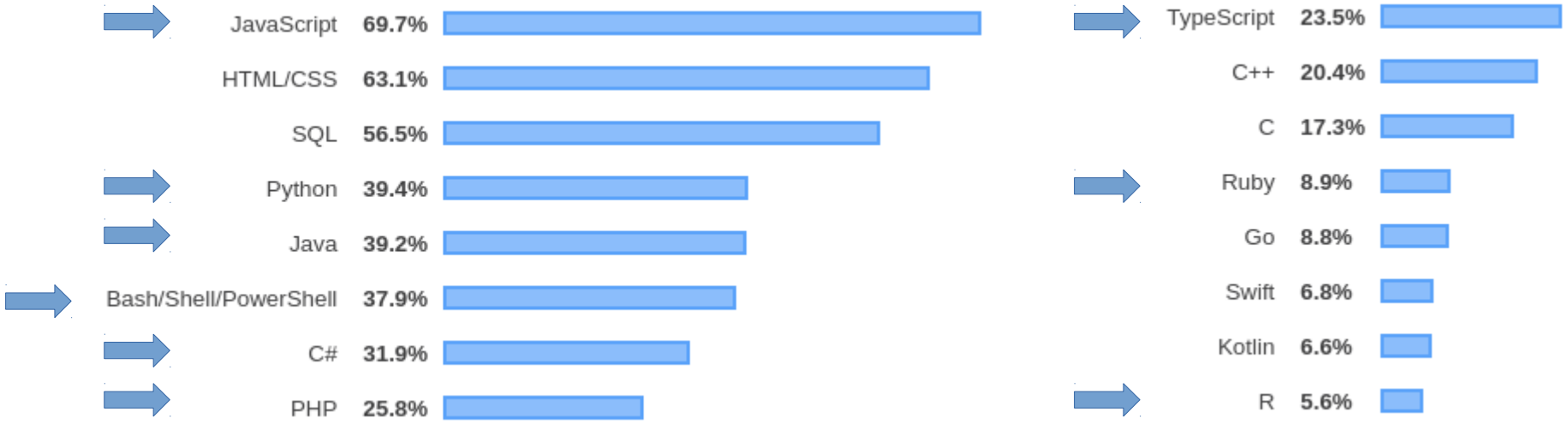
Open-source software and IBM i skills



- Many of the open-source packages on IBM i are known by a large number of developers
- Many open-source packages have the ability to call Db2 for i and ILE programs
  - Developers never need to work with 5250 or know they are on IBM i
  - Developers can be introduced to the “flavor” of IBM i slowly

Open-source software and IBM i skills

- Stack Overflow 2019 Developer Survey “Most Popular Technologies”:



Available on IBM i through open-source software

IBM i open-source software success stories

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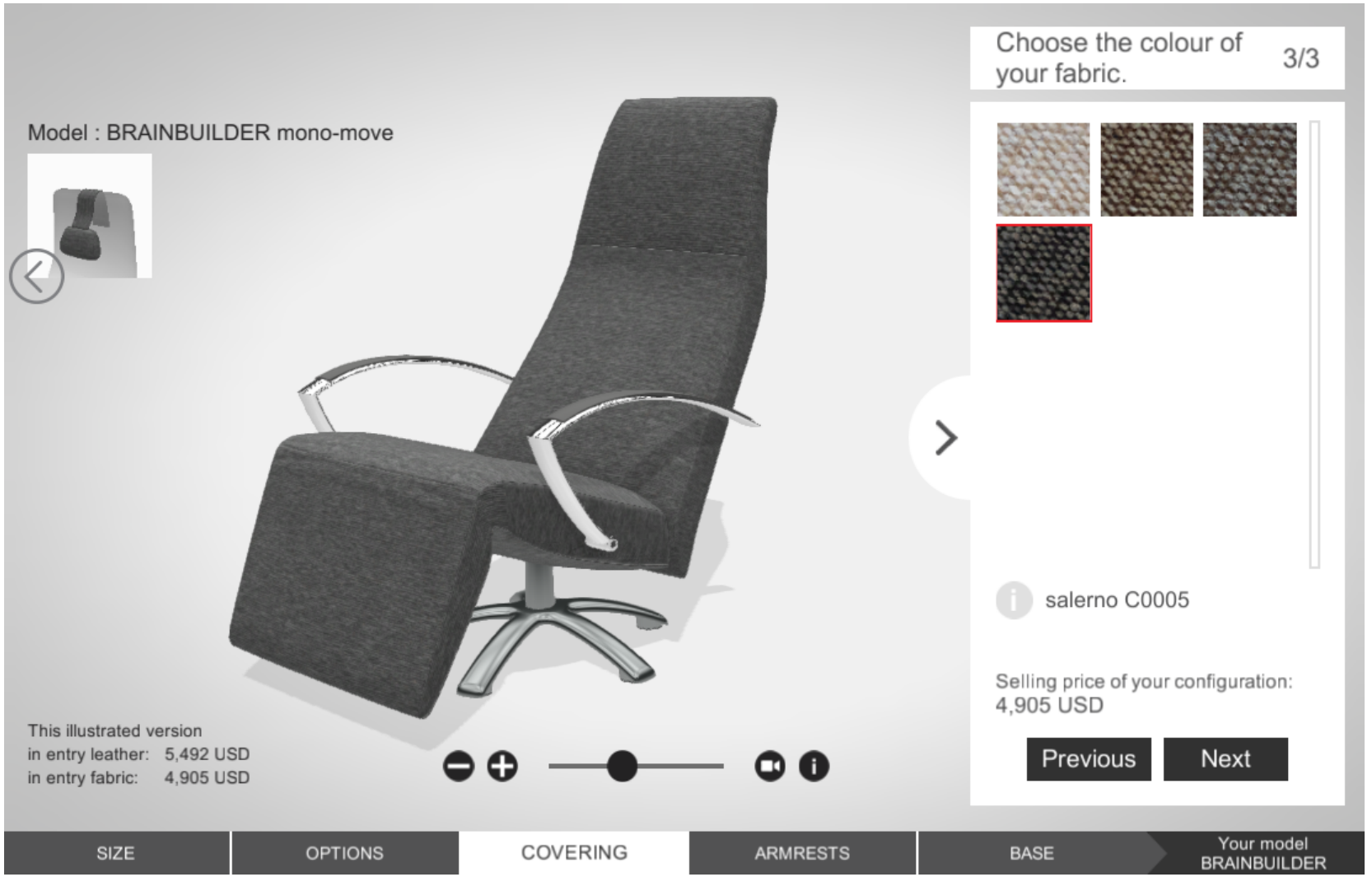
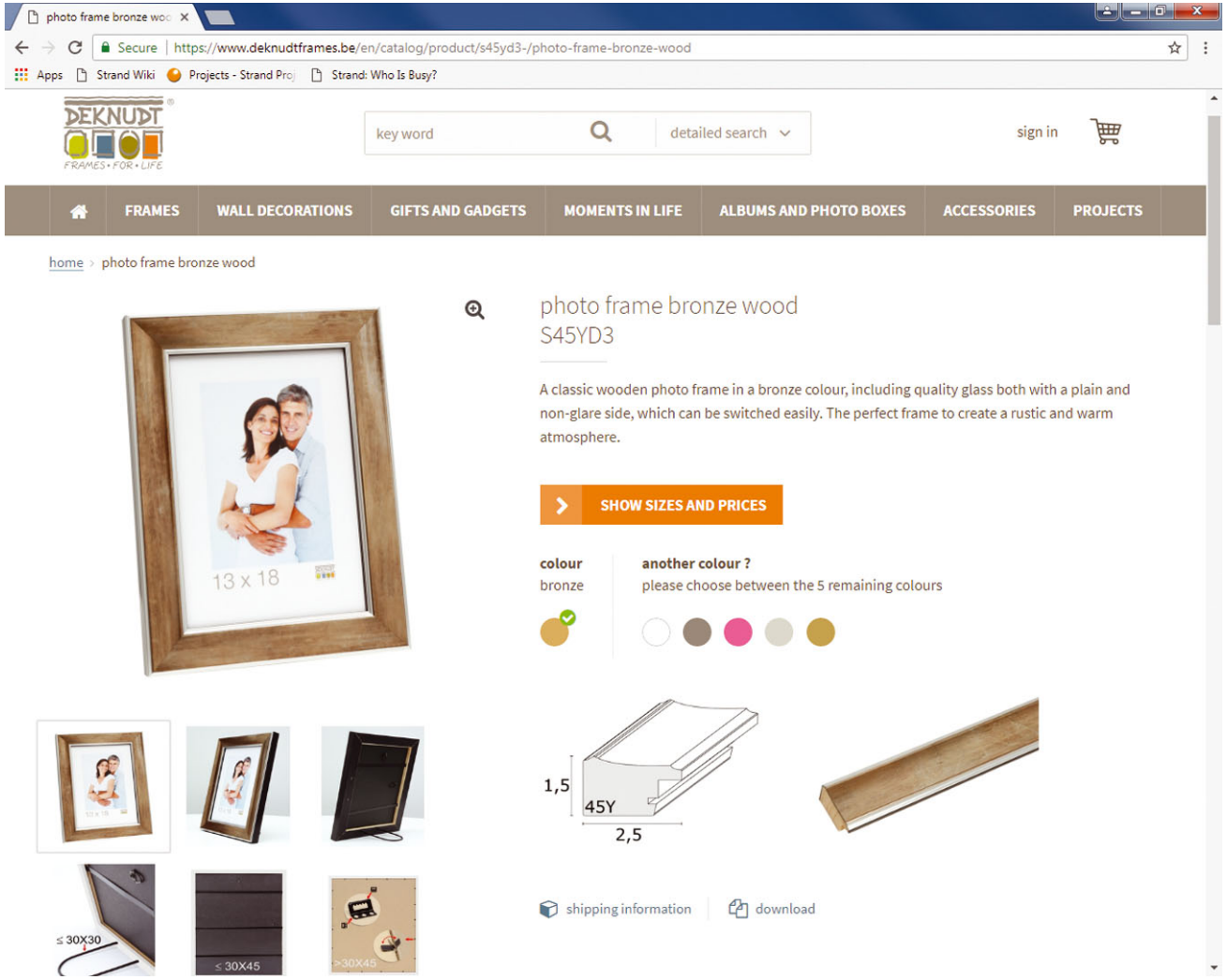


