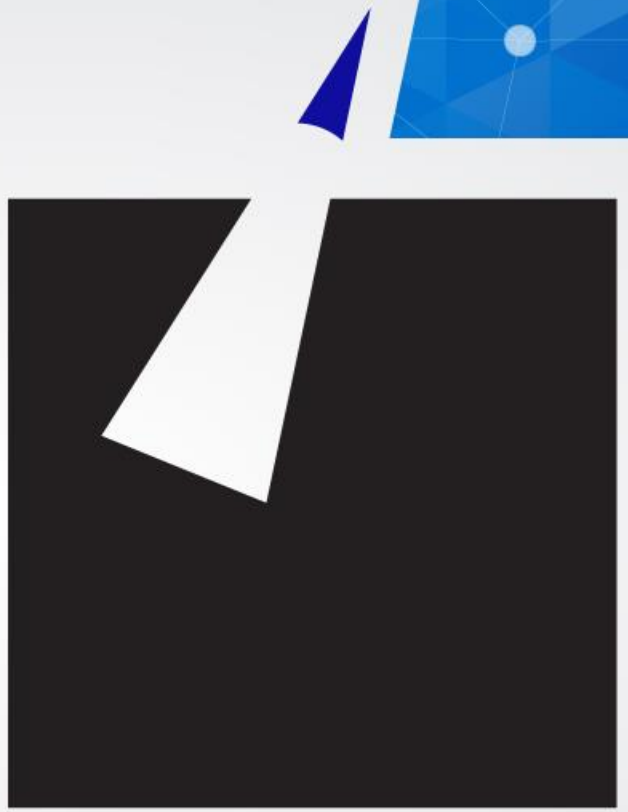
Rocket



Open Source on z/OS

November 2019

What I will talk about

- Why open source on the mainframe?
- Rocket's open source offerings
- How is open source different on z/OS?
- Zowe
- Conclusion

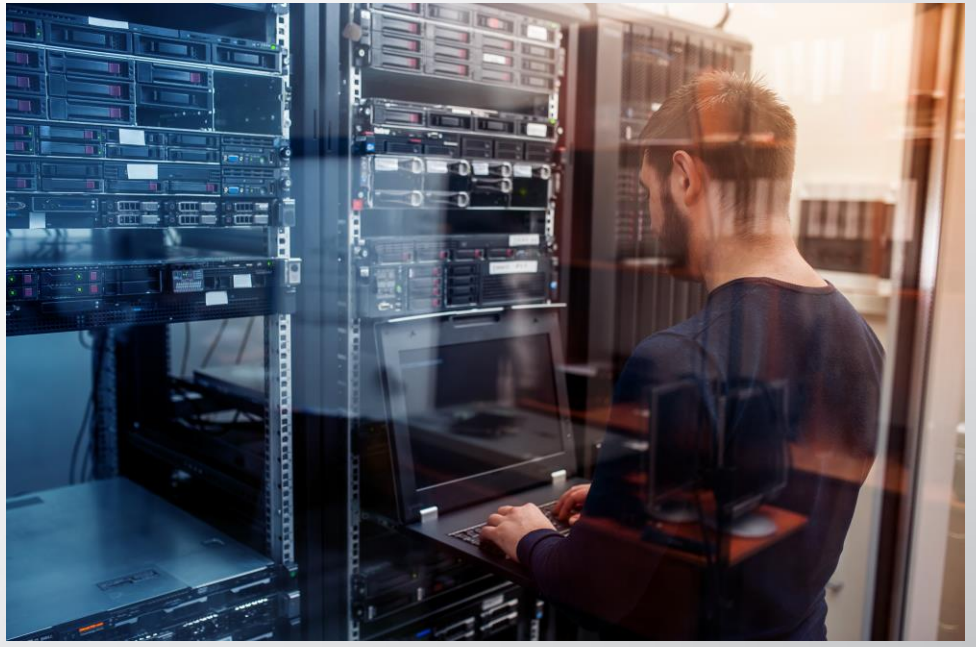
Why open source on the mainframe?

Mainframe remains a critical platform

- A mature platform
  - Impressive uptime
  - Excellent transactional performance
  - Robust logging
- It's where the data is
  - 92 of the top 100 banks
  - 10 of the top 10 airlines
  - 23 of the top 25 retailers
  - 23 of the top 25 insurance companies

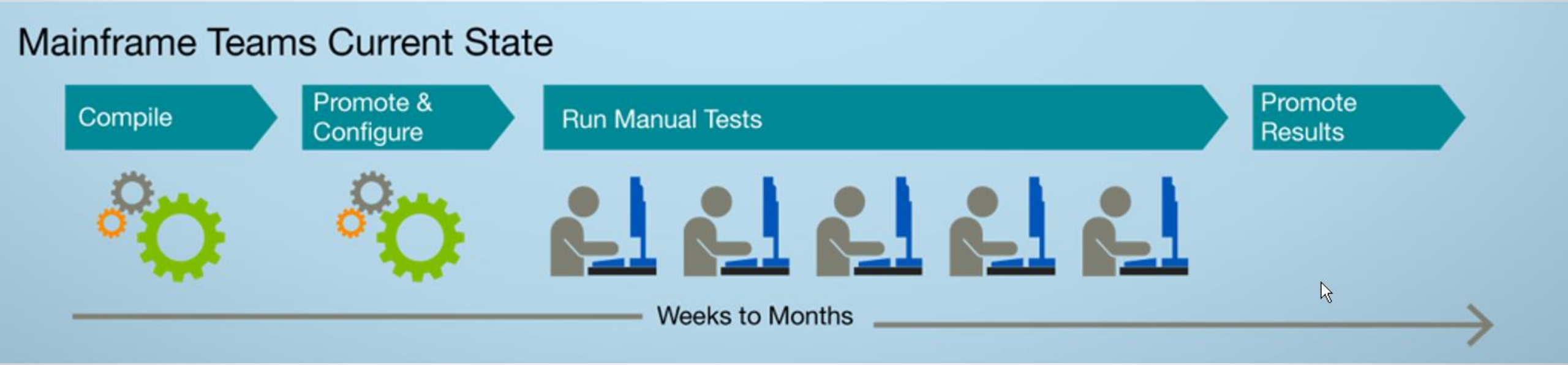
The developer problem

- Exclusive group of developers
- High learning curve to join
- Shrinking talent pool



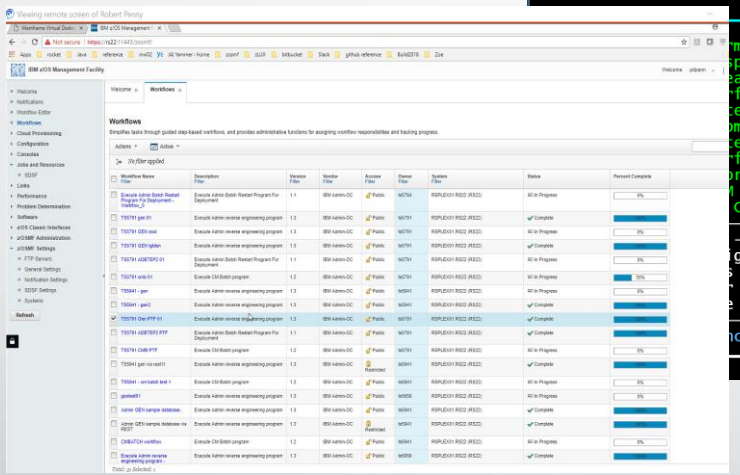
The DevOps problem

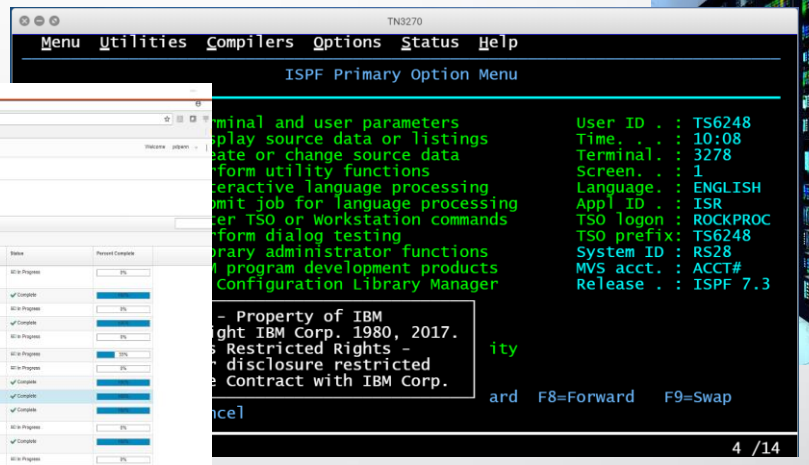
- Traditional development cycle still the norm

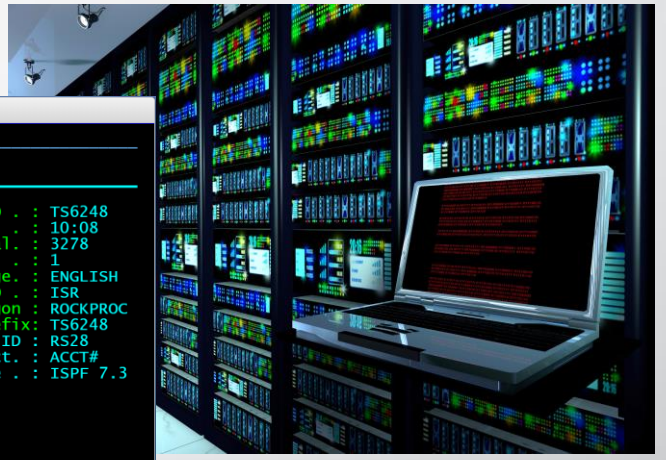


The user experience problem

- Green screen technology
- Heterogenous set of browser-based applications
- No cross-application cooperation

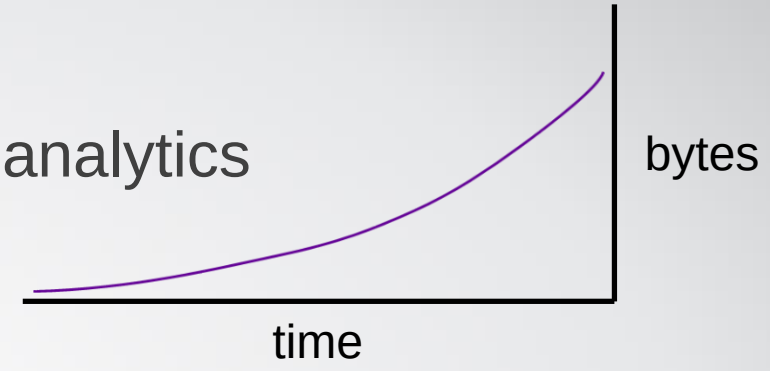






The analytics demand problem

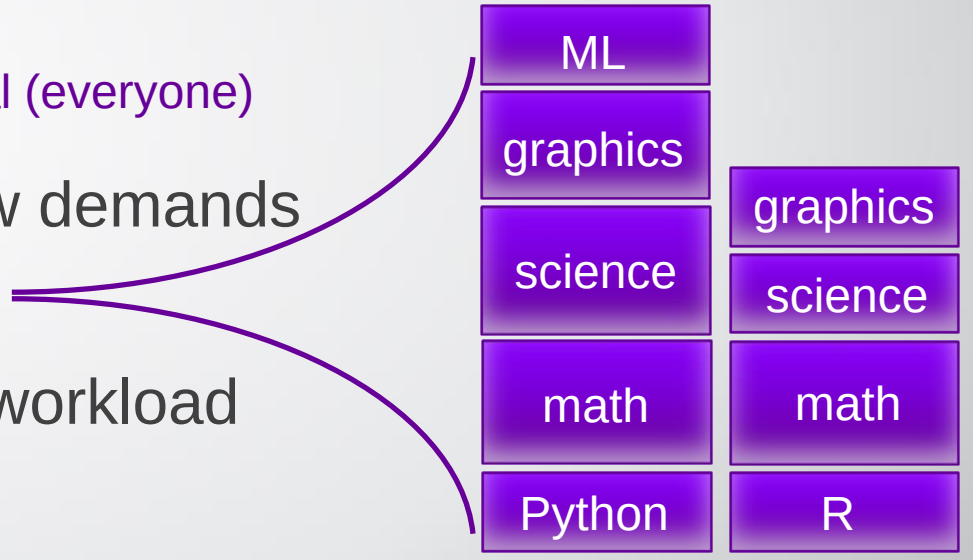
- Data growing exponentially and with it demand for analytics



- Demand is for more real-time analytics

  Strategic (C-level) ➔ Tactical (management) ➔ Operational (everyone)

- Traditional mainframe languages not ideal for new demands



- Cost is prohibitive for lots of additional analytical workload

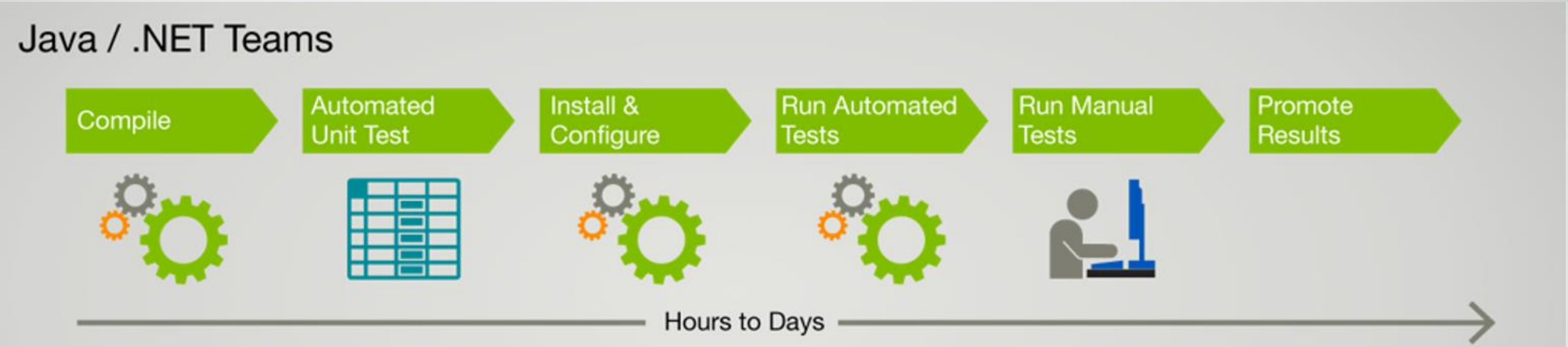
  Large volume of new DSWL + GPP = $$$

The open source world

- Millions of programmers -- Billions of lines of free code
  - As of May 2019, GitHub reports having over 37 million users[9] and more than 100 million repositories[10] (including at least 28 million public repositories),[11] making it the largest host of source code in the world.[12] (~45% increase in two years)
- Lower execution costs
- Lower development costs
  - Fast evolving languages, packages, and tools
    - Java, JavaScript, Typescript, Perl, Python, Go, etc
    - SciPy, Scikit-Learn, Spark, Dask
    - git, cURL, PHP, Jupyter, Zeppelin
- Security through transparency

The open source world

- Modern development cycle



How to get the benefits? Move the data?

Rocket

- ETL solutions have serious drawbacks for analytics
  - High cost – high upfront cost and consumes CPU and bandwidth
  - High latency – credit card fraud best done in real-time!
  - Security risks – many data breaches have occurred due to ETL
- Moving data is a non-starter for DevOps
  - The world has moved to git
  - Corporations want a uniform developer experience across all platforms used by an enterprise …even Z

Rocket's open source offerings on z/OS


Self-Managing Systems
Security
Self-service Collaborative BI
Machine Learning
Analytics Spark Anaconda
Automation Operations Deployment DevOps
Open Source Languages and Tools
API Economy z/OS Connect
Blockchain
Cognitive
Data Virtualization
Discovery
Hybrid Cloud
THE MODERN MAINFRAME

Open Source Languages on z/OS

- Python 3.7.0* w/ASCII
- R 3.5.2* w/ASCII
- Perl 5.24 w/ASCII
- PHP 7.0.5 w/ASCII

* Most recent versions of Python and R only by special request for the next 3 months while we finish conversion to conda

Languages are not enough

- Editors (vim)
- Source code control (git)
- Build utilities (autoconf, automake, bison, make, ant*)
- Web development tools (cURL, webalizer, zlib)
- File and Text utilities (diffutils, findutil, m4, sed)
- Compressors and archivers (bzip2, gzip, zip)
- User interfaces (Bash, jupyter)

Languages and Tools are not enough

Rocket

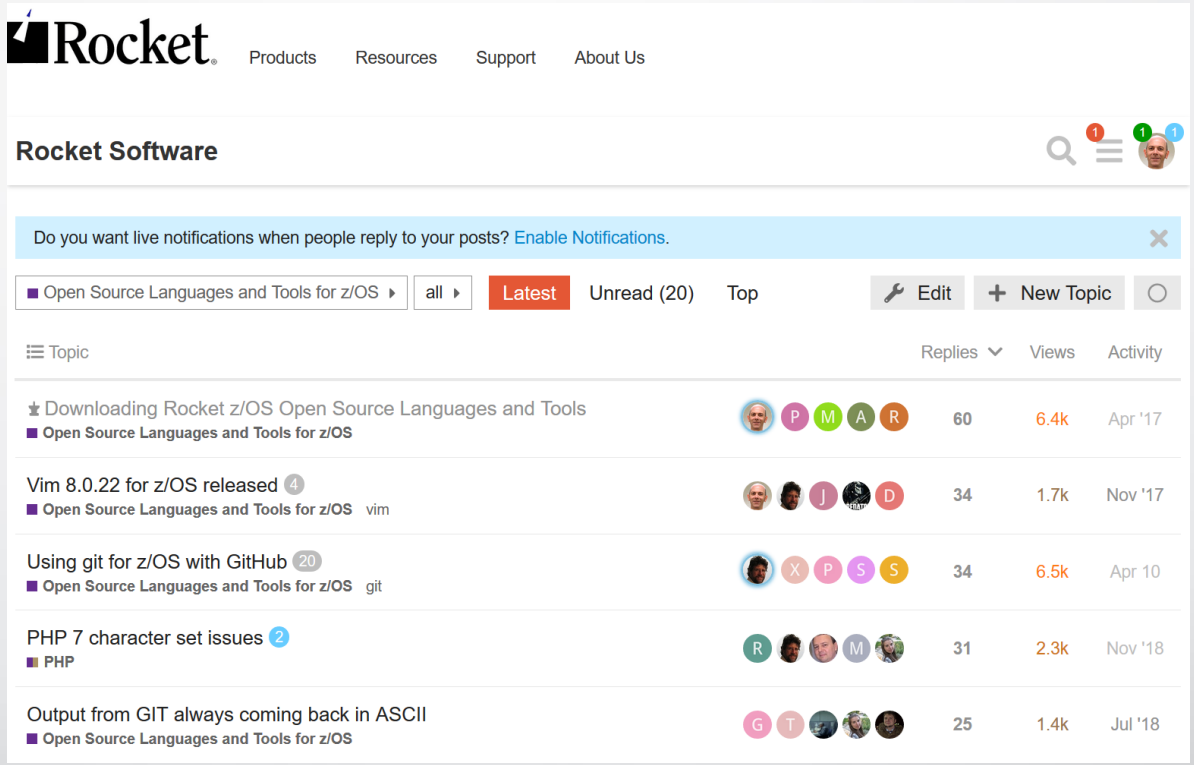
- Math and Science:
  - numpy, statsmodel, sympy, scipy
- Analytics and ML:
  - scikit, pandas, blaze, odo, nltk, pyspark, dask
- Presentation:
  - bokeh, seaborn, Django, Flask, cairo
- Package management:
  - conda

ANACONDA®

…for z/OS

Is anyone really using this?

