

DevOps using Zowe - deep dive

Alex Dumitru
Broadcom

Joe Winchester
IBM

November 2019
Session **MD**



Option ==>

More: *

STANDARD OPTIONS

HURSLEY EXTENSIONS

- 0 Settings Terminal & user parms DB Database DB2 Managers
- 1 View Display source data DM Data Mgmt Data Management
- 2 Edit Create/change source U Utils Utilities
- 3 Utilities Perform utility funcs SP SysProg System Programming
- 4 Foreground Interactive processing I IPCS Dump Processing
- 5 Batch Submit job processing O OMVS UNIX System Services
- 6 Command Enter TSO/wkstn cmds R RACF Data Security Dialog
- 7 Dialog Test Perform dialog testing S SDSF Job/Output Display
- 8 LM Facility Library admin funcs LU Utils Local Utilities
- 9 IBM Products Program dev products
- 10 SCLM SW Config Lib Manager X EXIT Exit from ISPF
- 11 Workplace ISPF Workplace
- 12 z/OS System z/OS sysprog appls
- 13 z/OS User z/OS user appls

For information on MVS Support Services visit:
<http://w3.hursley.ibm.com/zos>

User ID : JCAIN Time : 20:19 Terminal : 3278
 Screen : 1 Language : ENGLISH Appl ID : ISR
 F1=Help F2=Split F3=Exit F7=Backward F8=Forward F9=Swap
 F10=Actions F12=Cancel

File Edit Edit_Settings Menu Utilities Compilers Test Help

VIEW JCAIN.SPFL0G1.LIST

Columns 00001 00121

Command ==> Scroll ==> PAGE

***** Top of Data *****

==MSG> -Warning- The UNDO command is not available until you change
==MSG> your edit profile using the command RECOVERY ON.

```

000001 1 Time *** ISPF transaction log *** Userid: JCAIN Date: 18/05/21 Page: 1
000002
000003 13:50 Start of ISPF Log - - - - Session # 1 -----
000004 13:52 TSO - Command - - %ISREDRTI ISPPROF
000005 1 Time *** ISPF transaction log *** Userid: JCAIN Date: 18/05/22 Page: 1
000006
000007 10:12 Start of ISPF Log - - - - Session # 1 -----
000008 10:29 Utility - Move/Copy - 'USER.PROCLIB(ZOEUSER)' Copied
000009 10:29 - to 'JCAIN.USER.PROCLIB(ZOEJC)'
000010 10:29 TSO - Command - - S 'USER.PROCLIB(ZOESVR)'
000011 10:36 Utility - Delete - 'JCAIN.USER.PROCLIB' deleted from volume 3BP001
000012 10:45 TSO - Command - - S 'USER.PROCLIB(ZOEJC)'
000013 1 Time *** ISPF transaction log *** Userid: JCAIN Date: 18/06/15 Page: 1
000014
000015 09:32 Start of ISPF Log - - - - Session # 1 -----
000016 09:33 TSO - Command - - S 'USER.PROCLIB(ZOEJC)'
000017 09:34 TSO - Command - - %BOT
000018 1 Time *** ISPF transaction log *** Userid: JCAIN Date: 18/06/29 Page: 1
000019
000020 13:54 Start of ISPF Log - - - - Session # 1 -----
000021 13:54 Invalid command - Command name '/D' contains invalid syntax.
000022 13:54 TSO - Command - - IPLINFO

```

F1=Help F2=Split F3=Exit F4=Expand F5=Rfind F6=Rchange F7=Up F8=Down F9=Swap F10=Left
 F11=Right F12=Cancel

The Linux Foundation
and the projects we
support form the
most ambitious and
successful investment
in the creation of
shared technology



Zowe

WHAT IS THE MODERN MAINFRAME?

Mainframe has transformed over the past 65 years, and still is the goto platform for high transactional and secure computing

LEARN HOW

OPEN SOURCE ON MAINFRAME

From Linux, to data platforms and developer tools, mainframe is a great architecture for open source

SEE HOW

TRY YOUR APP ON MAINFRAME

Get free cloud access to a mainframe right now, see how your app seamlessly works on mainframe

TRY NOW

Listen to our "I Am A Mainframer" podcast to hear how mainframe is making an impact on industry, society, and careers.

Latest Updates from the Mainframe

I am a Mainframer – Jeanne Glass
chrisblum | Blog, I Am A Mainframer
In today's episode of the "I Am A Mainframer" podcast, Steven Dickens sits down with Jeanne Glass. Jeanne is the CEO at VirtualZ Computing. Jeanne tells Steven about her journey...

Gaining momentum: Zowe proves its value
openmainframe | Blog, Zowe
A statistics analysis from the Open Mainframe Project demonstrates the impact of Zowe in the mainframe open source community It was just a year ago that the Open Mainframe Project...

Zowe™'s Role in z/OS® and Your Journey to Cloud
openmainframe | Blog
By Bruce Armstrong – Member Zowe™ Leadership Committee and IBM Z Offering Manager In A Beginners Guide to Cloud and IBM Z , Bill gives a "shout out" to Zowe™...

JOIN THE MORE THAN 30 ORGANIZATIONS ALREADY SUPPORTING THE OPEN MAINFRAME PROJECT

The success of the Open Mainframe Project is based on the support and contributions of our member companies and our developer community. Learn how your organization can contribute to the project.