IBM i open-source software success stories



IBM i open-source software success stories

“This e-commerce platform is another example of how we are using technology to generate competitive advantage. And what’s really interesting is that this up-to-date, **open source solution runs side-by-side and fully integrated with trusted core business systems originally coded in the 1970s.** In all the years we’ve used IBM i and the Power Systems platform, we’ve never experienced any issues around stability or security, which contributes to the low total cost of ownership—for us, IBM i is a phenomenally stable platform for business that is also open to all kinds of future possibility.”

IBM i open-source software success stories

- Many IBM i success stories with open-source software:
  - https://www.ibm.com/case-studies/cras-systems-open-source
  - https://www.ibm.com/case-studies/fibrocit-systems-furniture-design
  - https://cms.ibm.com/case-studies/winsol-systems-hardware-manufacturing-digitization
  - https://www.ibm.com/case-studies/kube-pak-systems-gardening-wholesale
  - https://www.ibm.com/case-studies/immo-bonehill-systems-hardware-website-compliance
  - https://www.ibm.com/case-studies/ORIS

What open-source software is available on IBM i?

Open-source software survey

- There are over 300 individual packages of open-source software delivered directly to IBM i
- Here is a really fast overview of some of what is offered...

IBM partnership: Zend PHP

- Zend Server
  - Preloaded with IBM i 6.1 and 7.1
  - One year of Silver Support from Zend
- Zend Studio for i: Eclipse-based development environment
- Zend DBi: MySQL implementation for IBM i
- Request for Enhancement (RFE) for a PHP RPM has been accepted, **expect to see it soon**

IBM i PHP users

IBM Partnership: POWER Ruby

- Freely available and commercially supported
- Includes supporting infrastructure for web applications on IBM i
- Available for download at www.powerruby.com
- Includes native Db2 for i database driver
- Integrates with XMLSERVICE for access to IBM i programs and objects

Python

- Powerful general-purpose language
- Interpreted
- Why Python?
  - Easy to use (designed to be fun!)
  - The CL language of the modern programmer
  - Easy for IBM i programmers to learn
- 200,000+ third-party packages available on pypi.org

Machine Learning Software

- Python packages that allow you to do machine learning on IBM i
  - scikit-learn
  - pytorch
  - jupyter-notebooks

R

- Very popular language used for
  - Data analysis
  - Statistical computing
  - Data mining
  - Big data

Language Ranking: IEEE Spectrum

Rank	Language	Type	Score
1	Python		100.0
2	Java		96.3
3	C		94.4
4	C++		87.5
5	R		81.5

2019 IEEE Spectrum rankings showing the most popular and influential development languages

Node.js

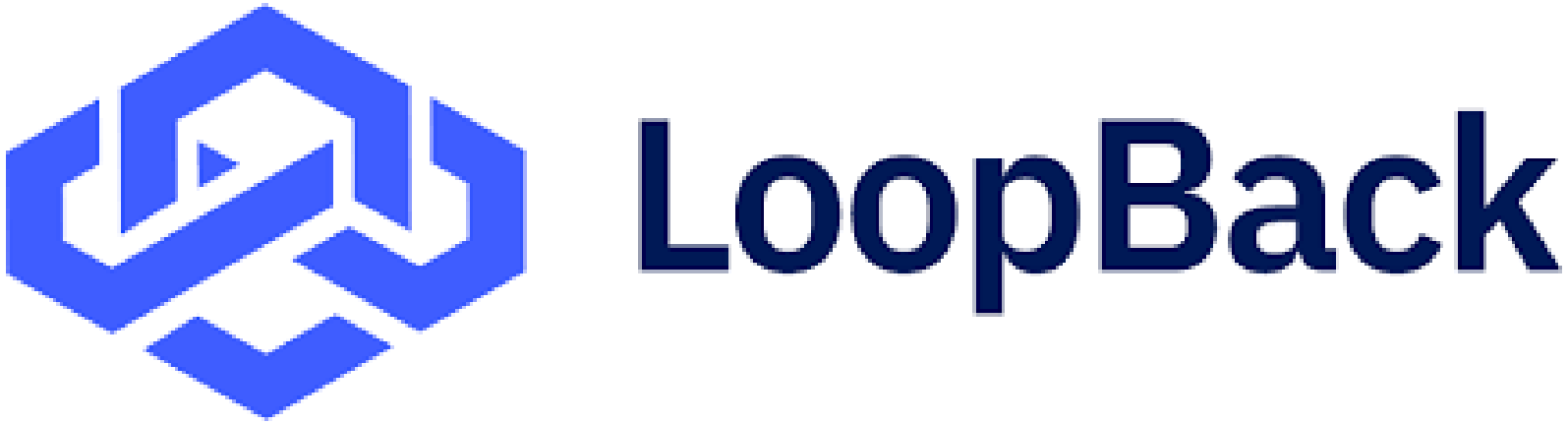
- JavaScript runtime
- Server-side applications with JavaScript
- Uses Google’s V8 engine
- Why Node.js?
  - JavaScript on the front end and the back end
  - Highly performant (much faster than Java for I/O)
  - 1,000,000+ third-party packages available on npmjs.com