- Yes. In fact, Rocket is building a community…
- https://forum.rocketsoftware.com/c/rocket-z-os-open-source-languages-tools
  - 234 topics
  - 723 replies
  - 1M views



Solution for analytics demand problem – move the compute to the data

- Port open source to z/OS
  - Python and R -- #1 and #2 in data science (after Excel)
  - Spark
  - Anaconda
  - …and Bash
- IBM MDS for Apache Spark enables easy (SQL) access to data
  - CICS
  - IMS
  - SMF
  - DB2
  - VSAM

How is open source different on z/OS? (example: git)

Mostly it is about character encoding?

- z/OS Enhanced ASCII
  - Source code is ASCII encoded
  - All open source is compiled with `-qascii` option
  - All open source is ported to support CCSID tagged files
  - Automatic conversion is enabled via `_BPXK_AUTOCVT`
  - Untagged files are presumed to be EBCDIC

Encoding Solution for z/OS git

```
# This sets the default encoding for files that do NOT match any of the
# following patterns. Many z/OS users will want the bulk of their files
# as EBCDIC.

* git-encoding=iso8859-1 working-tree-encoding=ibm-1047

# Some of the git configuration files MUST be ASCII.

.gitattributes   git-encoding=iso8859-1 zos-working-tree-encoding=iso8859-1
.gitignore       git-encoding=iso8859-1 zos-working-tree-encoding=iso8859-1

# Some files are not text; leave them untouched, and tagged as binary files.

*.jpg   git-encoding=BINARY    zos-working-tree-encoding=BINARY
*.png   git-encoding=BINARY    zos-working-tree-encoding=BINARY
*.gif   git-encoding=BINARY    zos-working-tree-encoding=BINARY
*.zip   git-encoding=BINARY    zos-working-tree-encoding=BINARY
```

Rocket

z DevOps Pipeline at Rocket using Open Source

zDevOps at Rocket

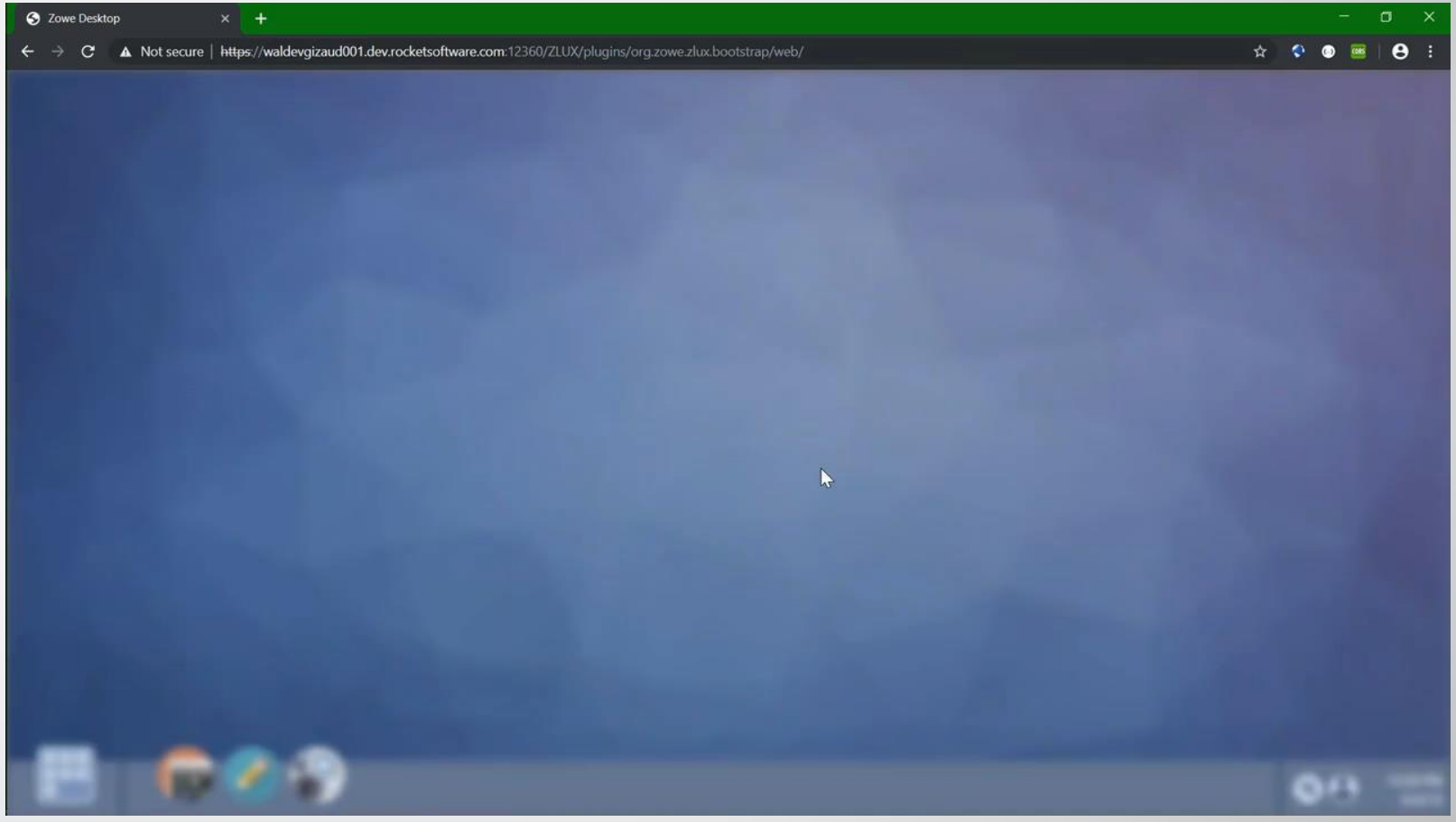
- Conductor: Jenkins on Linux (off mainframe)
- SCM: Git Server (BitBucket off mainframe) & z/OS Git Client
  - Source cloned from BitBucket to z/OS Unix System Services (USS)
- Build Scripting:
  - Moving files between USS and MVS (Partitioned Data Sets)
  - Executing builds
    - z/OS ant
    - z/OS bash
    - z/OS python
- Automated testing and scanning:
  - z/OS Python
- (planned) Artifact Repository: Artifactory (off mainframe)

Rocket

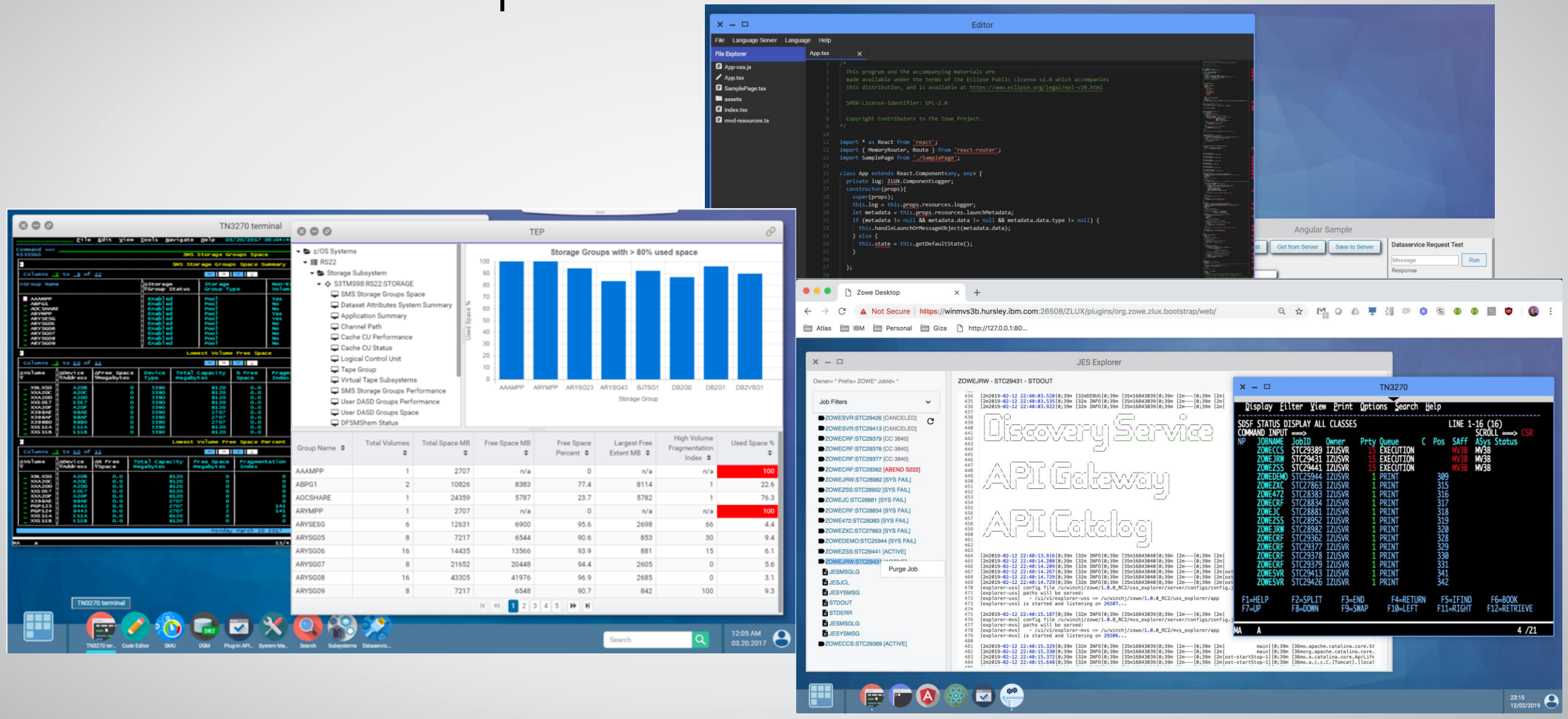
Introducing Zowe

The Opportunity

- Create a unified environment
  - Homogenous desktop-like platform
  - Modern look-and-feel
  - Single sign-on
  - Cross-application launch & communication between vendors
  - 0 install, cloud-like UI
  - Access to legacy web applications, terminals
  - Tools to port & modernize in favorite web technology



A Brand New Experience



The Opportunity

- Attract the new generation of developers
  - Best-of-breed web technologies
  - Simplified application architecture
  - Self documenting REST-APIs
  - Reduced learning curve
  - Open source effort

The Opportunity

- Modernize and enhance existing applications
- Free applications with paying upgrades
- Converge onto a single platform
  - Unified technological stack

The Opportunity

- Increase application development speed
  - Fast development through standard web-app architecture
- Improve release agility
  - Faster delivery of small targeted changes within an app
  - In-between-release delivery

The Opportunity

- Improve responsiveness to customer needs
  - Make, test, and deploy changes in days
  - Create, test, and deploy custom apps in weeks
- Involve customers in the development effort
  - Customers create their own applications and contribute them back to the community
  - Direct insight into their needs and perspectives

The Plan

How We Get There

- Create a web-based desktop environment
  - Rocket's contribution to Zowe
- Expose core z/OS functionalities through REST APIs
  - The empowering move that makes it easy for web developers to master the mainframe
- Plug into the z/OS security model
  - A no-compromise zone for mainframe operators

How We Get There

- Drive adoption
  - Commercial offerings on top of Zowe
  - Customer Advisory Board under OMP
- Provide support
  - Training material and documentation
  - Commercial support

Open Source Transformation

- Rocket
  - Founding member of a new Open Mainframe Project
    - https://www.openmainframeproject.org/
  - Member of the OMP Governing Board
  - Part of the Linux Foundation
- Partnership with IBM and Broadcom

The dawn of a new mainframe ecosystem

What to look for in 2020

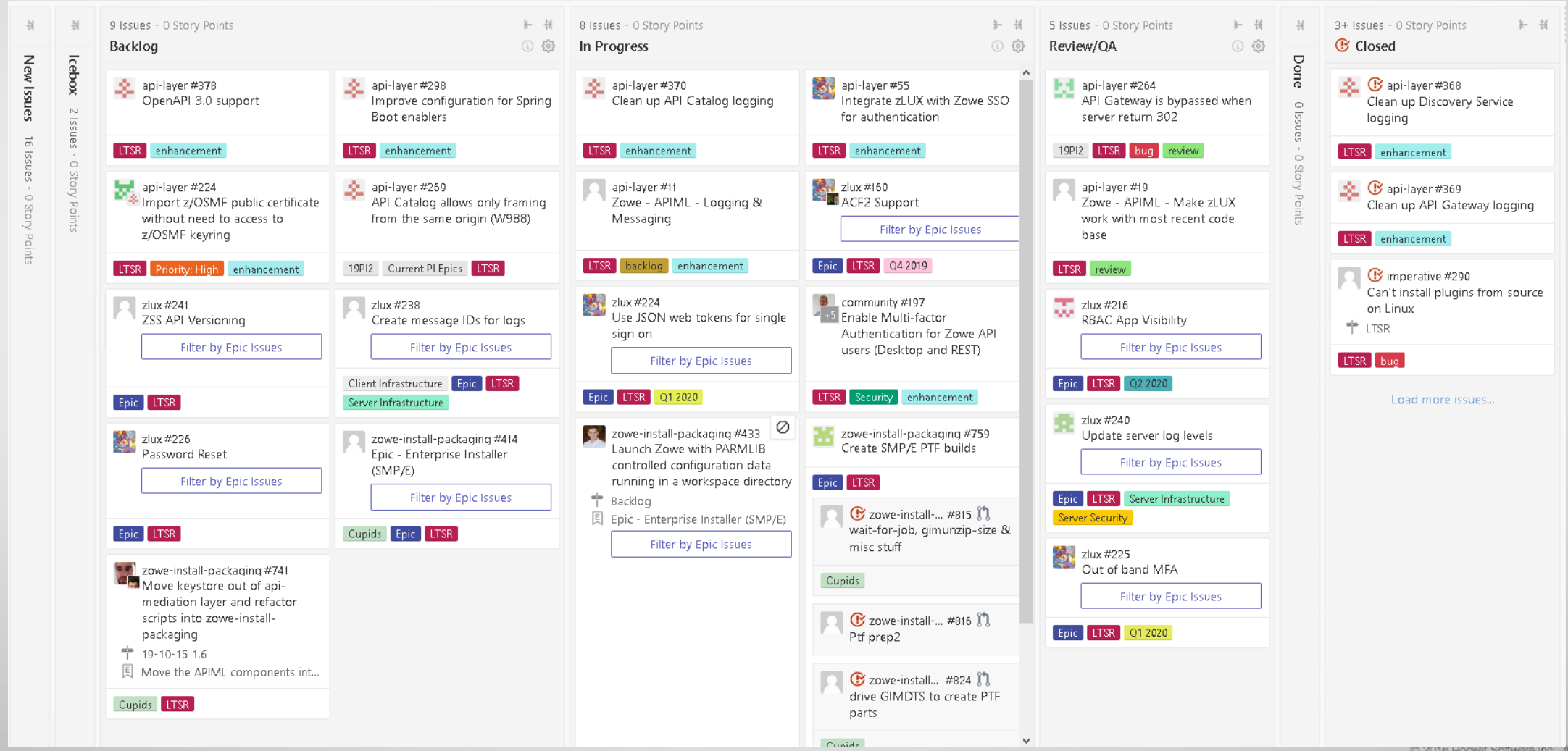
Solution-based z/OS open source bundles

Rocket

- Bundles of ports that work together to solve common problems (e.g. DevOps)
- Easier user experience via conda and packaging and delivery
- 24x7 support offerings to help you succeed in production
- Bundles include examples and extensions specific to DevOps
- Services offerings to get you started

Zowe is now mature: v1.x LTS 2020, v2 starts 2020

See https://zowe.org & https://github.com/zowe & Zenhub

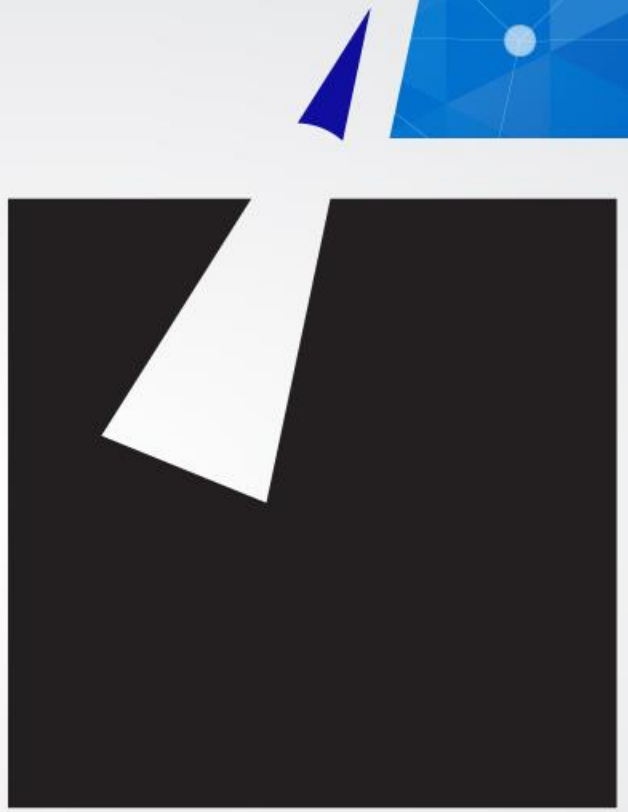


Conclusion

Rocket

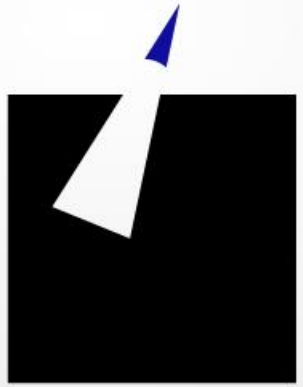
Conclusion

Re-enabling new line of business application development on z/OS



IT'S NOT ROCKET SCIENCE.

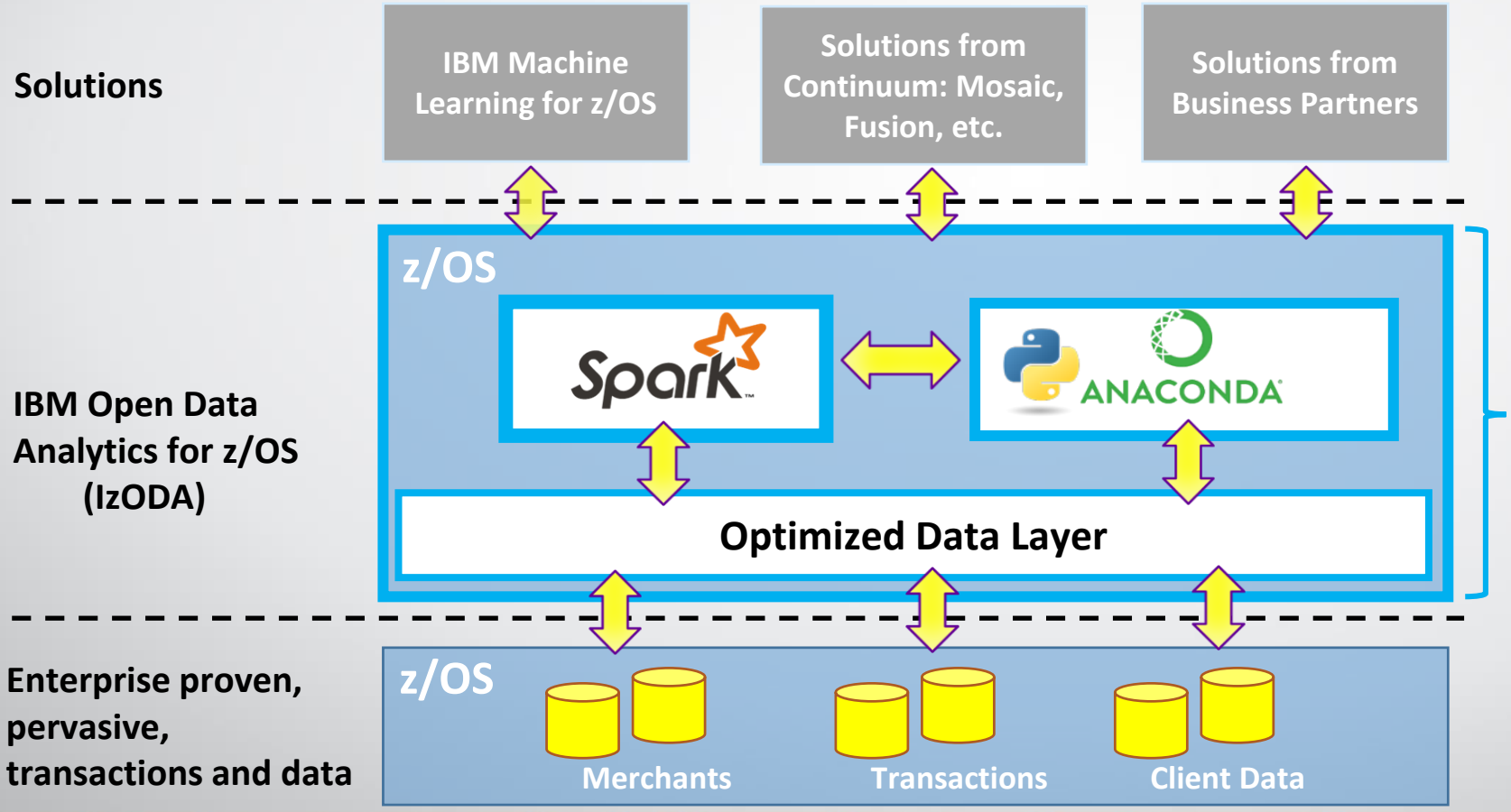
IT'S ROCKET SOFTWARE.



Backup Slides

IBM Open Data Analytics for z/OS V1.1

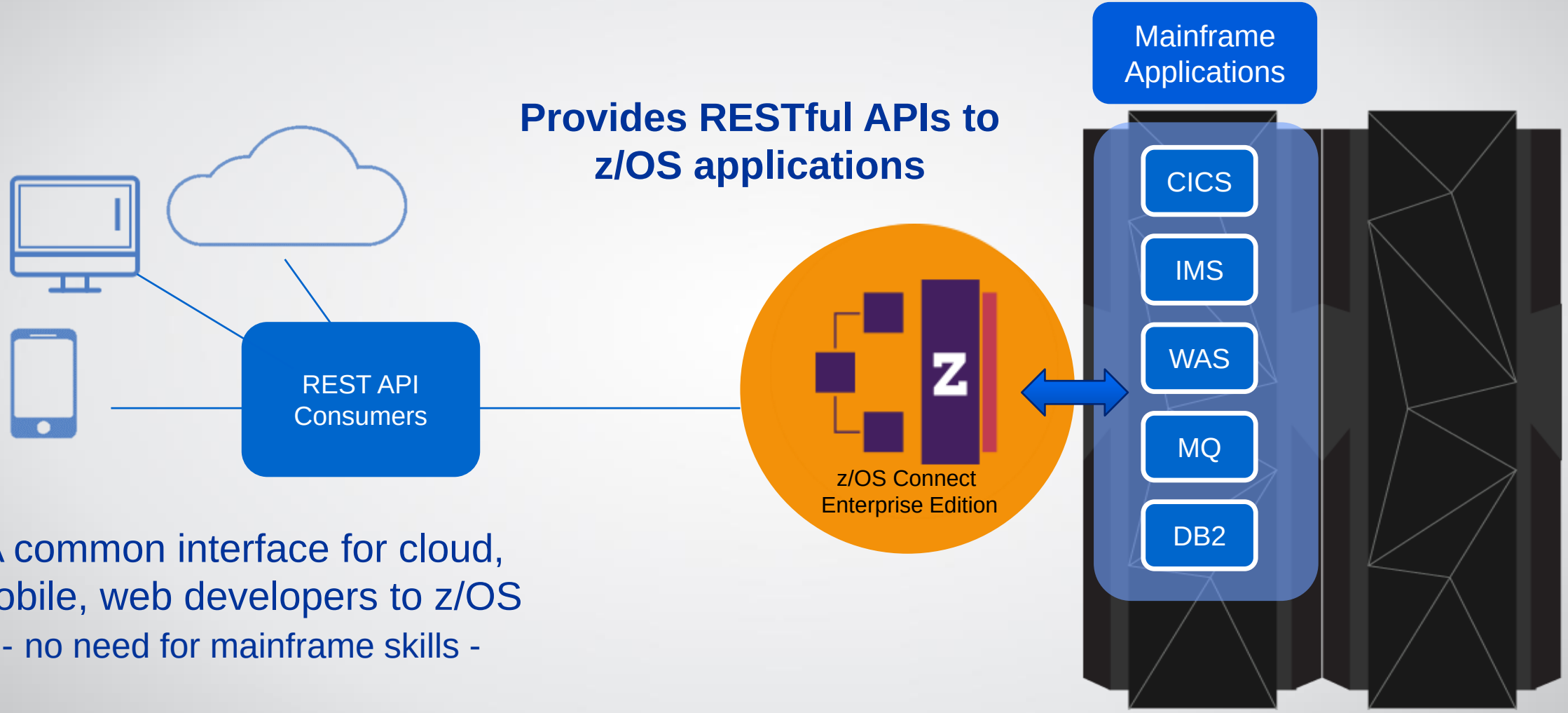
IBM + Rocket + CONTINUUM ANALYTICS = https://izoda.github.io/



- Establish rich runtimes for analytics co-located with IBM Z data
- Leverage leading open source technologies
- Enable advanced solutions from IBM and partners
- Integrate and differentiate with z/OS security & workload

RDV for Modernization

Provides RESTful APIs to z/OS applications

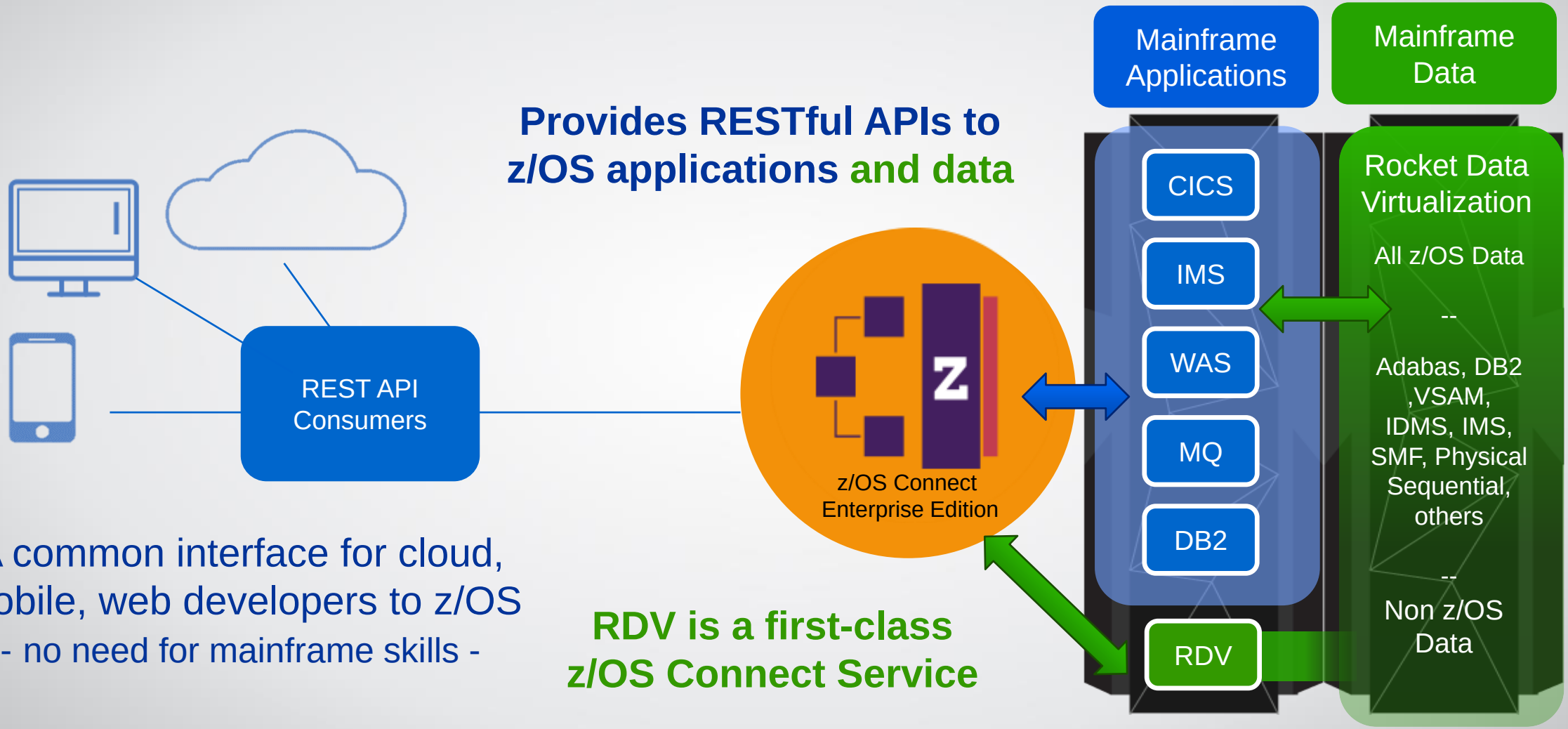


A common interface for cloud, mobile, web developers to z/OS

- no need for mainframe skills -

RDV for Modernization

Provides RESTful APIs to z/OS applications and data



A common interface for cloud, mobile, web developers to z/OS

- no need for mainframe skills -

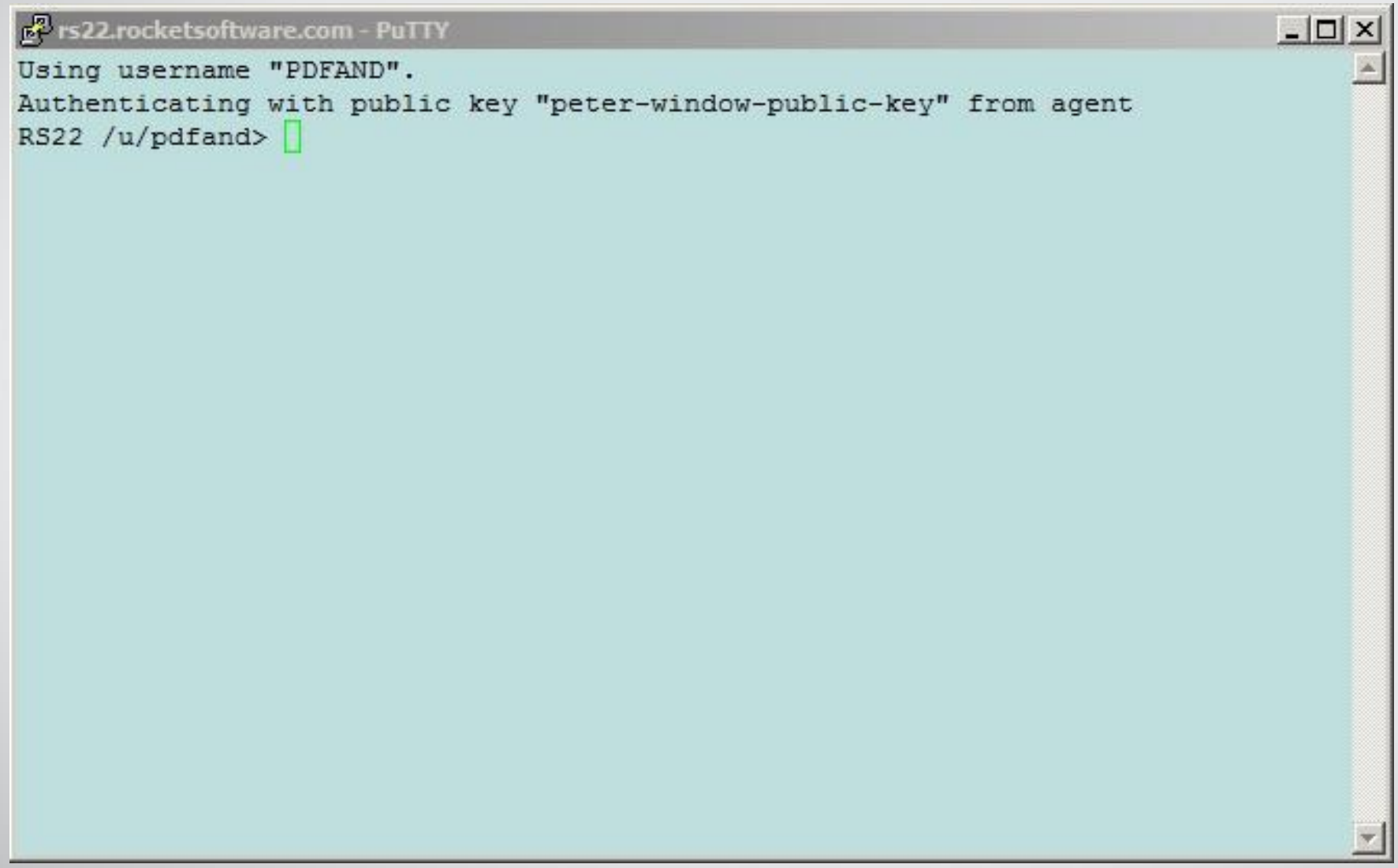
RDV is a first-class z/OS Connect Service

Offline “Demo”

Demonstrate:

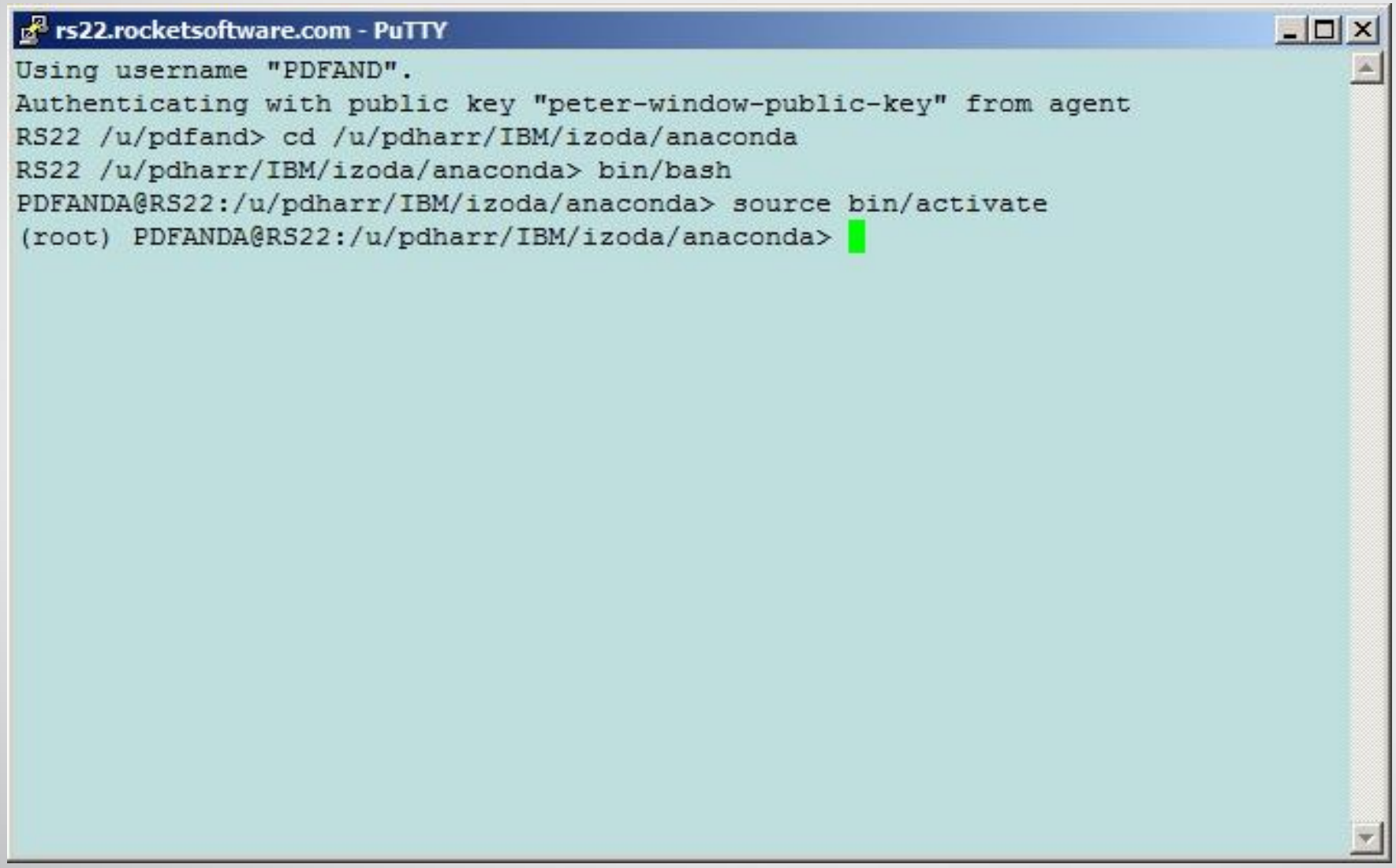
- Setting up Anaconda
- Installing git
- Cloning a github project
- A jupyter notebook
  - written in python
  - getting data via the optimized data layer
  - using data science packages to process, analyze, and visualize in order to create a prediction model for that data.