Node.js connectivity libraries

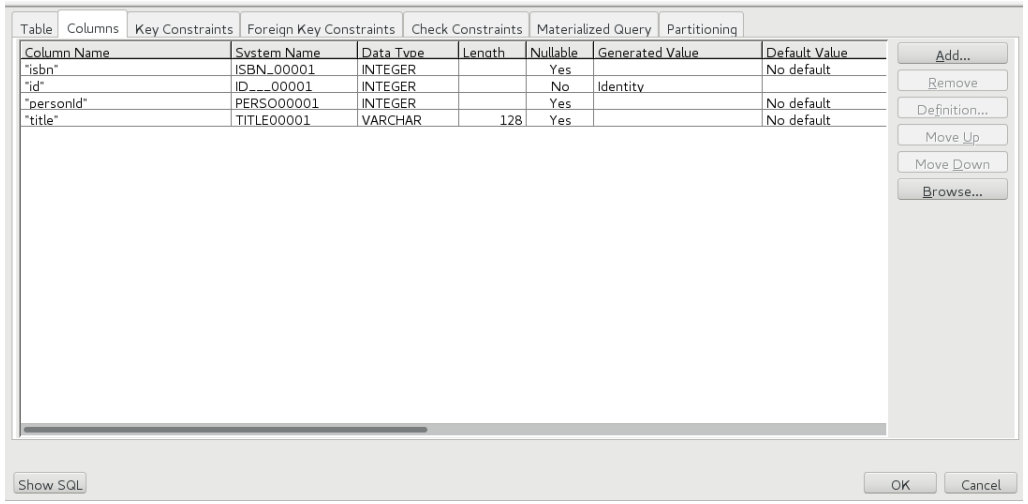
- idb-connector
  - Db2 for i database connector
- idb-pconnector
  - Db2 for i connector with pooling and Promises
- odbc
  - ODBC connector (maintained by me!)
- itoolkit
  - Connecting with XMLSERVICE to call PGMs and more

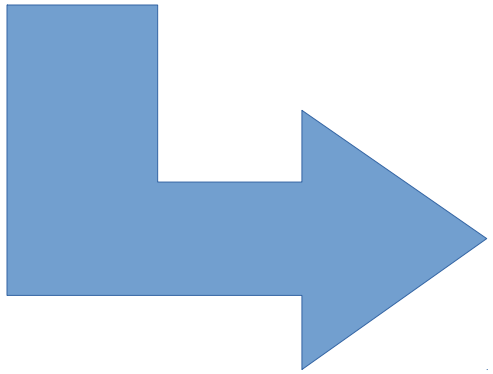
LoopBack

- Framework for quickly creating REST API endpoints
- Can create models and propagate them to Db2 for i, or create models from current Db2 for i tables and schemata



LoopBack





book

Show/Hide | List Operations | Expand Operations

PATCH	/books	Patch an existing model instance or insert a new one into the data source.
GET	/books	Find all instances of the model matched by filter from the data source.
PUT	/books	Replace an existing model instance or insert a new one into the data source.
POST	/books	Create a new instance of the model and persist it into the data source.
PATCH	/books/{id}	Patch attributes for a model instance and persist it into the data source.
GET	/books/{id}	Find a model instance by {{id}} from the data source.
HEAD	/books/{id}	Check whether a model instance exists in the data source.
PUT	/books/{id}	Replace attributes for a model instance and persist it into the data source.
DELETE	/books/{id}	Delete a model instance by {{id}} from the data source.
GET	/books/{id}/exists	Check whether a model instance exists in the data source.
GET	/books/{id}/person	Fetches belongsTo relation person.
POST	/books/{id}/replace	Replace attributes for a model instance and persist it into the data source.
GET	/books/change-stream	Create a change stream.
POST	/books/change-stream	Create a change stream.
GET	/books/count	Count instances of the model matched by where from the data source.
GET	/books/findOne	Find first instance of the model matched by filter from the data source.
POST	/books/replaceOrCreate	Replace an existing model instance or insert a new one into the data source.
POST	/books/update	Update instances of the model matched by {{where}} from the data source.
POST	/books/upsertWithWhere	Update an existing model instance or insert a new one into the data source based on the where criteria.

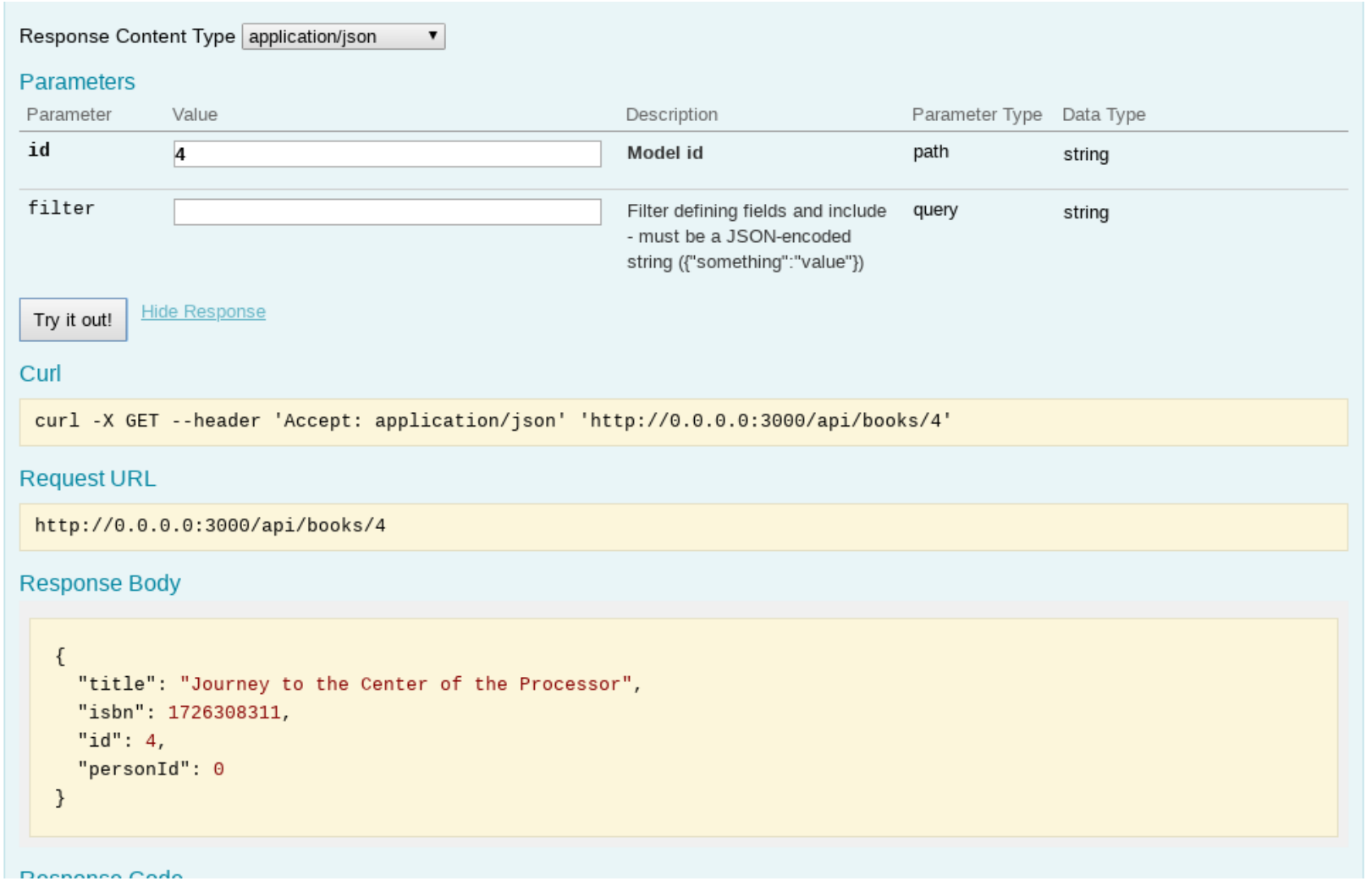
LoopBack

```
Enter an empty property name when done.
? Property name: Name
? Property type: string
? Required? Yes
? Default value[leave blank for none]:

Let's add another employee property.
Enter an empty property name when done.
? Property name: EmployeeID
? Property type: number
? Required? Yes
? Default value[leave blank for none]:

Let's add another employee property.
Enter an empty property name when done.
? Property name: StartDate
? Property type: date
? Required? Yes
? Default value[leave blank for none]:

Let's add another employee property.
Enter an empty property name when done.
? Property name:
[markirish@oc6133424434 loopback-test]$
```