Logon via Putty

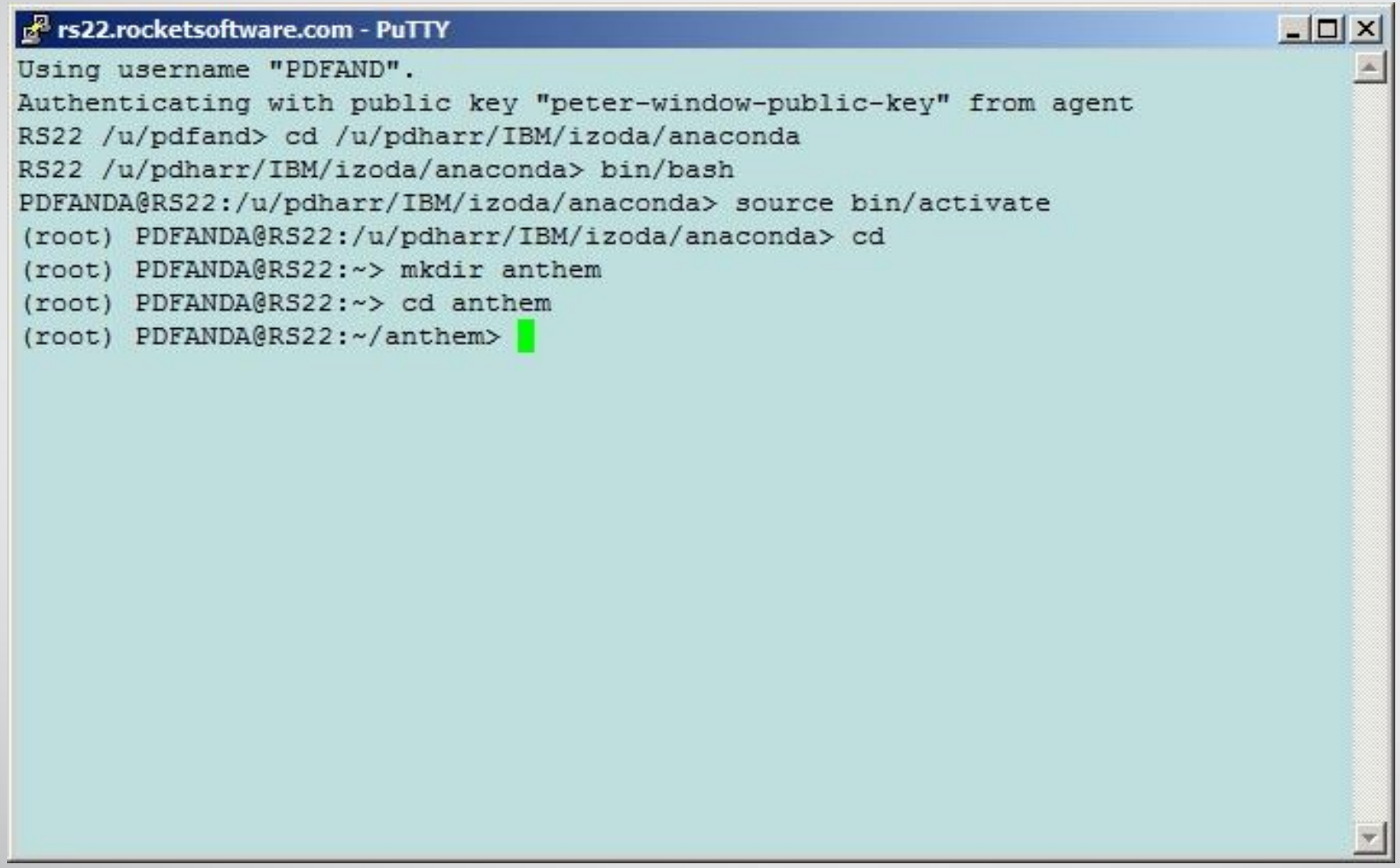


Start Bash

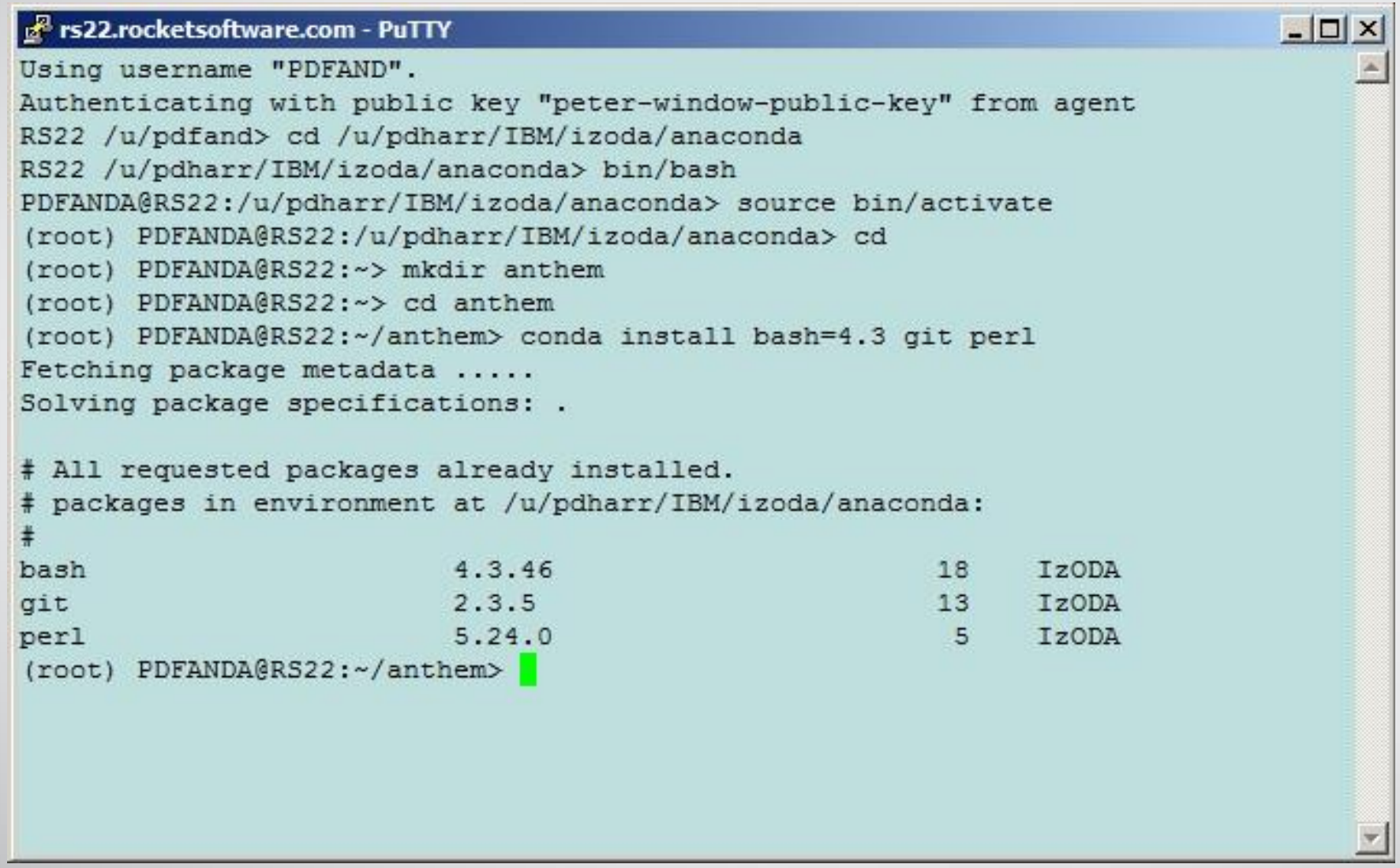
Set up Anaconda



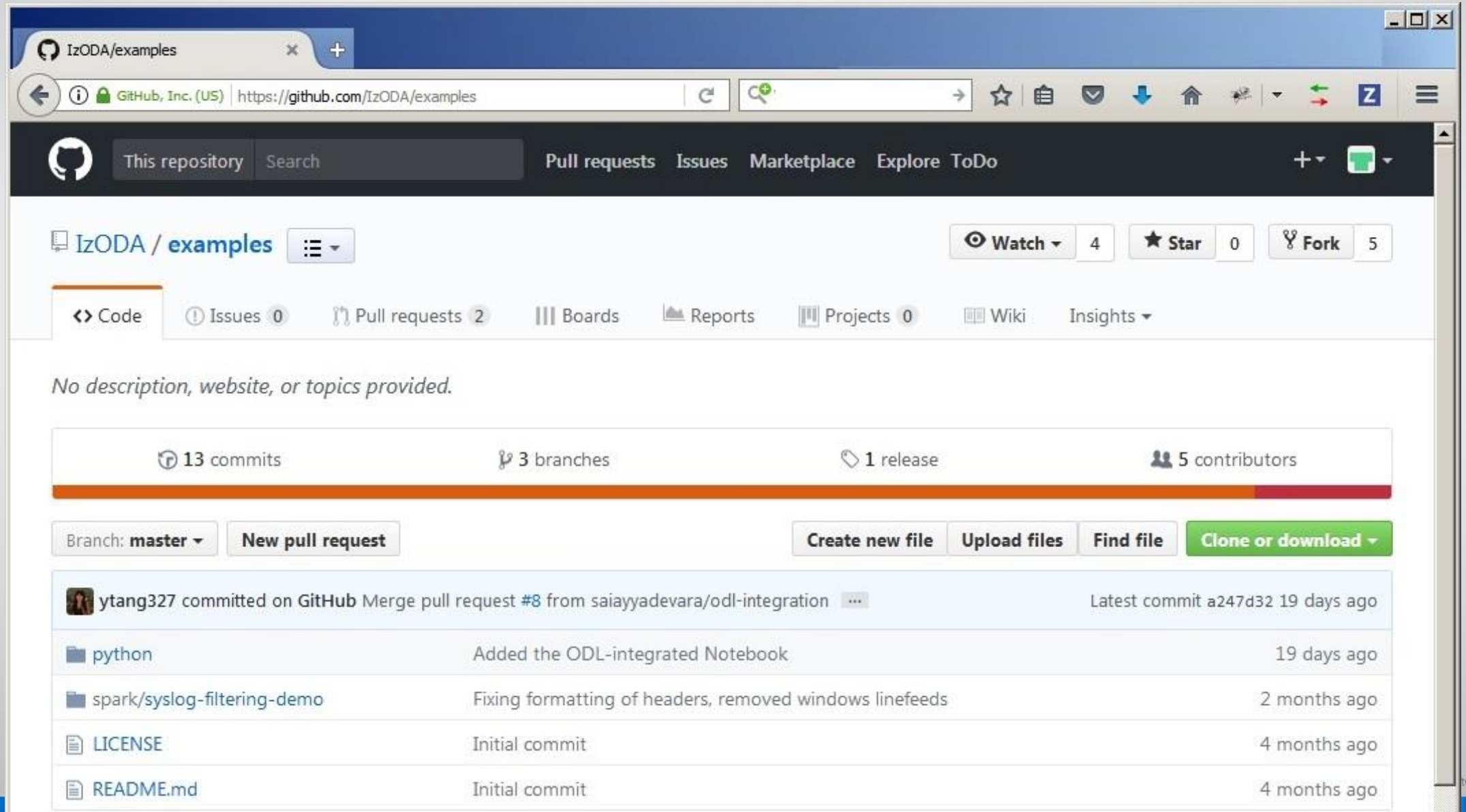
Create your sandbox directory



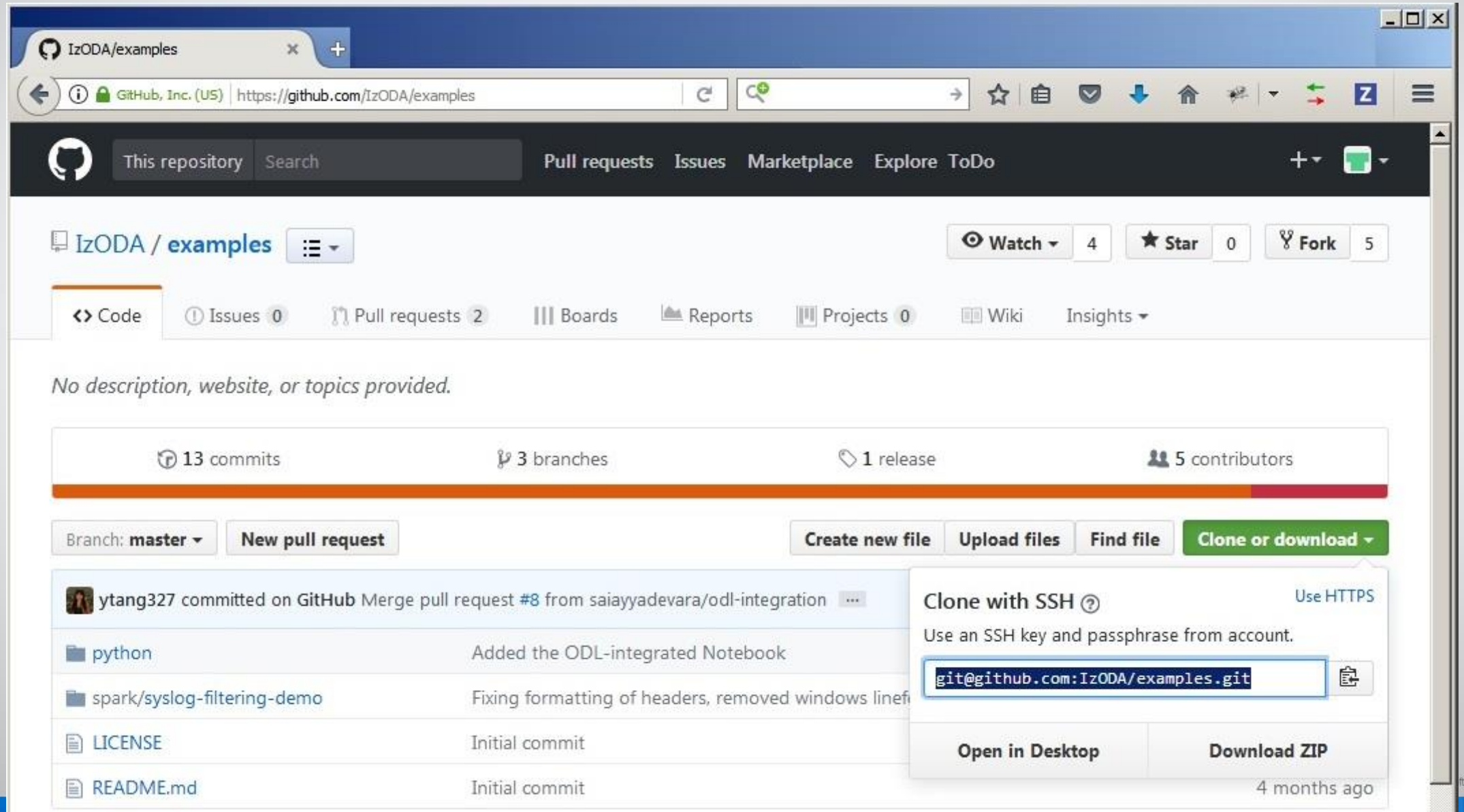
Install latest Bash, git, and Perl



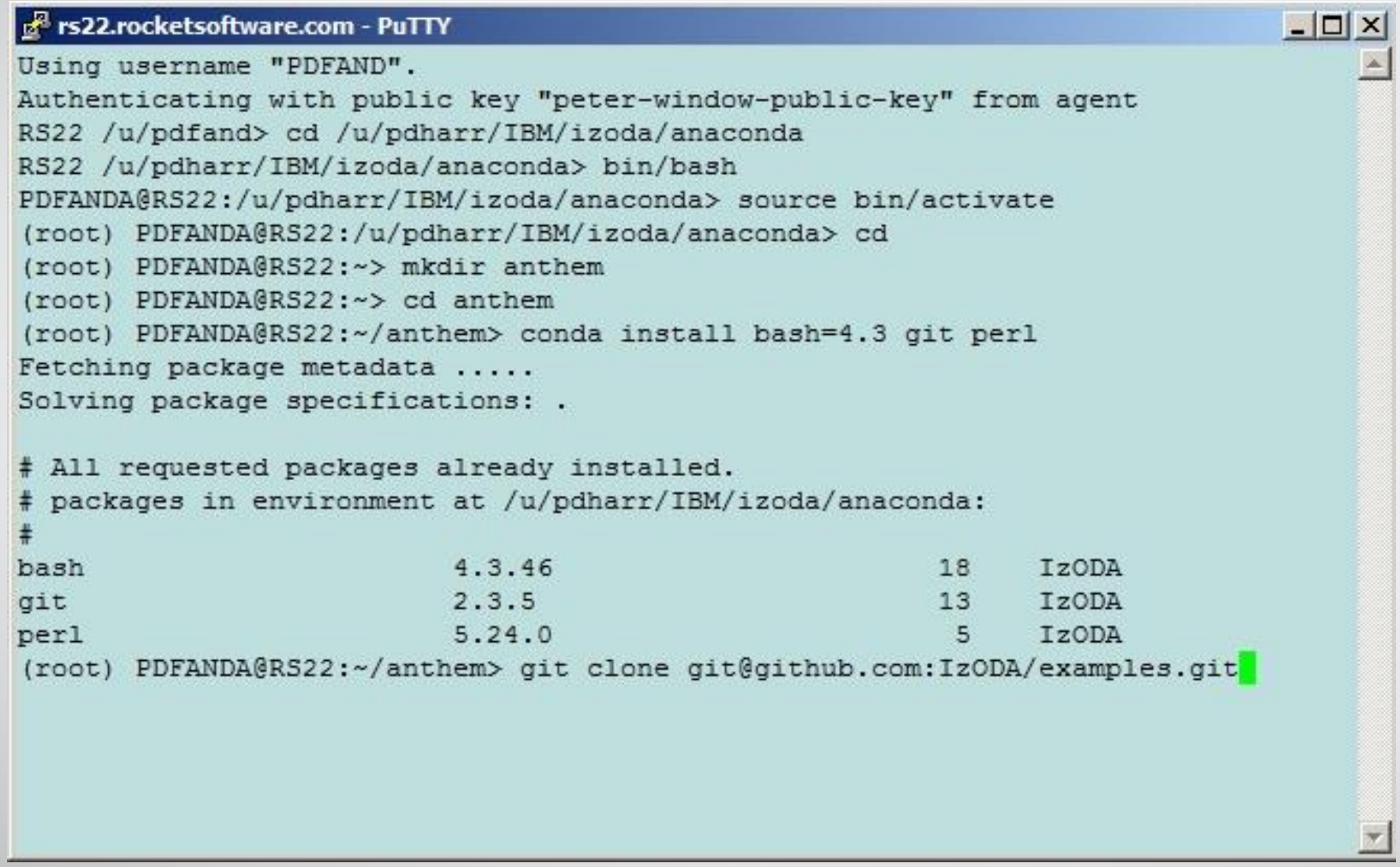
Locate code on github



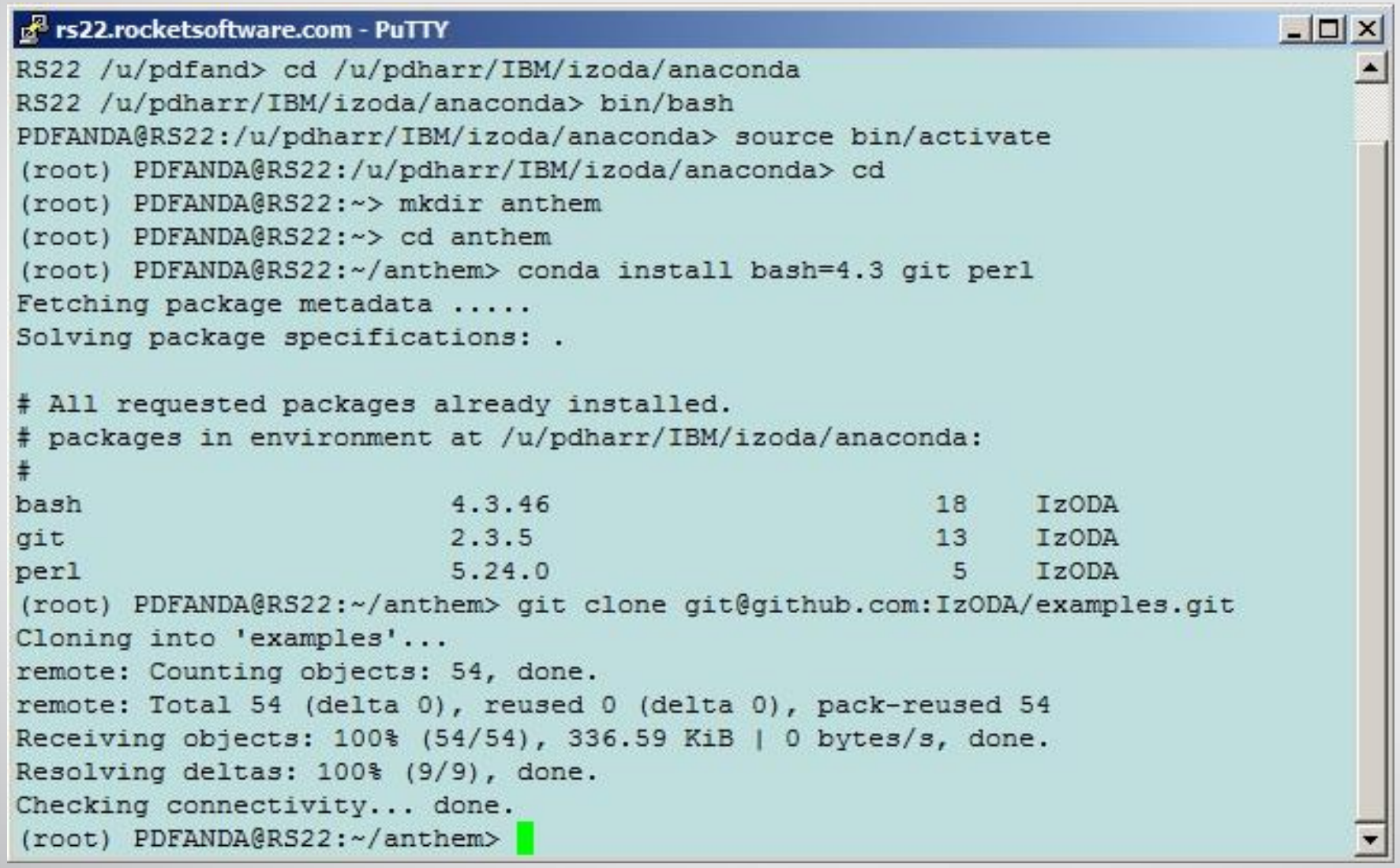
Copy a clone reference to clipboard



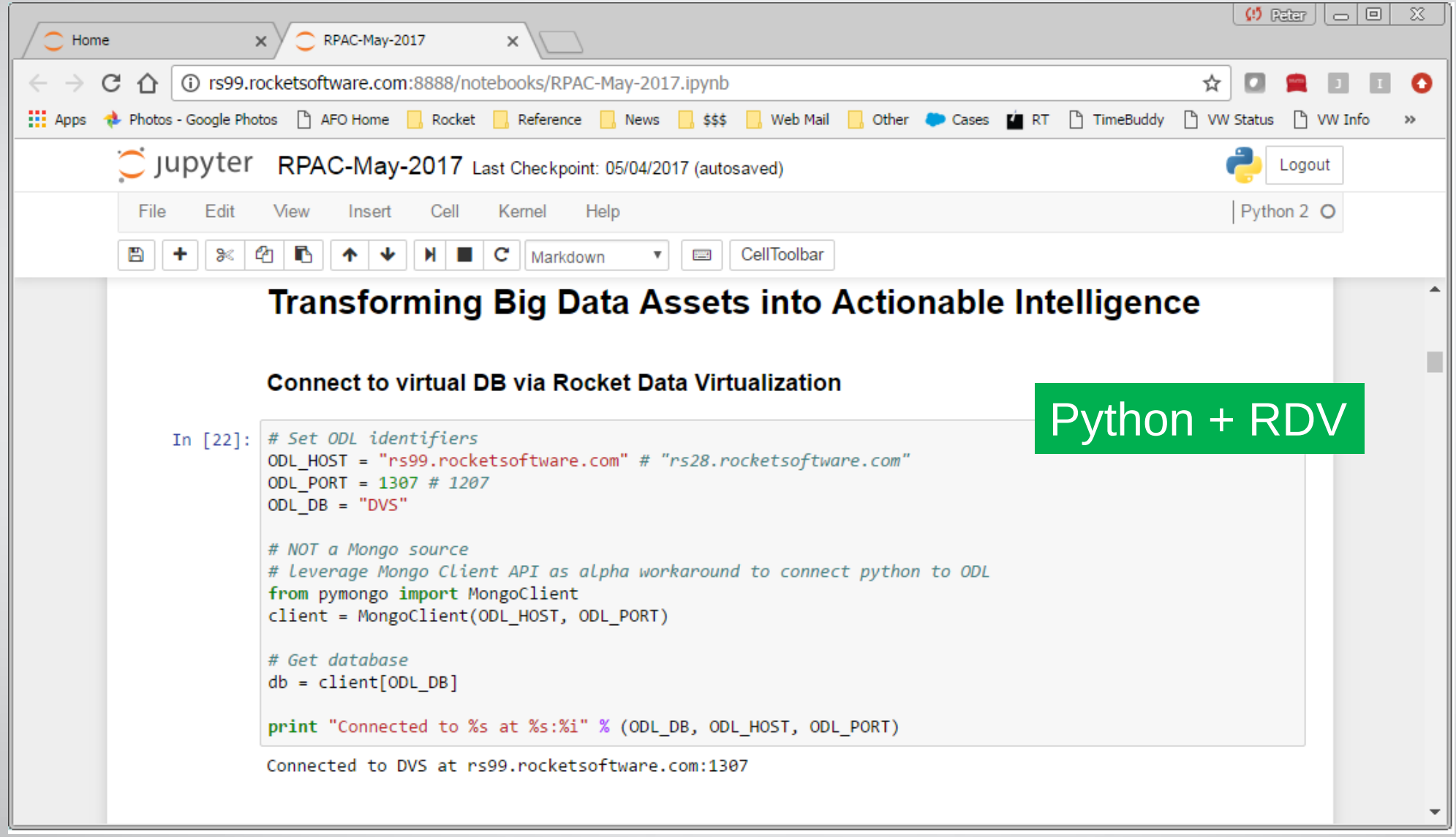
Clone repository



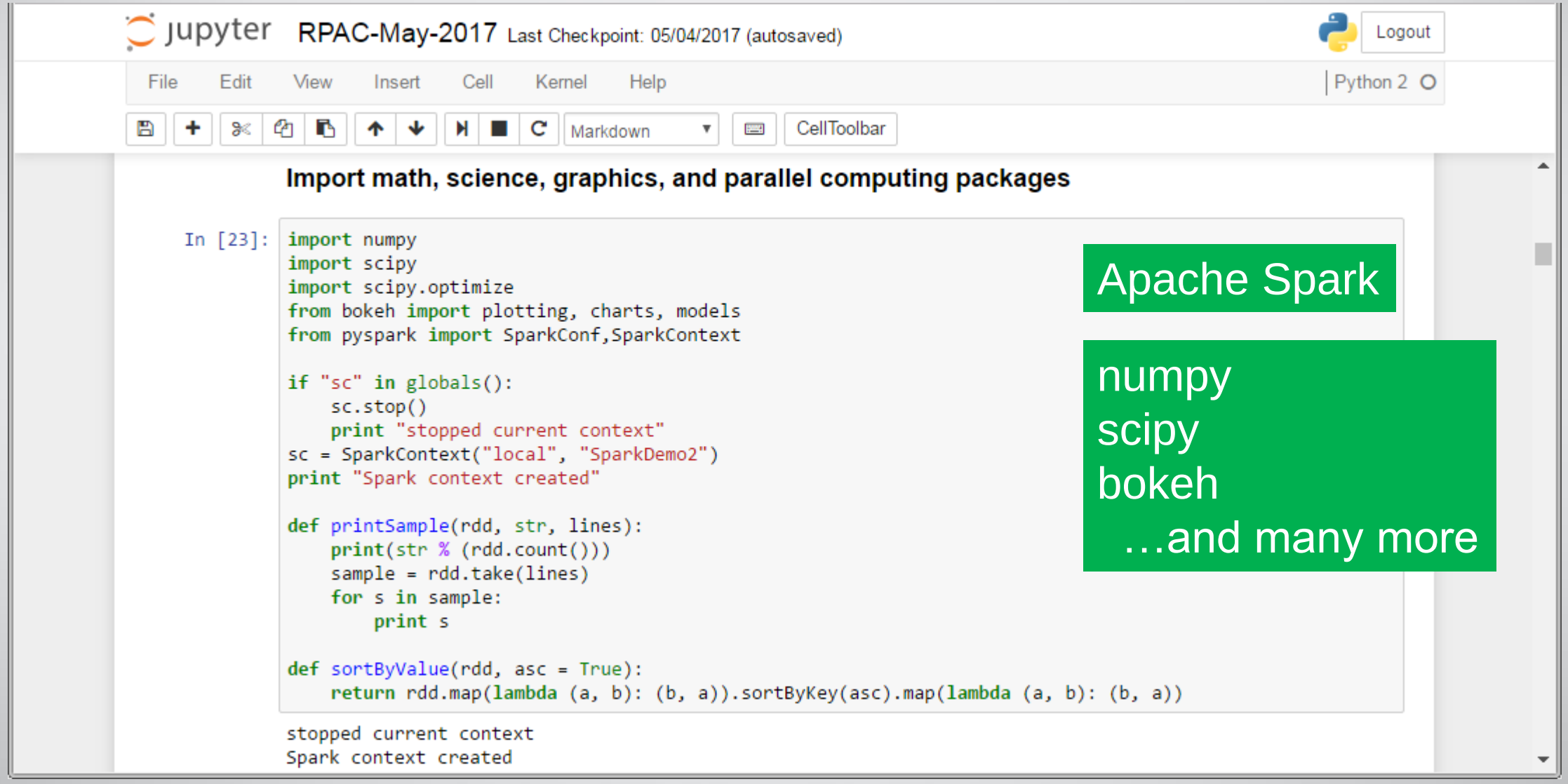
Ready to begin work!



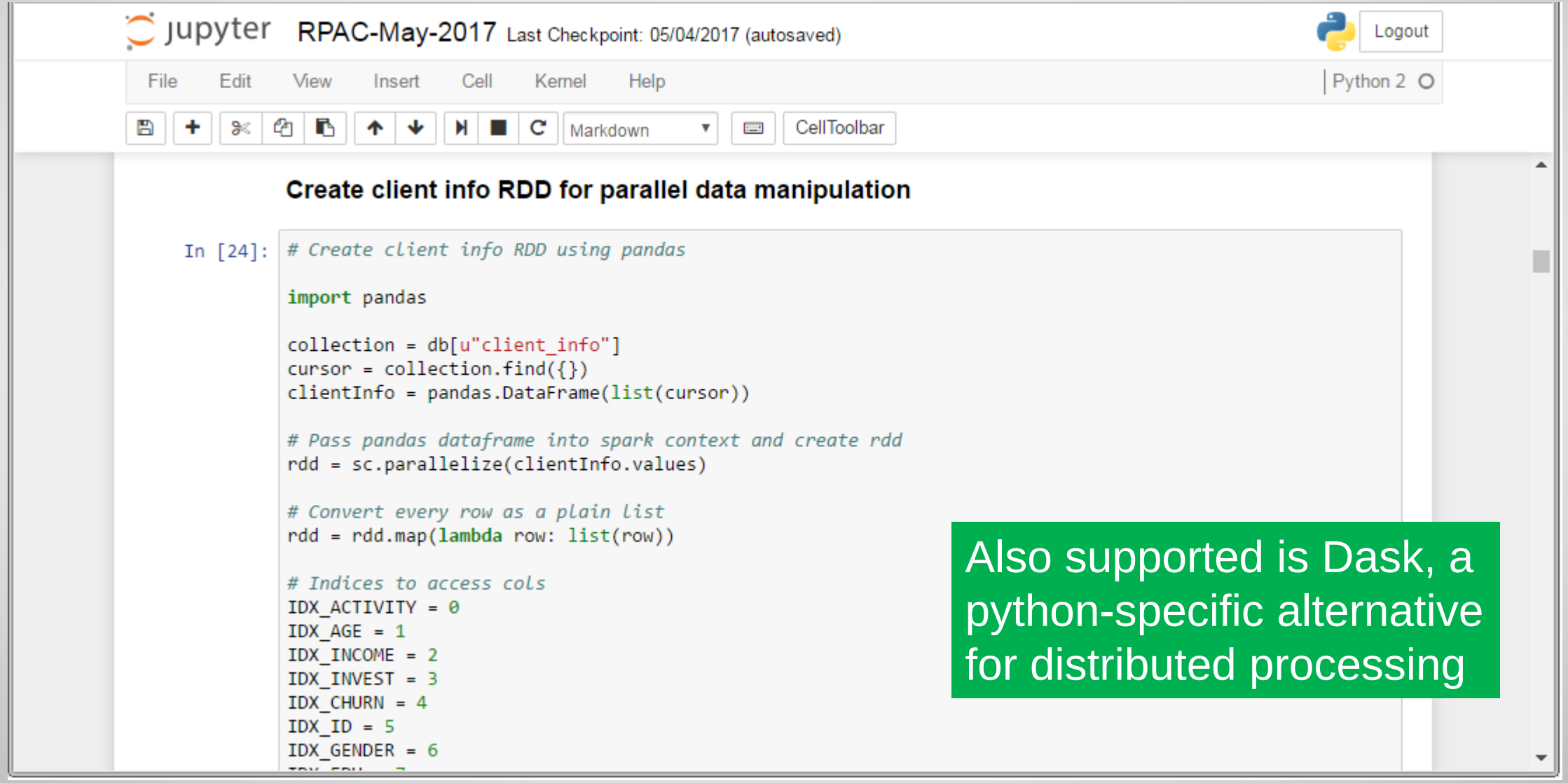
What can one do with this?



What can one do with this?