employee Show/Hide | List Operations | Expand Operations

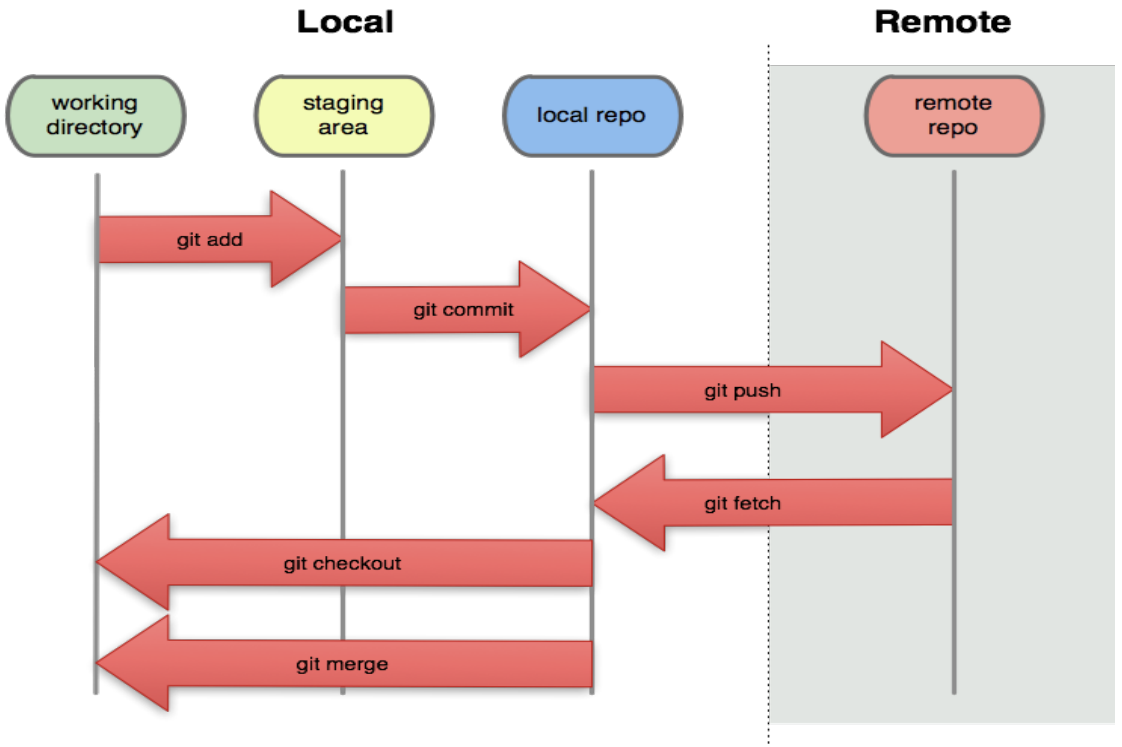
PATCH	/Employees	Patch an existing model instance or insert a new one into the data source.
GET	/Employees	Find all instances of the model matched by filter from the data source.
PUT	/Employees	Replace an existing model instance or insert a new one into the data source.
POST	/Employees	Create a new instance of the model and persist it into the data source.
PATCH	/Employees/{id}	Patch attributes for a model instance and persist it into the data source.
GET	/Employees/{id}	Find a model instance by {{id}} from the data source.
HEAD	/Employees/{id}	Check whether a model instance exists in the data source.
PUT	/Employees/{id}	Replace attributes for a model instance and persist it into the data source.
DELETE	/Employees/{id}	Delete a model instance by {{id}} from the data source.
GET	/Employees/{id}/exists	Check whether a model instance exists in the data source.
POST	/Employees/{id}/replace	Replace attributes for a model instance and persist it into the data source.
GET	/Employees/change-stream	Create a change stream.
POST	/Employees/change-stream	Create a change stream.
GET	/Employees/count	Count instances of the model matched by where from the data source.
GET	/Employees/findOne	Find first instance of the model matched by filter from the data source.
POST	/Employees/replaceOrCreate	Replace an existing model instance or insert a new one into the data source.
POST	/Employees/update	Update instances of the model matched by {{where}} from the data source.
POST	/Employees/upsertWithWhere	Update an existing model instance or insert a new one into the data source based on the where criteria.

LoopBack



Git

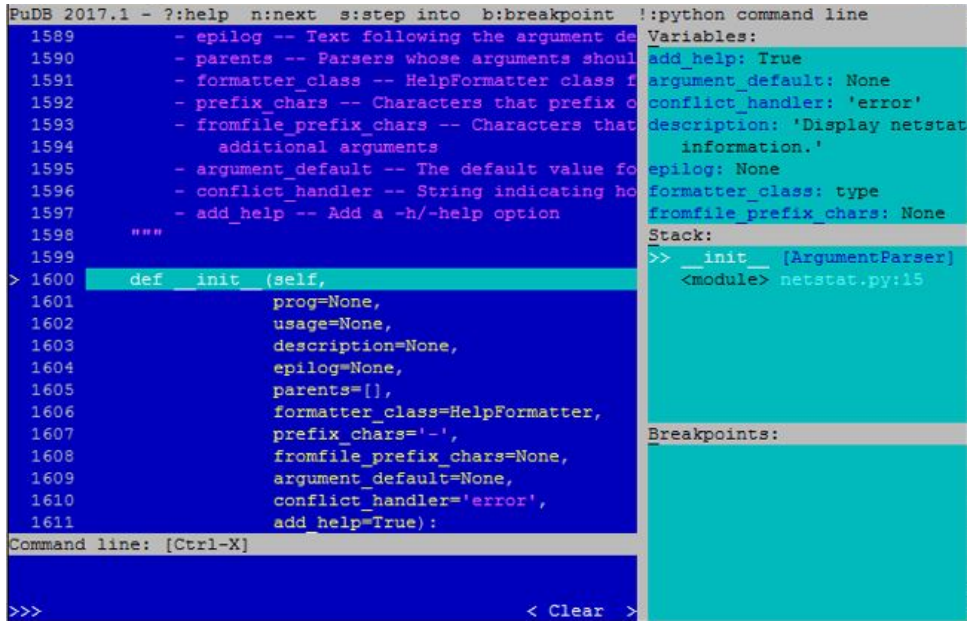
- Open-source distributed source control system
- Source control for virtually any language
- Industry standard for source control

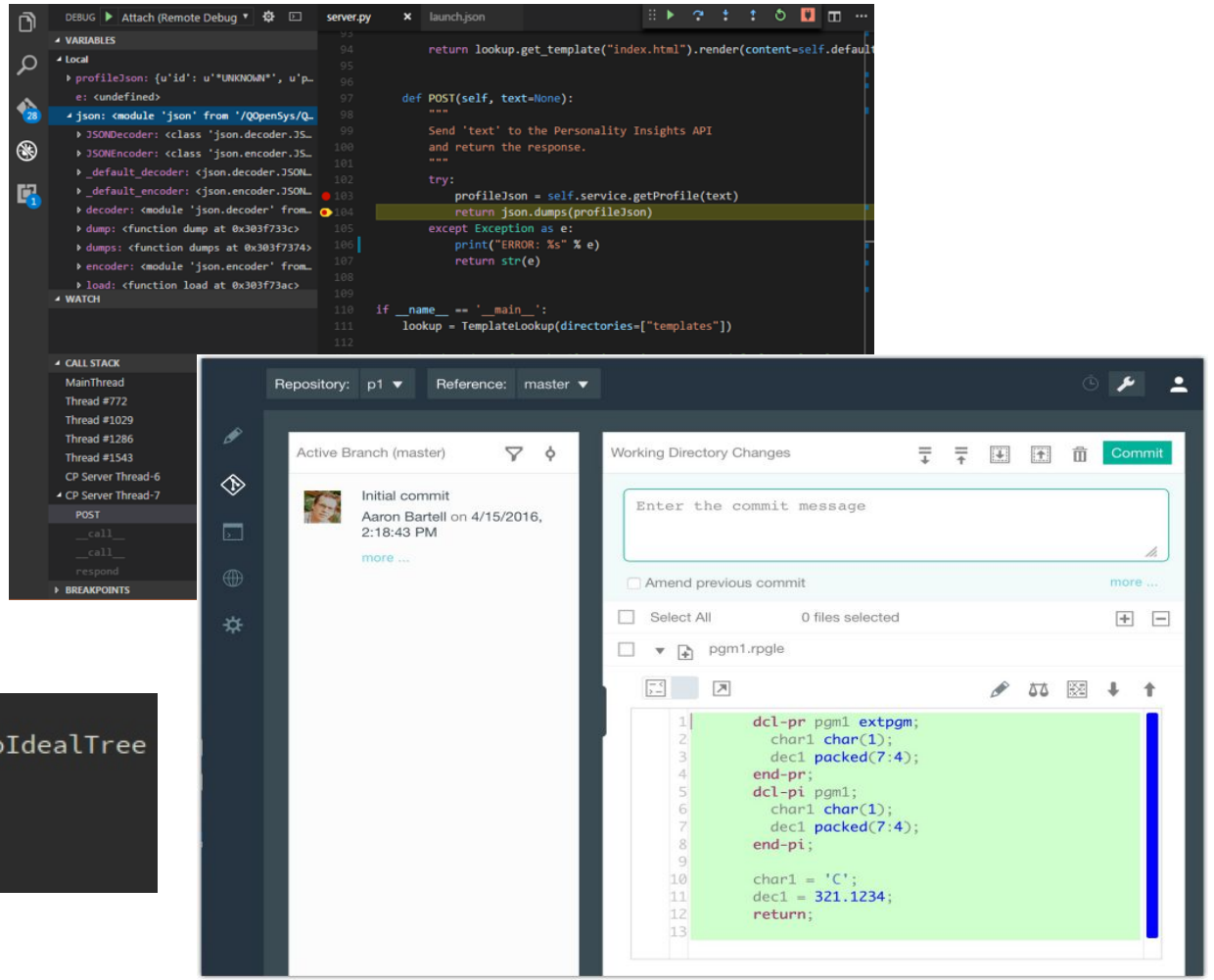


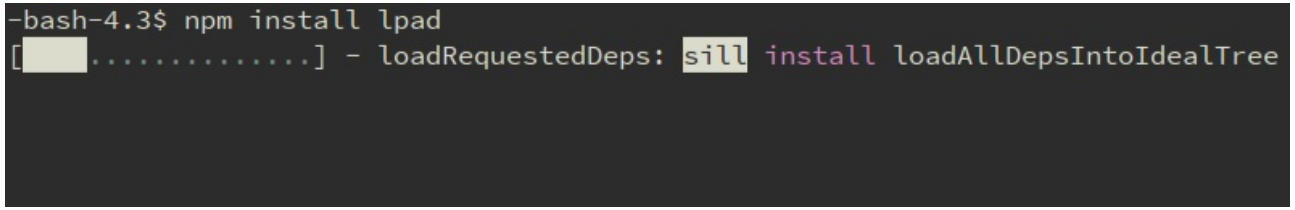
Open-source software tools available

- File system can be accessed with
  - SMB
  - sftp/scp
  - sshfs
  - ftp/ftps
  - IBM i-specific access tools
- Tools for editing code
  - Visual Studio Code
  - Notepad++
  - vi/emacs/joe
  - Rational Developer for IBM i