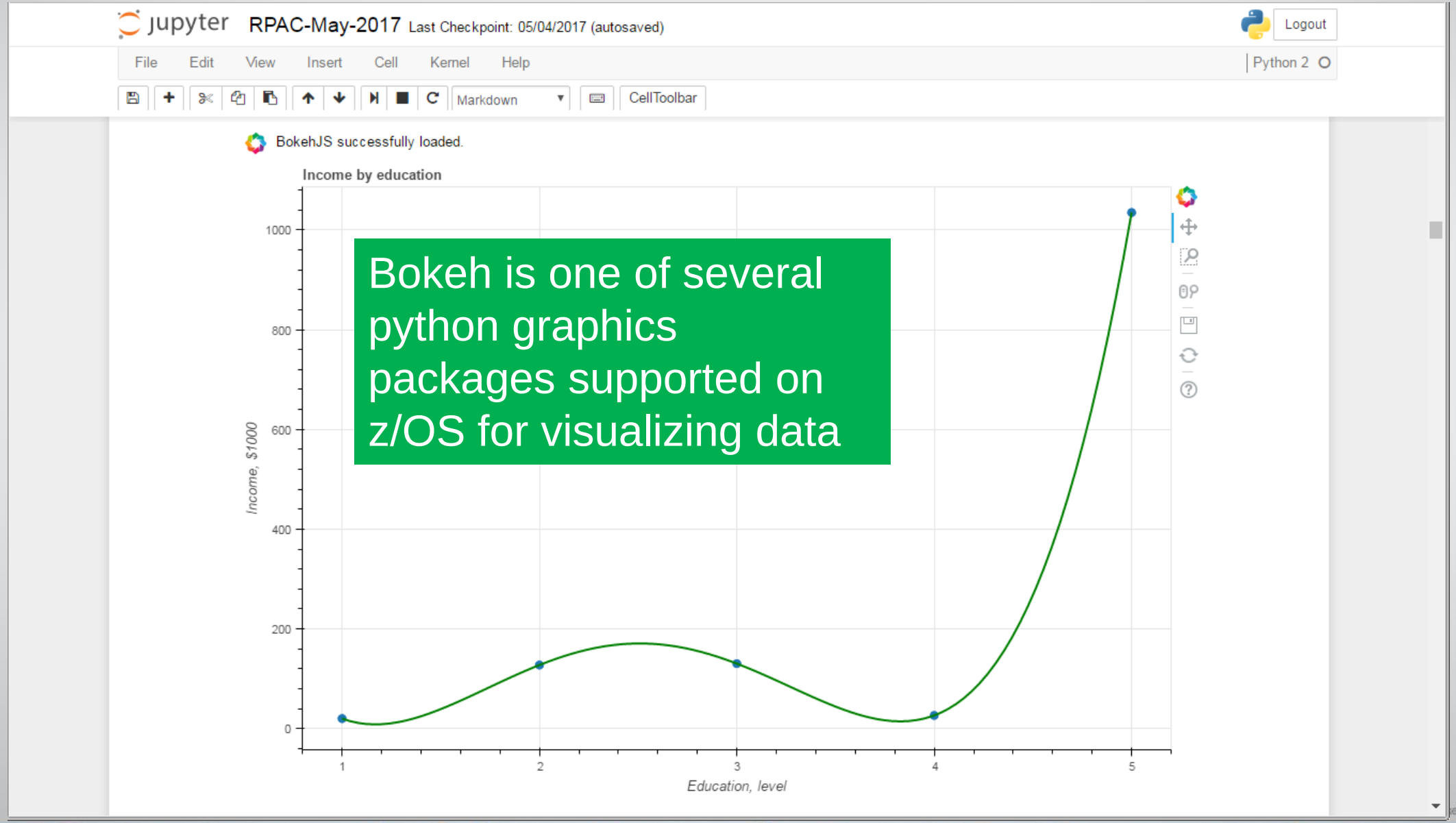


What can one do with this?

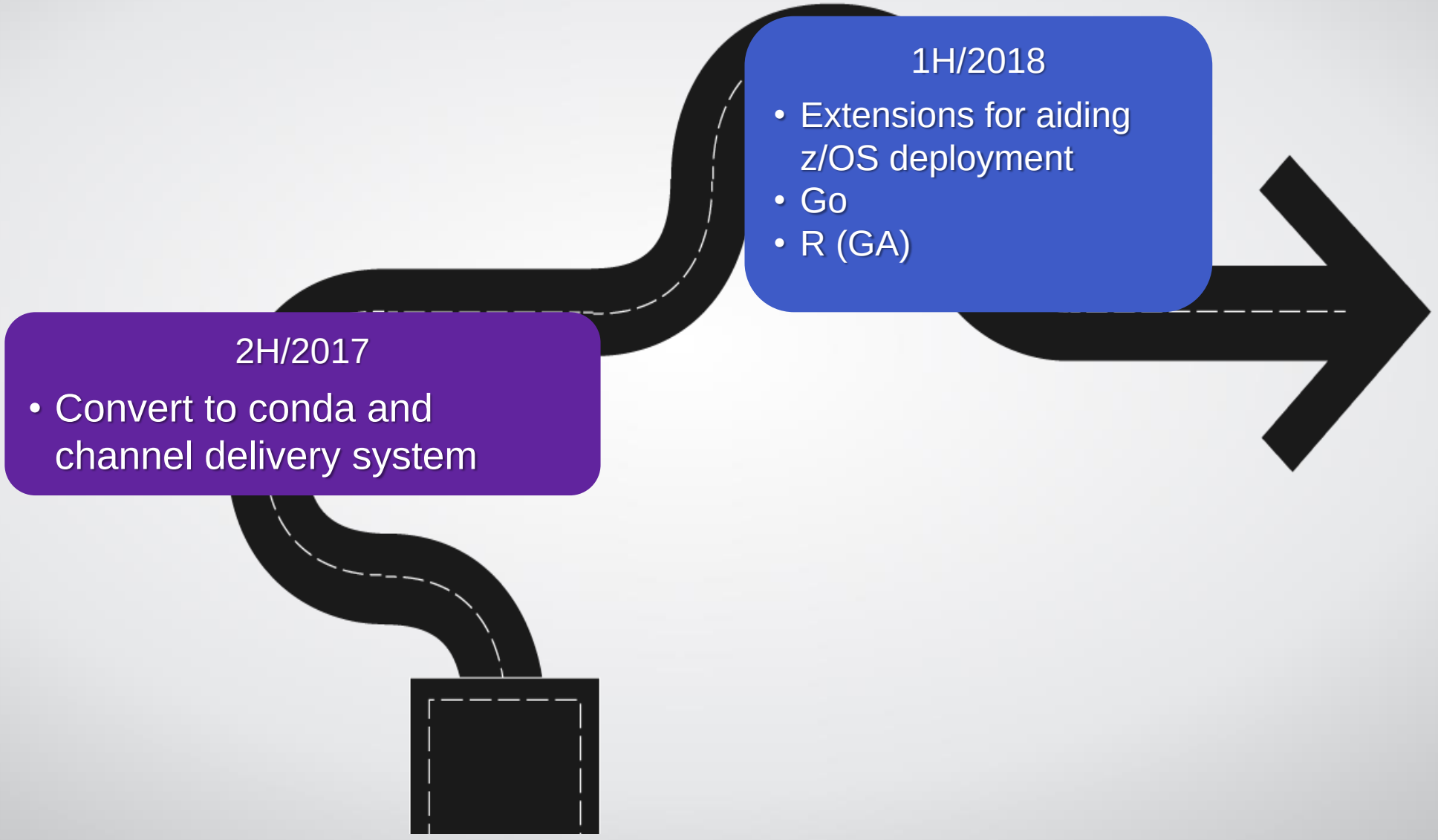


Also supported is Dask, a python-specific alternative for distributed processing

What can one do with this?



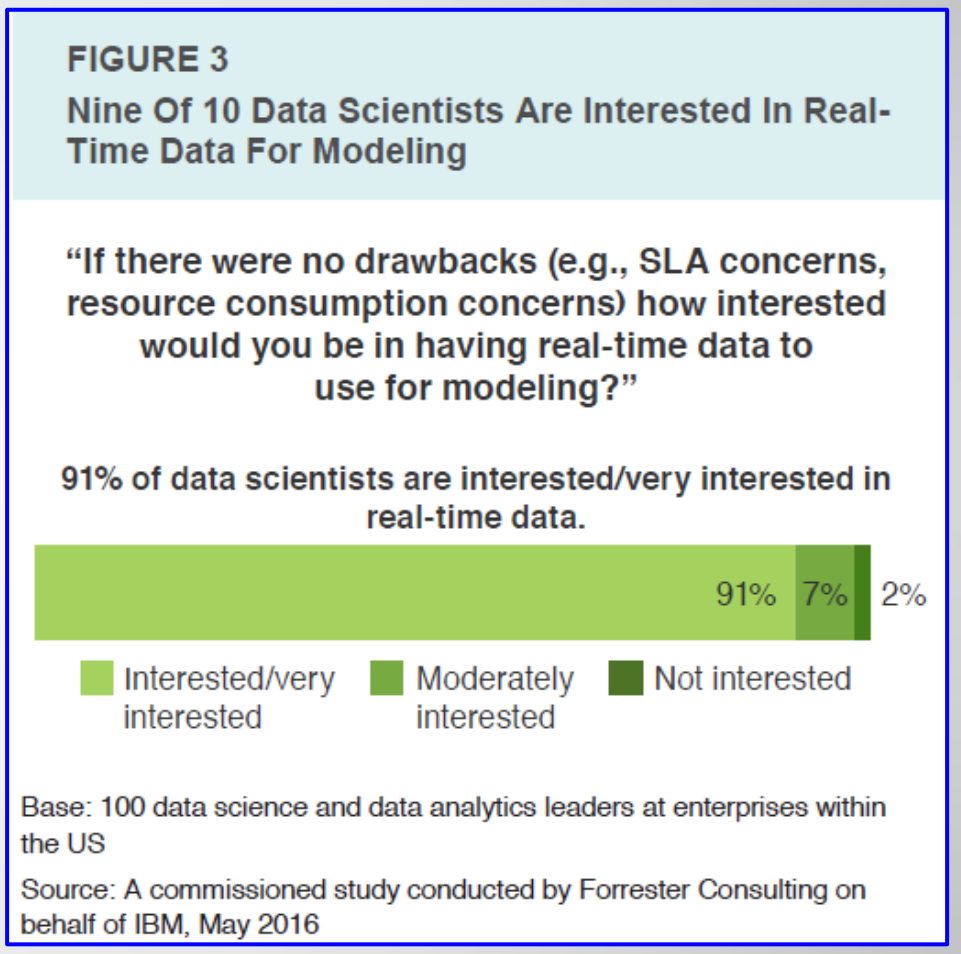
Roadmap – z/OS Open Source



Data Analytics Survey: Need

- Pervasiveness of Analytics
- Business growth

- Need for Real-Time
- Insight at point of impact



Source & Full Forrester paper: https://www-03.ibm.com/systems/z/solutions/real-time-analytics/data-analysis.html

Data Analytics Survey: Challenges

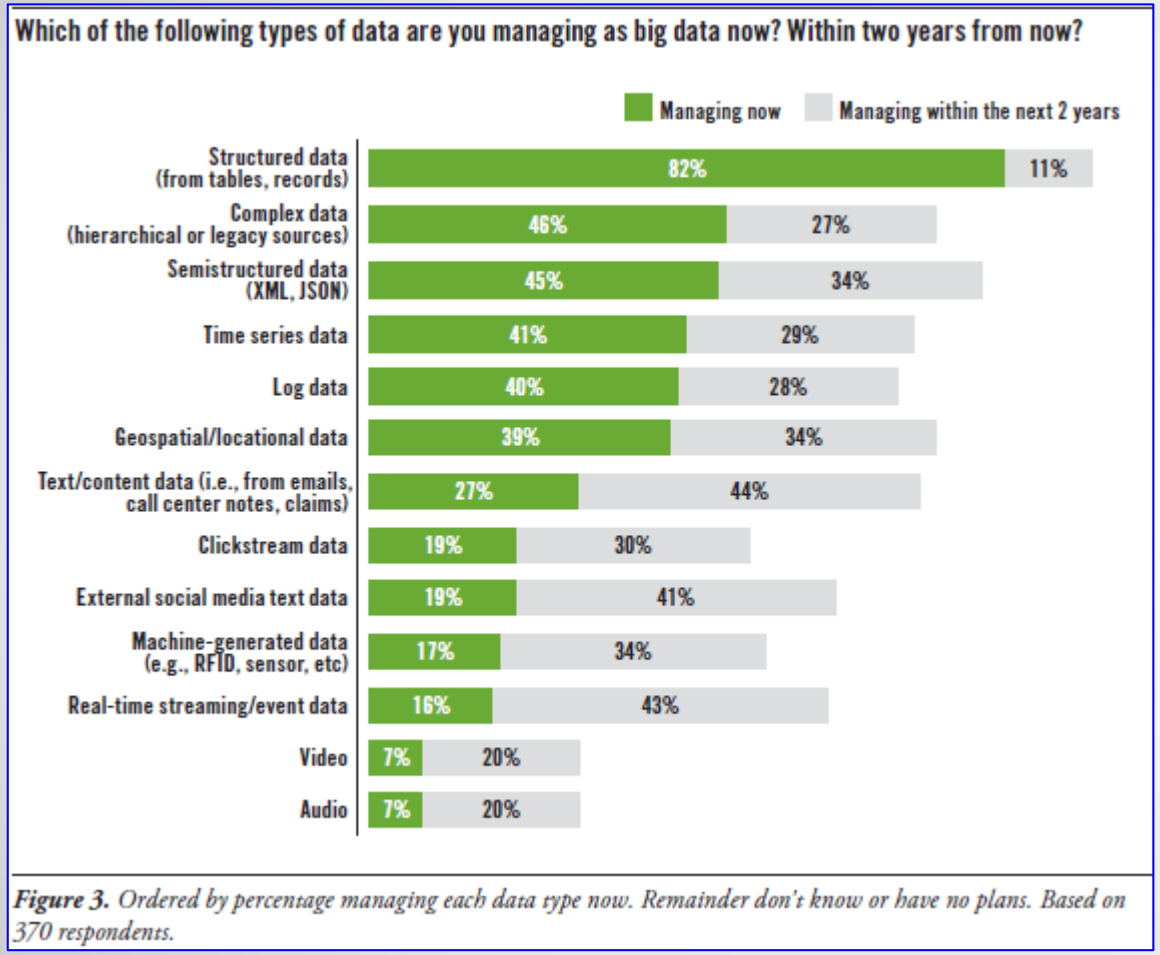
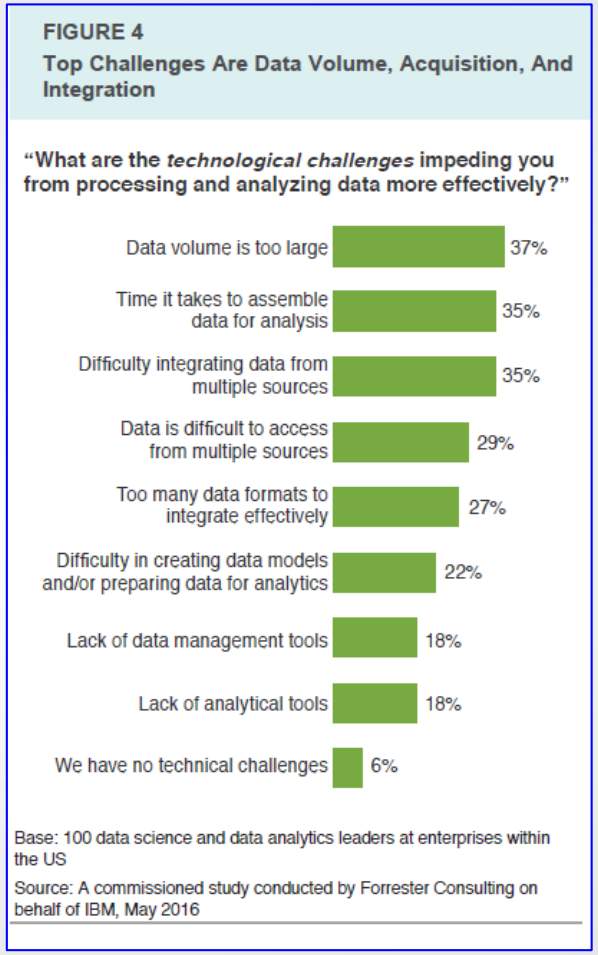


Figure 3. Ordered by percentage managing each data type now. Remainder don't know or have no plans. Based on 370 respondents.