Open-source software tools available

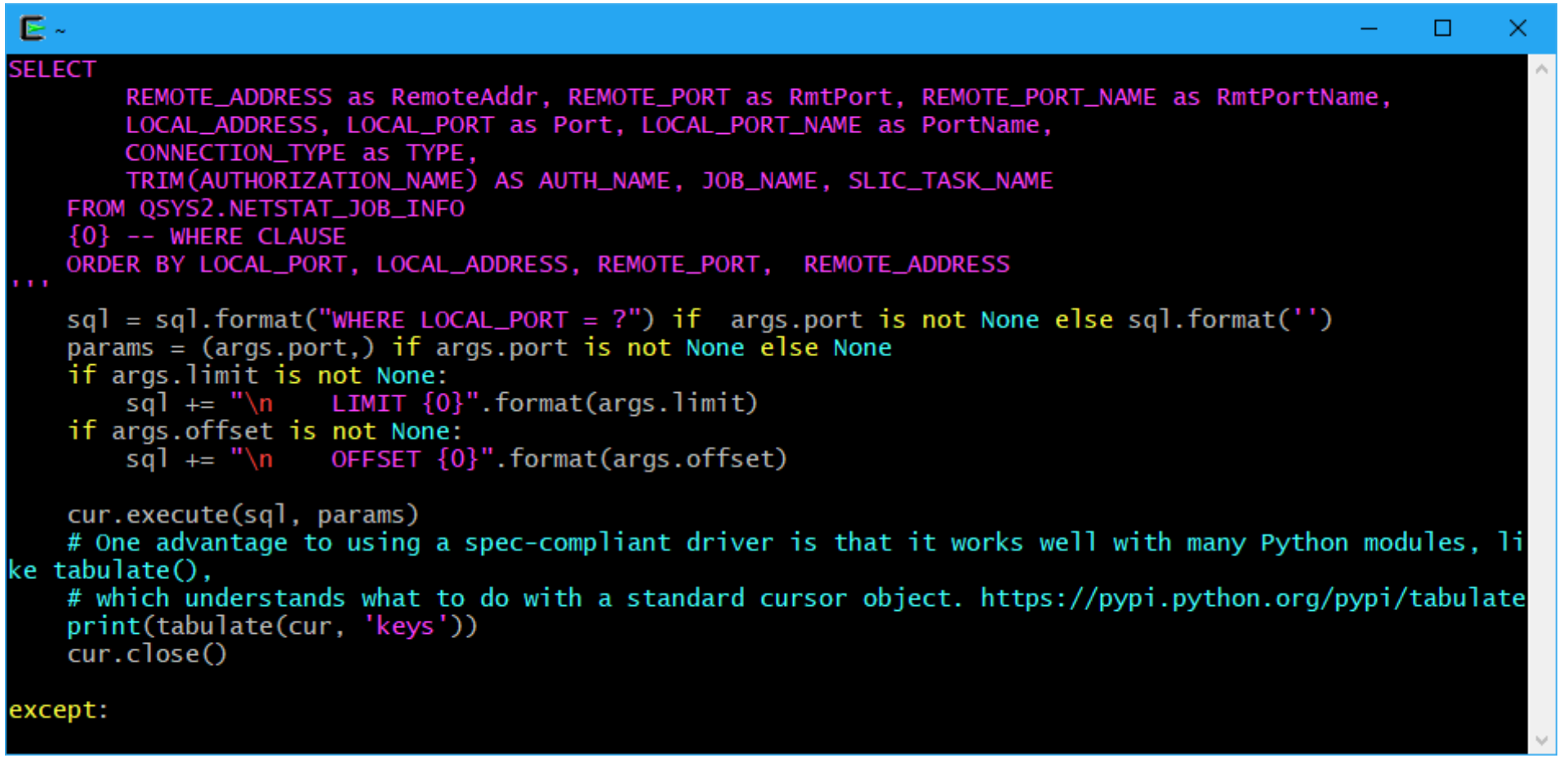






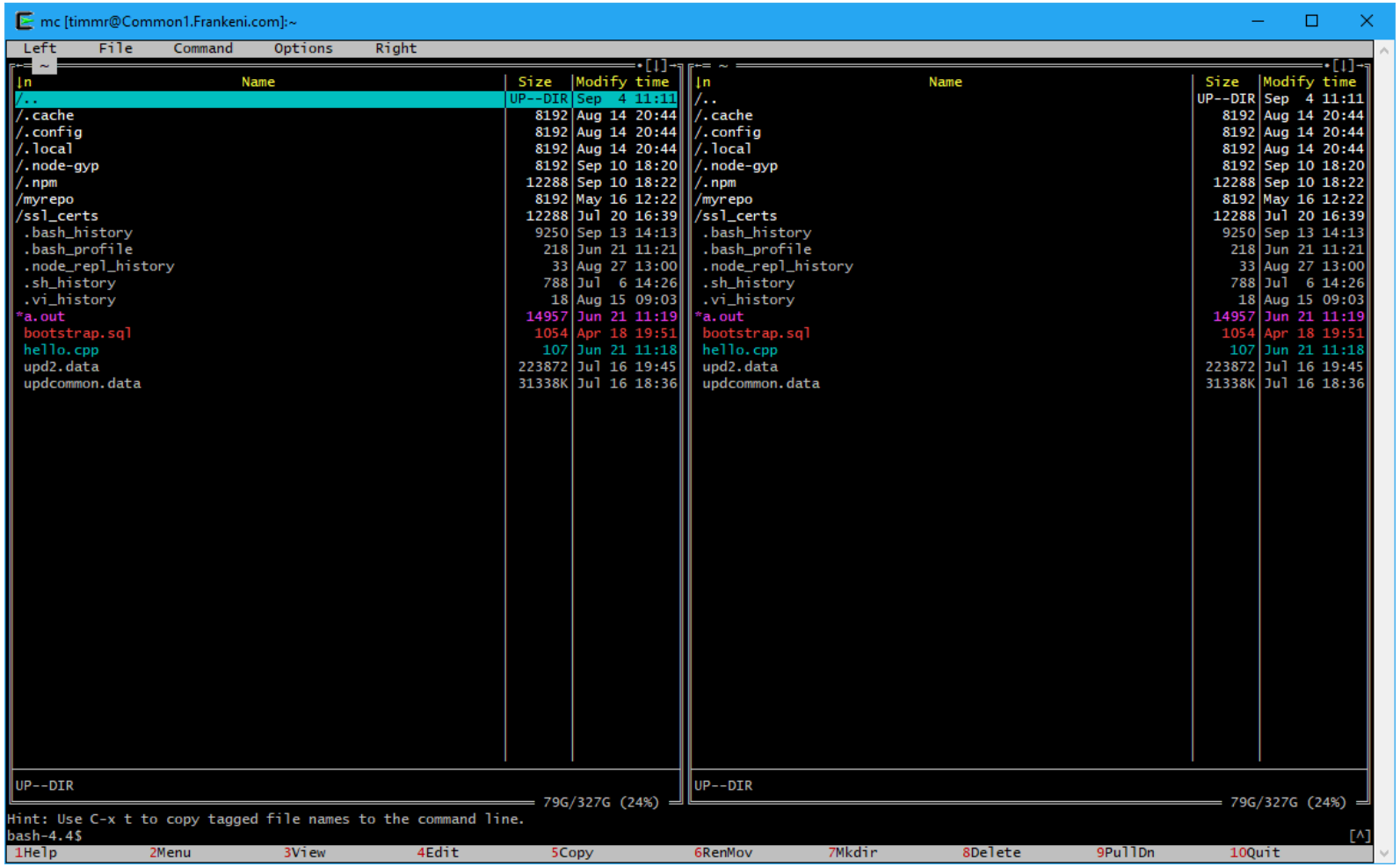
vim

- (In)famous terminal-based editor



Midnight Commander

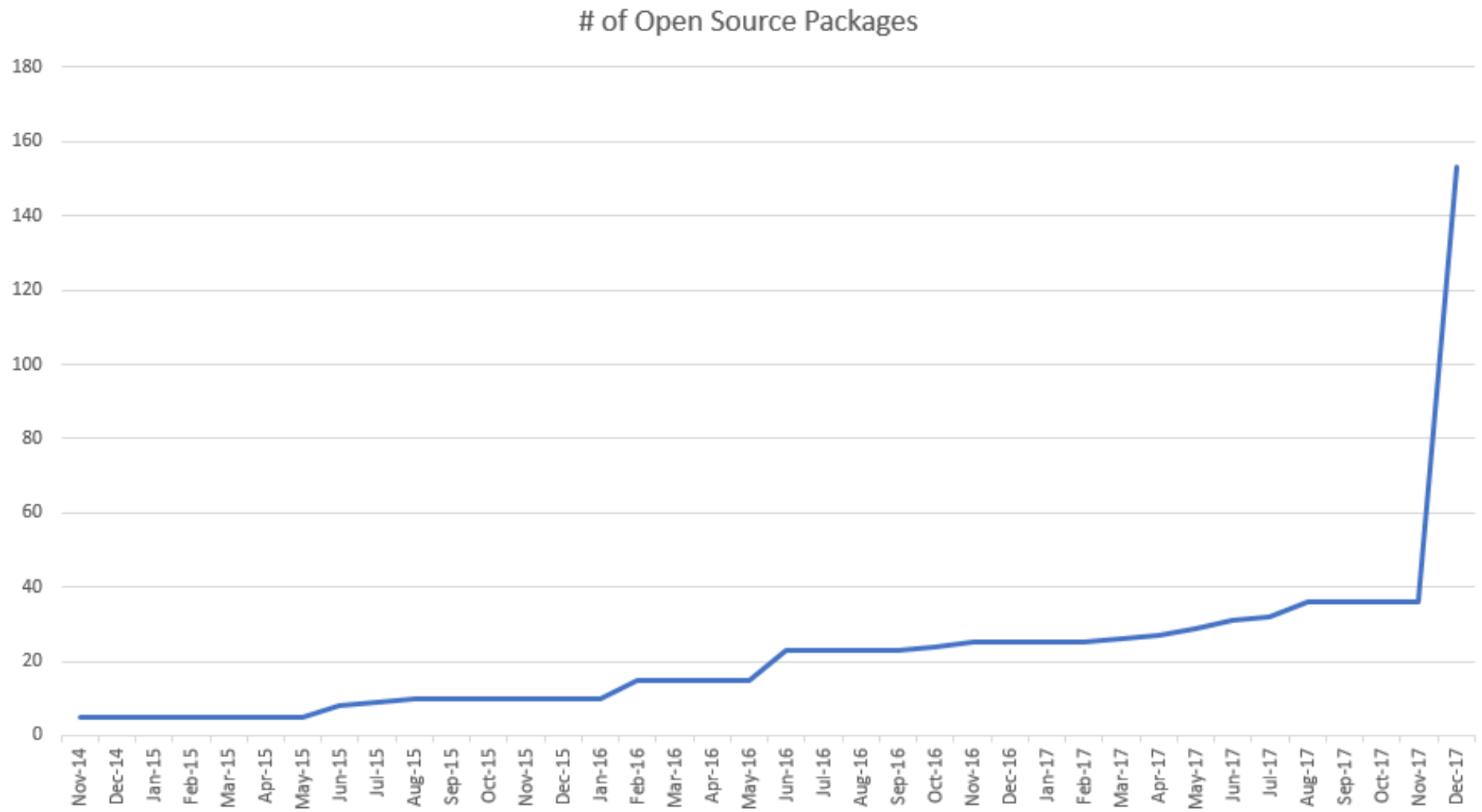
- Two-pane file manager
  - FTP access
  - Compare files
  - Compare directories
  - Edit files
  - Move, copy, delete, etc.
  - Subshell
  - Scroll wheel
  - Modify file info



IBM delivers new software often

- IBM i Open-Source Software Team works to deliver the best of open-source software to IBM i
  - Languages (Node.js, Python, Lua, Perl, etc.)
  - Machine learning
  - Integration with Db2, RPG, CL, etc.
  - New tools for developing applications with open-source software
  - Important pieces for the IBM i open-source ecosystem
- Also contributes to open-source projects, maintain key partnerships, documents software for IBM i users, and much more

The number of packages is growing



You can check what's available

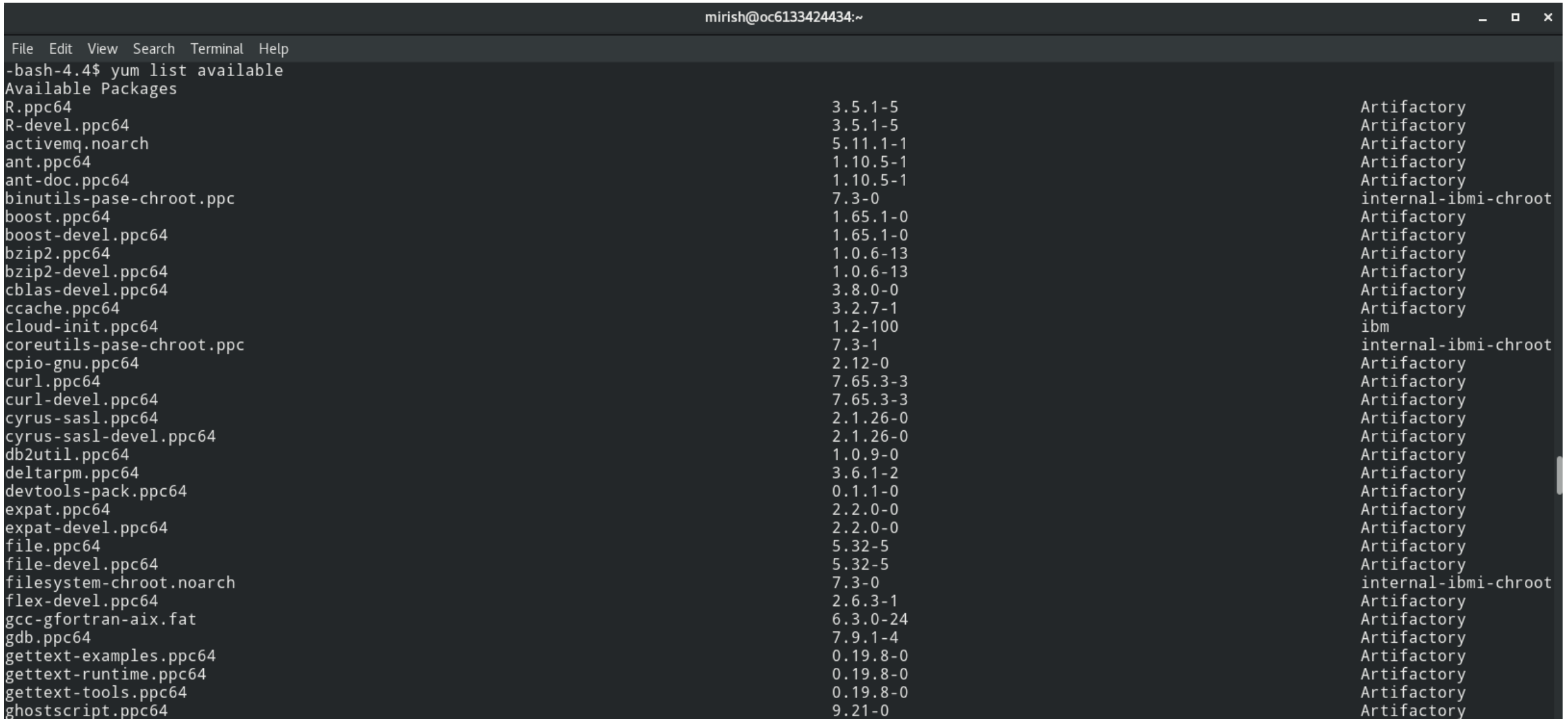
- When you have yum installed, you can query your repositories to see what open-source software is available

```
$ yum list available
```

- Or you can view the repository in your browser to see available packages

  ftp://public.dhe.ibm.com/software/ibmi/products/pase/rpms/repo/

You can check what's available



How can I get open-source software?

5733-OPS is dead

- Open-source software used to be delivered by 5733-OPS
- Most 5733-OPS options are already out of support
- The following options will be out of support as of December 15th 2019
  - Option 4: Python 2.7
  - Option 6: Git
  - Option 7: Tools
  - Option 9: Cloud-init
  - Option 11: Nginx

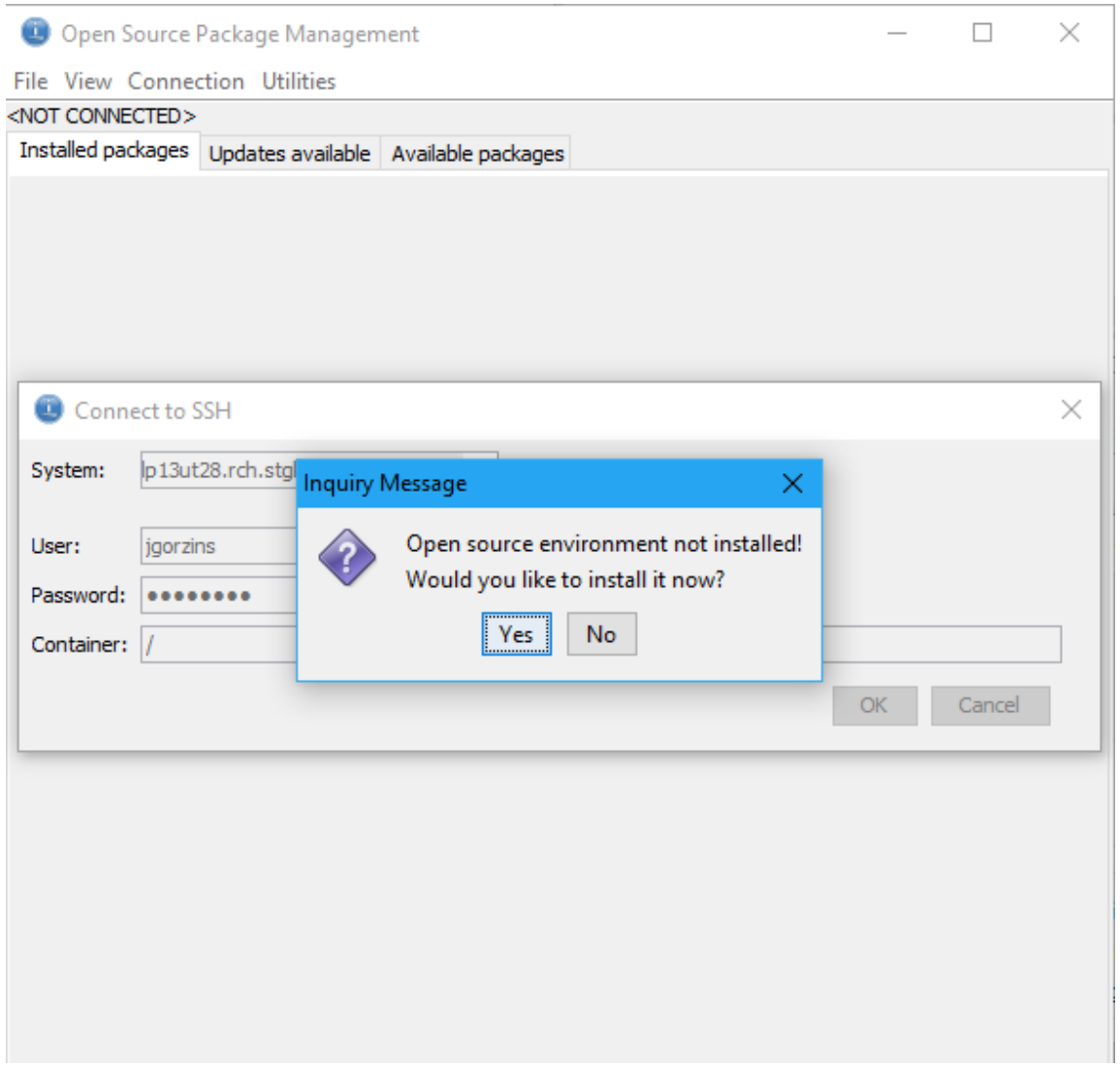
RPMs now deliver open-source software

- RPMs are packaged up binaries and where to install them
- When you install RPMs (with yum), all of the files will be placed in the correct location in the IFS
- When you uninstall open-source software, the files and all dependencies will be removed from your system
- http://ibm.biz/ibmi-rpms