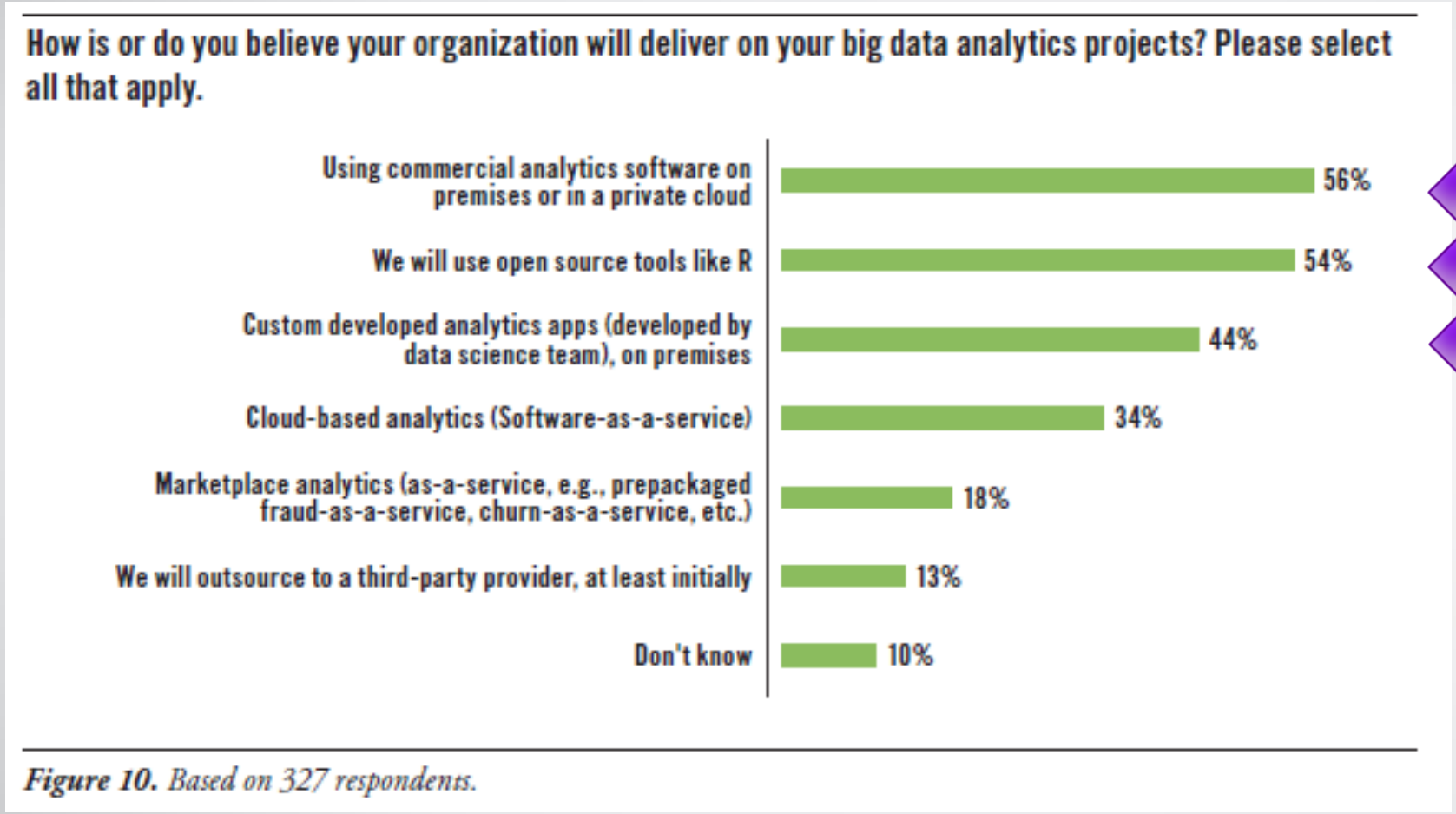
Challenges:

- Data integration
- Disparate sources
- Volume of Data
- Model creation and preparation

Source: TDWI Best Practices Report, Dec 2016, Data Science and Big Data, by Fern Harper

Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, May 2016

Data Analytics Survey: Methods



On premise, leverage commercial analytics tools

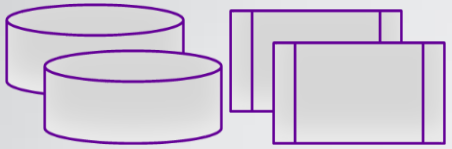
Leverage open source

Custom applications, on premise

Source: TDWI Best Practices Report, Dec 2016, Data Science and Big Data, by Fern Harper

RDV data flow

Multitude of Enterprise Applications & Data



- Dataset names
- Cobol copybooks
- PL1 include files

1

IBM Application Discovery and Delivery Intelligence (IBM ADDI)

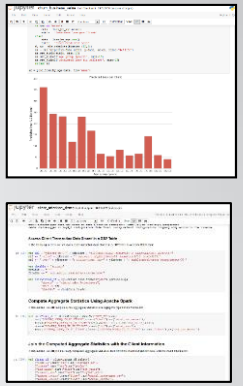
2

IBM ADDI Catalog (Relational Store)

3

RDV

7



Analytic Output

4

Match high level language structures to physical datasets and databases

Validate to associate type of data

	z/OS Dataset Name	Type	COBOL Structure
X	CSD.AI38.EMPLOYEE.KSDS	VSAM	EMPLOYEE-RECORD
	CSD.AI38.DEPARTMENT.KSDS	VSAM	DEPARTMENT-RECORD
X	CSD.AI38.OFFICE.KSDS	VSAM	OFFICE-RECORD
X	CSD.AI38.UPDATE.TRANS	QSAM	NAME-CHANGE-RECORD
X	CSD.AI38.UPDATE.TRANS	QSAM	ADDR-CHANGE-RECORD
	CSD.AI38.UPDATE.TRANS	QSAM	SALARY-CHANGE-RECORD
X	CSD.AI38.UPDATE.TRANS	QSAM	OFFICE-CHANGE-RECORD

5

Map Selected

Generate virtual tables using simple wizards and batch processes with **no additional data collection**

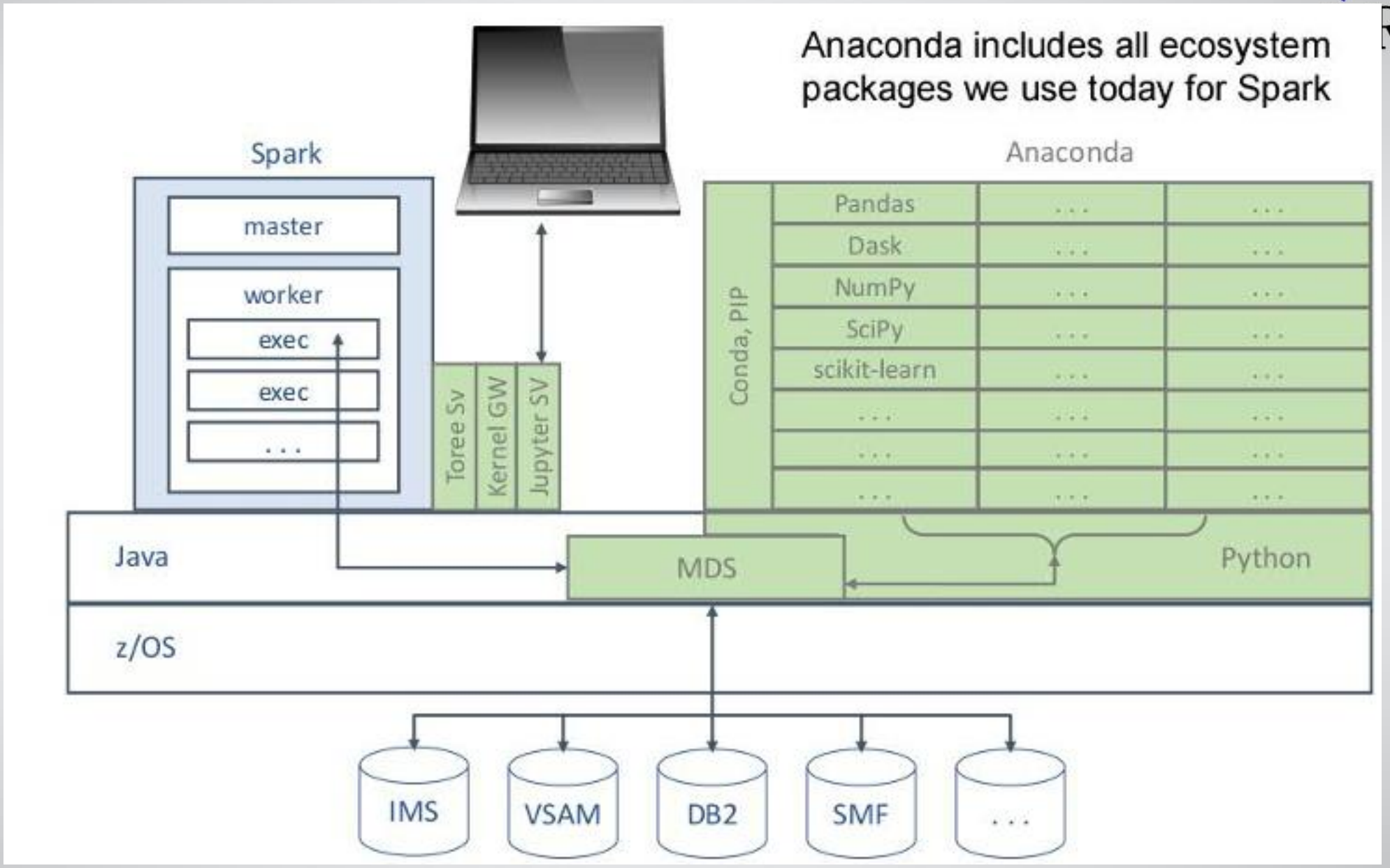
6

Read & analyze as result of SparkSQL or Python Interaction

Cust_ID	Investment	Avg TX AMT
1009530860	114368	2090.32
1009574010	112099	1297.41
1009578620	84638	1333.18

Virtual Tables Consumed by IBM Open Data Analytics for z/OS

BELOW HERE, SURPLUS SLIDES



Applying Data-in-Place Analytics within the Enterprise: IBM Open Data Analytics for z/OS

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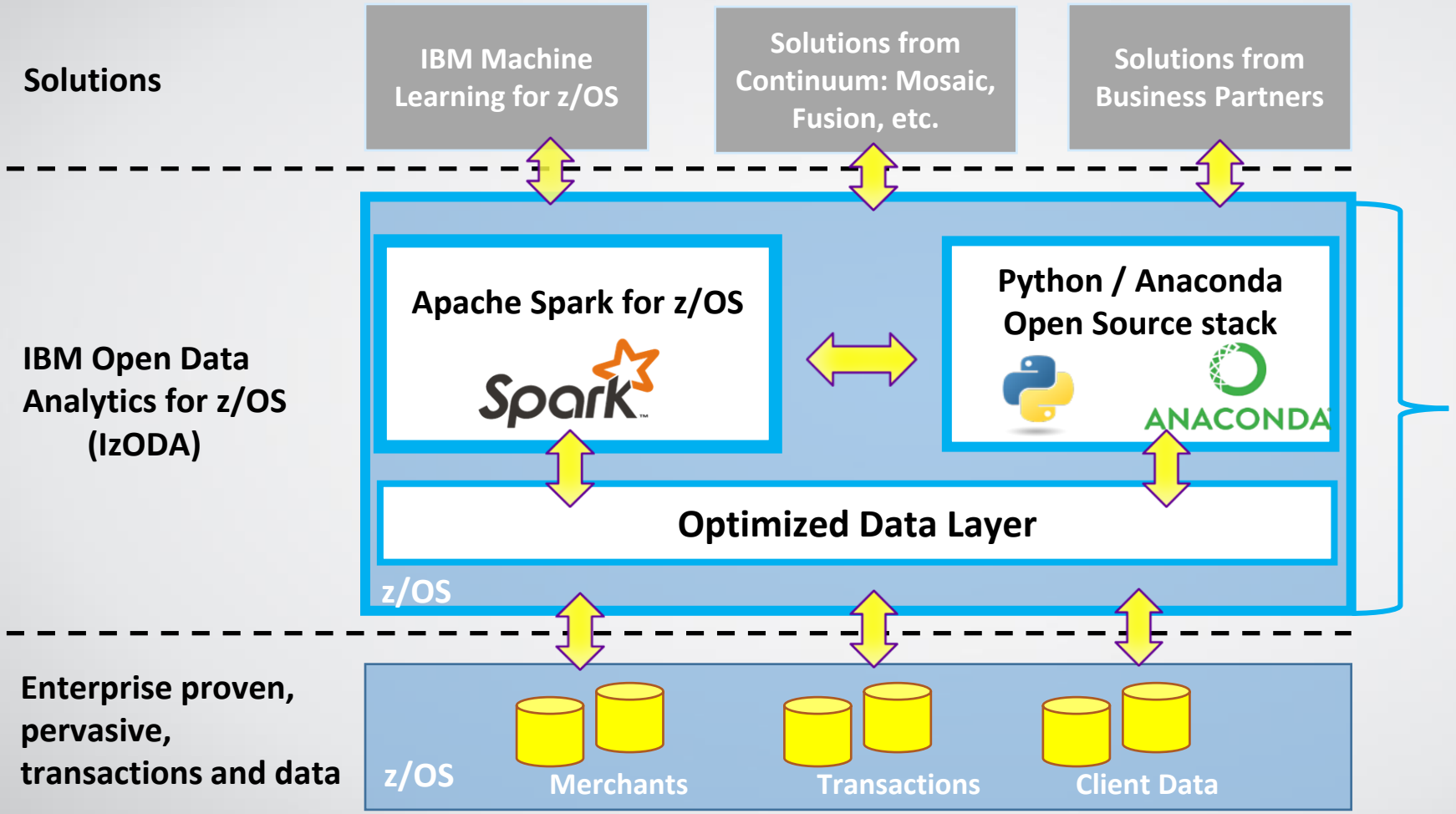


- Establish rich runtimes for analytics co-located with IBM Z data
- Leverage leading open source technologies
- Enable advanced solutions from IBM and partners
- Integrate and differentiate with z/OS security & workload

Courtesy of Joe Bostian (jbostian@us.ibm.com), IBM Z Ecosystem Team Lead

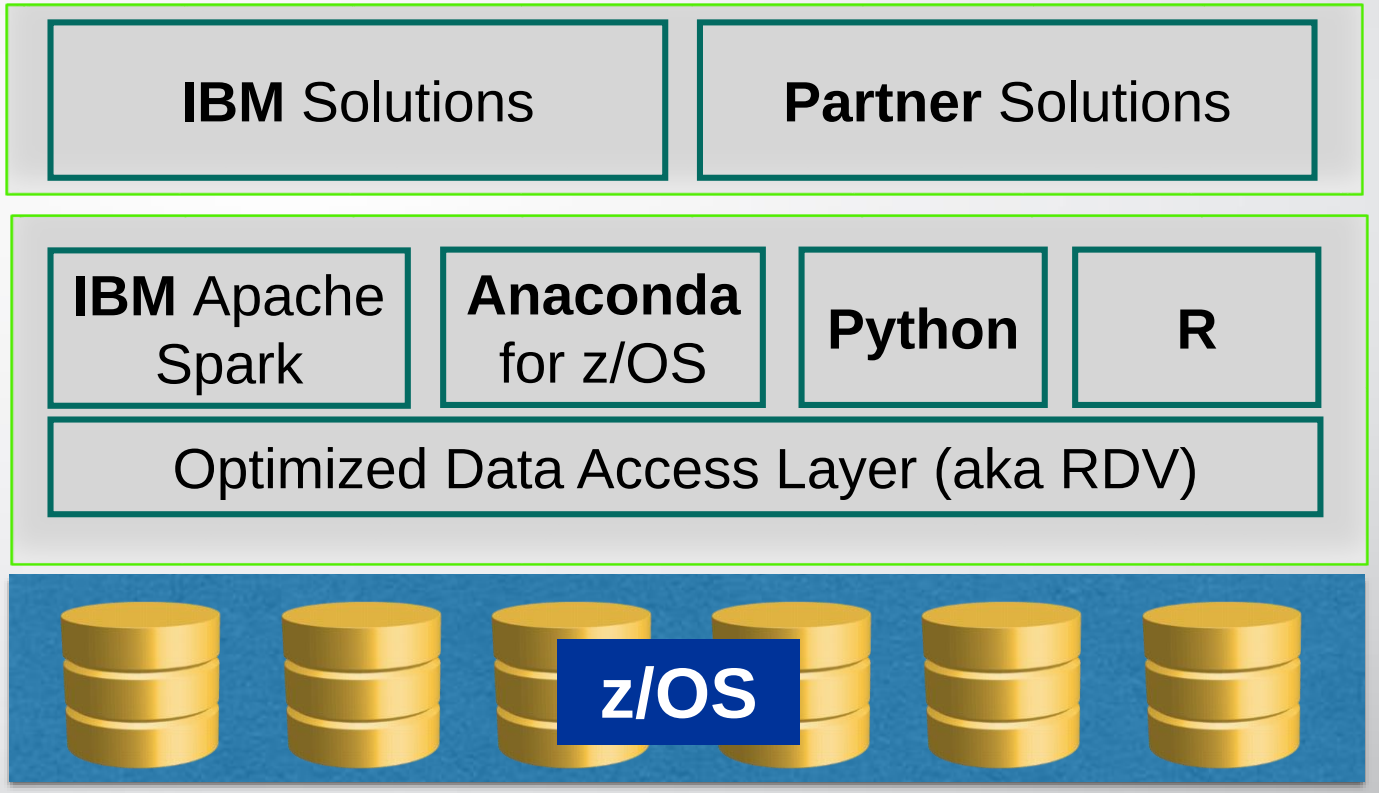
IBM Open Data Analytics for z/OS V1.1

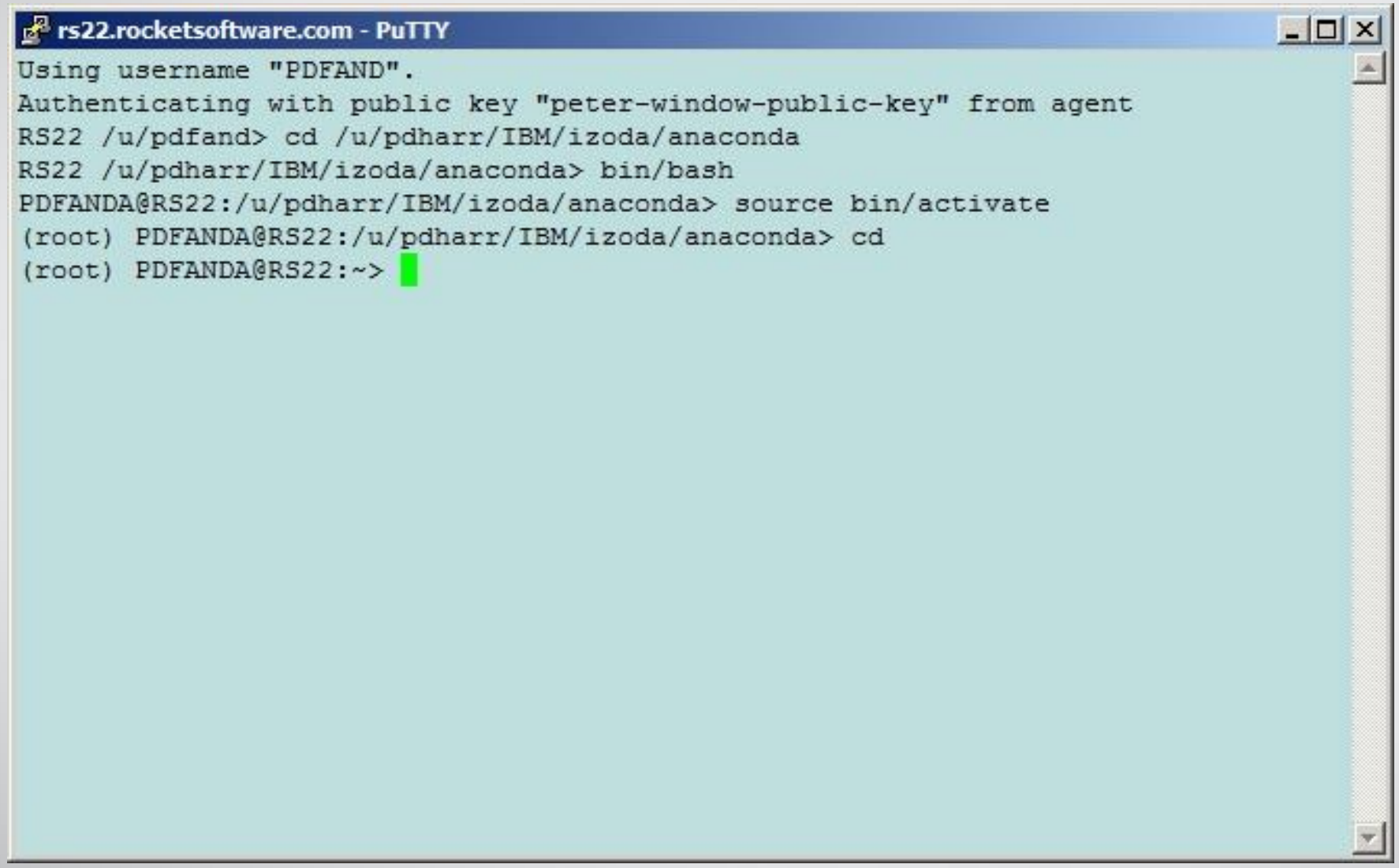
IBM + Rocket + CONTINUUM ANALYTICS = https://izoda.github.io/