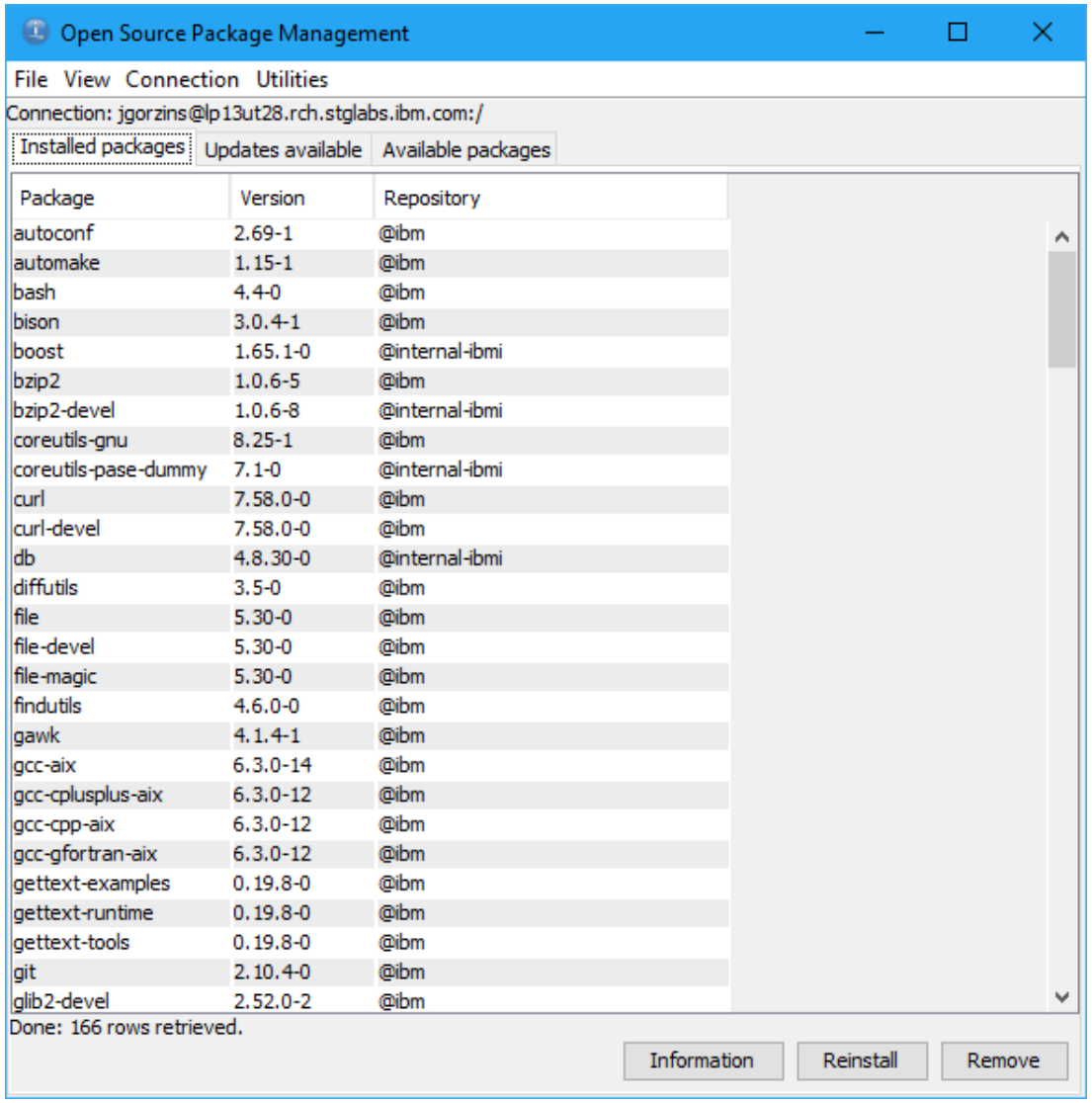
Why RPMs?

- PTFs and other IBM i-specific ways are a poor fit for open-source software, which is usually built for Unix systems
- RPMs allow much faster delivery of open-source packages and patches for these packages
  - Automated tests, continuous integration, continuous delivery
  - Dozens of 5733-OPS options, hundreds of RPMs
- Can install the entire open-source environment and all packages in a matter of minutes

Managing open-source with ACS



Managing open-source with ACS



Managing open-source with yum

- Install/remove packages
- Check for updates
- Check what packages are available
- Check versions of packages
- Check what package ships a certain file
- See the installation and update history for a package

Managing open-source with yum

```
-bash-4.3$ yum install nginx
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package nginx.ppc64 0:1.13.8-3 will be installed
--> Processing Dependency: lib:/QOpenSys/pkgs/lib/libcrypto.so.1.1(shr_64.o)(ppc64) for package: nginx-1.13.8-
3.ppc64
--> Processing Dependency: lib:/QOpenSys/pkgs/lib/libssl.so.1.1(shr_64.o)(ppc64) for package: nginx-1.13.8-3.p
pc64
--> Running transaction check
---> Package libopenssl1_1.ppc64 0:1.1.1-1 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================================================
 Package                      Arch                   Version                    Repository              Size
================================================================================================================
Installing:
 nginx                        ppc64                  1.13.8-3                   ibm                    1.2 M
Installing for dependencies:
 libopenssl1_1                ppc64                  1.1.1-1                    ibm                    2.0 M

Transaction Summary
================================================================================================================
Install       2 Packages

Total size: 3.2 M
Installed size: 14 M
Is this ok [y/N]:
```

How can I use open-source software?

There are lots of resources out there

- The only unique thing about most open-source software on IBM i is connecting to Db2, calling PGMs, etc.
- The rest of open-source software on IBM i is the same as open-source software on any other platform
  - That means that you can use any online tutorial, and only calling IBM i resources will be unique

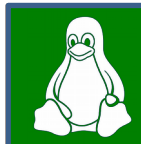
Some IBM open-source resources

- IBM i Open-Source Software Team has created some resources for you to get started using open-source software:
  - http://ibm.biz/ibmi-rpms
  - https://github.com/IBM/ibmi-oss-examples

Traditional open-source software

- RPM pile has community support, available through: https://bitbucket.org/ibmi/opensource/issues
- IBM supports some integration pieces
- Vendor support for Zend Server and Power Ruby
- Most open-source packages have community support

Professional support for open-source software



Linux
Subscription & Support

- Subscription & support for all major distributions of Linux including
- Linux system-level skills for multiple products
- Unmatched skills on IBM® System z®, IBM Power® and OEM Intel
- Focus on speed to resolution with direct access to IBM resources
- Basic, Enhanced & Premier support options available
- 99% TSS fix rate

Commercial OSS
Subscription & Support

- TSS can provide support solutions for the Red Hat & SUSE product portfolios
- Support for private cloud infrastructures running on multiple OpenStack distributions
- Software Defined Storage including Red Hat Ceph, Red Hat Gluster & SUSE Enterprise Storage
- Docker EE support available for IBM Power and System z platforms

Community OSS
Support

- Enterprise-class support for 100+ community versions of open source software
- IBM delivered L1/L2 support
- Available across x86, Power and System z
- Support includes diagnostics & virtually unlimited assistance with how-to, usage, configuration, installation, product compatibility and interoperability questions

Supported Packages include:

Apache HttpServer
MariaDB
MongoDB
MySQL
PostgreSQL
ActiveMQ
Rabbit MQ
Tomcat
NGNIX
WordPress
SugarCRM
Docker
Kubernetes
Chef
Puppet
Spark
Jenkins
OpenJDK
Elasticsearch
Logstash
Kibana
Cassandra
CouchDB
Redis
Maven
Apigility
GitLab
CephFS
Kafka
OpenLDAP
OpenSSL
Zookeeper
Nagios
PHP

Notable IBM i supportables

- Git
- Jenkins
- rsync
- Node.js
- Apache Tomcat
- WordPress
- Python

A great place to start

- If you want to learn more about open-source software support on IBM i, see Jesse Gorzinski's blog post:

https://ibmsystemsmag.com/Trends/12/2018/game-changer-open-source-support

Conclusions

The open-source revolution

- IBM i is in the middle of an open-source software revolution
  - Explosion of software available on the system over the last 3 years since the switch to RPMs
  - New software is being added weekly
  - More tools, languages, and capabilities on IBM i than ever before
- We continue to solicit feedback on what you want to see on IBM i
  - Community engagement is key for success of open-source on the system (so far, we have been really impressed)

Normalization of IBM i

- Open-source software on IBM i is greatly helping to normalize the system
  - Familiar tools
  - Industry-standard technology
  - Industry-standard techniques
- Open-source software on IBM i makes the hiring pool much larger
- If you hire any developer off the street, or a new college graduate, they are much more familiar with open-source software

Community engagement

- Attend sessions at conferences and ask questions
- Share code tips and tricks on public forums
- Make code contributions
- Where?
  - Ryver: https://ibmioss.ryver.com/
  - Midrange “Open Source” thread: https://archive.midrange.com/opensource/
  - LinkedIn IBMiOSS group
  - GitHub: https://github.com/ibm/ibmi-oss-examples

Community engagement

- IBM i Open-Source Software Team is active on Twitter
  - @IBMJesseG
  - @kadler_ibm
  - @markdirish

- Questions, just tweet #IBMiOSS!