Solutions

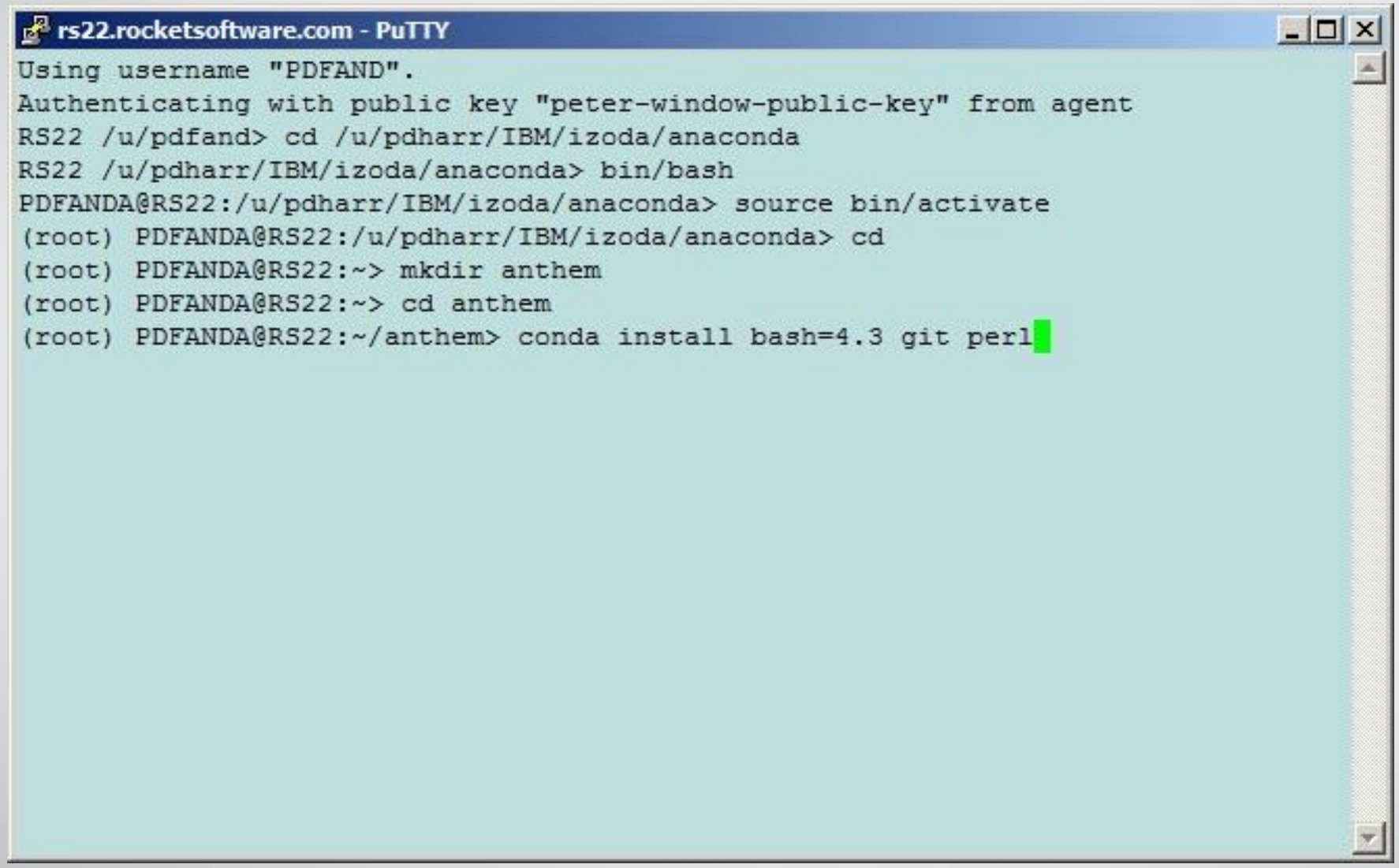
Optimized Analytics Platform

Your data!



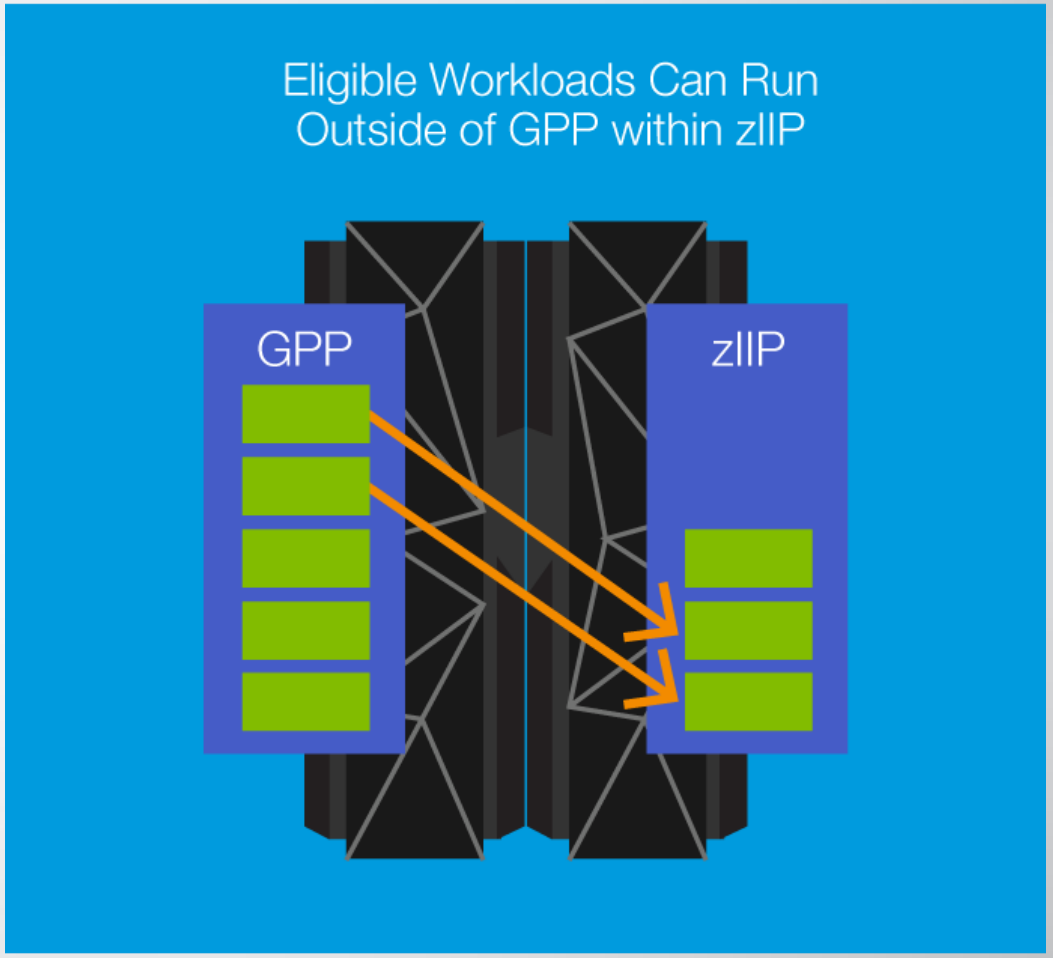


Install latest Bash, git, and Perl

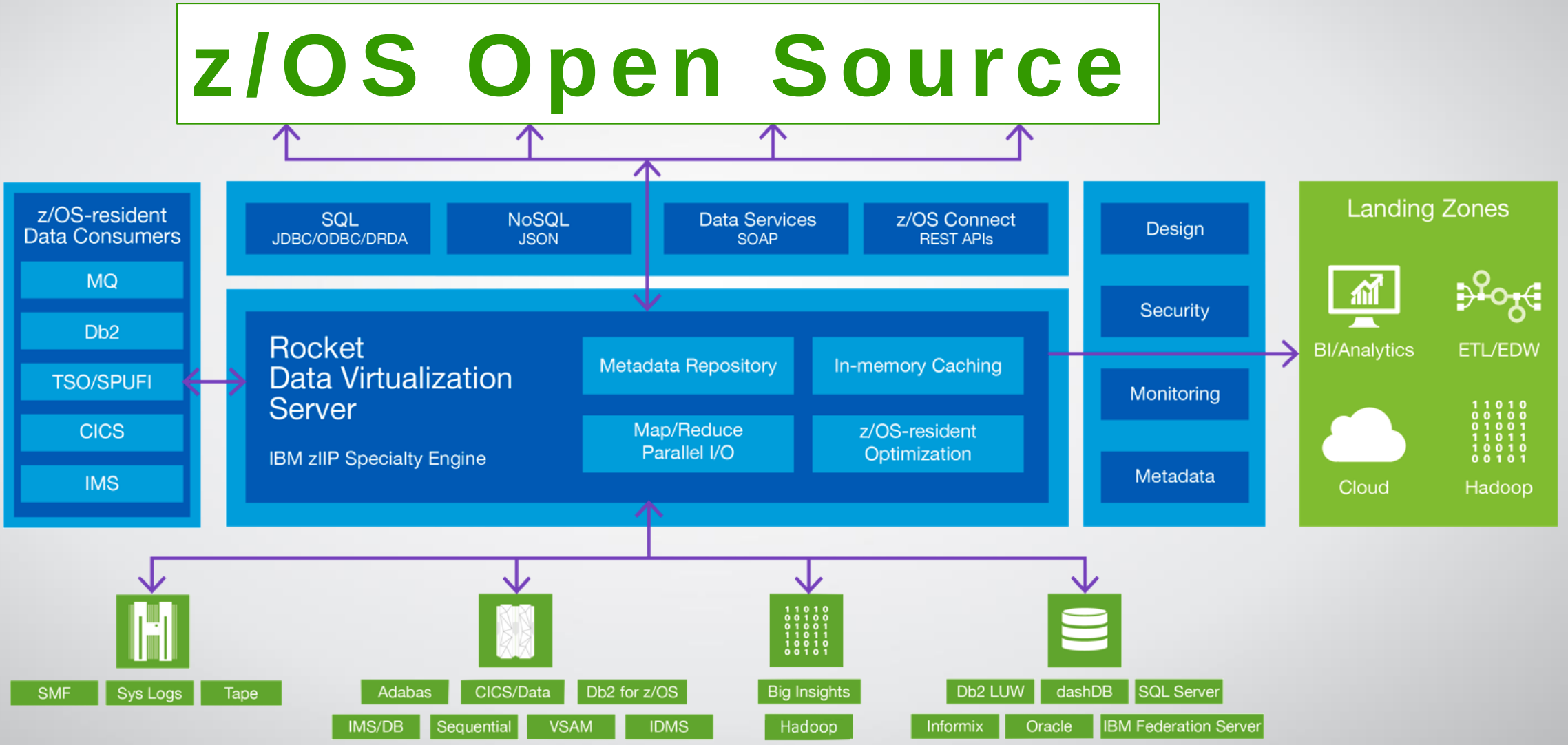


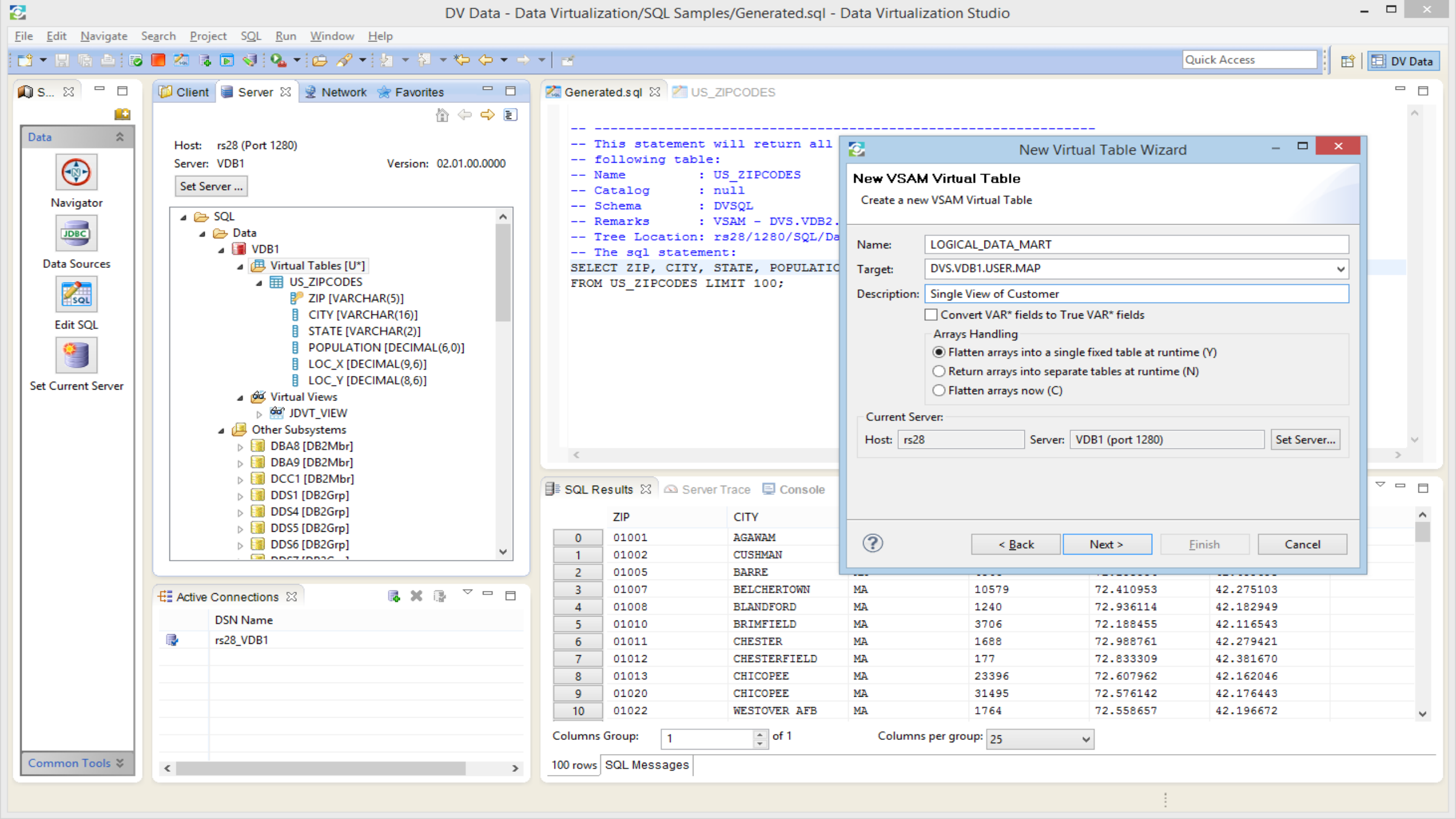
Addressing workload cost

- Python and R (In IzODA)
  - zIIP-costing via workload metering
- RDV engine
  - Up to 99% of its own processing in the zIIP engine



Rocket Data Virtualization (RDV)




DV Data - Data Virtualization/SQL Samples/Generated.sql - Data Virtualization Studio
File Edit Navigate Search Project SQL Run Window Help
Quick Access
DV Data
Data
Navigator
Data Sources
Edit SQL
Set Current Server
Common Tools
Client Server Network Favorites
Host: rs28 (Port 1280)
Server: VDB1
Version: 02.01.00.0000
Set Server ...
SQL
Data
VDB1
Virtual Tables [U*]
US_ZIPCODES
ZIP [VARCHAR(5)]
CITY [VARCHAR(16)]
STATE [VARCHAR(2)]
POPULATION [DECIMAL(6,0)]
LOC_X [DECIMAL(9,6)]
LOC_Y [DECIMAL(8,6)]
Virtual Views
JDVT_VIEW
Other Subsystems
DBA8 [DB2Mbr]
DBA9 [DB2Mbr]
DCC1 [DB2Mbr]
DDS1 [DB2Grp]
DDS4 [DB2Grp]
DDS5 [DB2Grp]
DDS6 [DB2Grp]
Active Connections
DSN Name
rs28_VDB1
Generated.sql
US_ZIPCODES
-- ----------
-- This statement will return all
-- following table:
-- Name : US_ZIPCODES
-- Catalog : null
-- Schema : DVSQL
-- Remarks : VSAM - DVS.VDB2.
-- Tree Location: rs28/1280/SQL/Da
-- The sql statement:
SELECT ZIP, CITY, STATE, POPULATIC
FROM US_ZIPCODES LIMIT 100;
New Virtual Table Wizard
New VSAM Virtual Table
Create a new VSAM Virtual Table
Name: LOGICAL_DATA_MART
Target: DVS.VDB1.USER.MAP
Description: Single View of Customer
Convert VAR* fields to True VAR* fields
Arrays Handling
Flatten arrays into a single fixed table at runtime (Y)
Return arrays into separate tables at runtime (N)
Flatten arrays now (C)
Current Server:
Host: rs28
Server: VDB1 (port 1280)
Set Server...
< Back
Next >
Finish
Cancel
SQL Results
Server Trace
Console
ZIP CITY
0 01001 AGAWAM
1 01002 CUSHMAN
2 01005 BARRE
3 01007 BELCHERTOWN MA 10579 72.410953 42.275103
4 01008 BLANDFORD MA 1240 72.936114 42.182949
5 01010 BRIMFIELD MA 3706 72.188455 42.116543
6 01011 CHESTER MA 1688 72.988761 42.279421
7 01012 CHESTERFIELD MA 177 72.833309 42.381670
8 01013 CHICOPEE MA 23396 72.607962 42.162046
9 01020 CHICOPEE MA 31495 72.576142 42.176443
10 01022 WESTOVER AFB MA 1764 72.558657 42.196672
Columns Group: 1 of 1
Columns per group: 25
100 rows
SQL Messages