BECOME A MEMBER

VIEW MEMBERSHIP



Announcements

Zowe 1.4.0 is now available. See [What's New](#).

A pre-release of the Zowe SMP/E install is now available. This is an alpha release based on Zowe 1.4.0, and should not be used in production. [Learn More](#)

What is Zowe?

Zowe is an open source project created to host technologies that benefit the Z platform from all members of the Z community (Integrated Software Vendors, System Integrators and z/OS consumers). Zowe, like Mac OS or Windows, comes with a set of APIs and OS capabilities that applications build on and also includes some applications out of the box.

Zowe offers modern interfaces to interact with z/OS and allows you to work with z/OS in a way that is similar to what you experience on cloud platforms today. You can use these interfaces as delivered or through plug-ins and extensions that are created by clients or third-party vendors.

Zowe consists of the following main components.

Zowe Application Framework: A web user interface (UI) that provides a virtual desktop containing a number of apps allowing access to z/OS function. Base Zowe includes apps for traditional access such as a 3270 terminal and a VT Terminal, as well as an editor and explorers for working with JES, MVS Data Sets and Unix System Services.

API Mediation Layer: Provides a gateway that acts as a reverse proxy for z/OS services, together with a catalog of REST APIs and a dynamic discovery capability. Base Zowe provides core services for working with MVS Data Sets, JES, as well as working with z/OSMF REST APIs. The API Mediation Layer also provides a framework for Single Sign On (SSO).





Gaining momentum: Zowe proves its value



By openmainframe | September 11, 2019 | Blog, Zowe

A statistics analysis from the Open Mainframe Project demonstrates the impact of Zowe in the mainframe open source community

It was just a year ago that the Open Mainframe Project announced the first open source project on z/OS, [Zowe](#). Zowe was started with the intent of bringing industry experts together to drive innovation for the community of next-generation mainframe developers. To accomplish this vision the open source mainframe community built a framework of software services that allows development and operation teams to securely manage, control, script and develop on the mainframe using modern tools and interfaces – just like any other cloud platform today.

To date, we have witnessed the growing excitement and energy the Zowe project has brought to the global Z community. Since the creation of Zowe, we have even seen [new open source projects on Z emerge](#). Ed Jaffe, Chief Technology Officer for Phoenix Software International, and new Open Mainframe Project [member organization](#) said in their [press release](#) that:

“We have observed, throughout our 40 years in business, that approximately every decade or so a transformative technology comes along that greatly enhances the usability of our platform. We believe Zowe is this decade’s transformative technology and it would be a mistake to not embrace it.” And Phoenix Software aren’t the only ones taking notice as evident from the following OMP Report on Zowe.org community metrics.



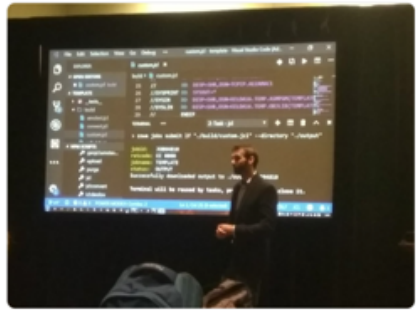
Gaining momentum: Zowe proves its value



“We have observed, throughout our 40 years in business, that approximately every decade or so a transformative technology comes along that greatly enhances the usability of our platform. We believe Zowe is this decade’s transformative technology and it would be a mistake to not embrace it.”

not embrace it.” And Phoenix Software aren’t the only ones taking notice as evident from the following OMP Report on Zowe.org community metrics.

Boudewijn Dekkema @BDekkema
 Last Day of #SHAREphx 2019!
 Now listening to great ZOWE stuff from the #NextGen on the #Mainframe!



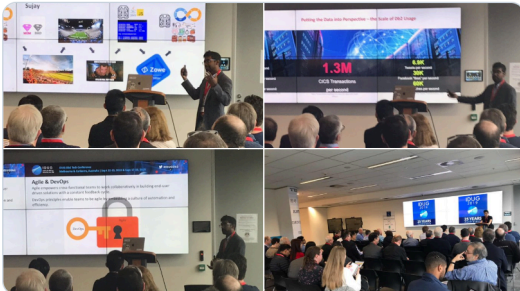
9:01 AM - 15 Mar 2019
 2 Retweets 14 Likes

Yongkook(Alex) Kim @kaxpunk
 Truly amazing open source efforts by dedicated developers! Congratulations #ZOWE TEAM and @OpenMFProject! #IBMZ #Think2019



5:54 AM - 12 Feb 2019

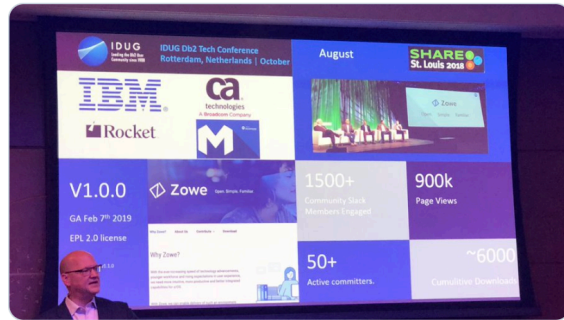
Sujay Solomon @sujaysolomon · Sep 17
 Lots of interest in #devops, #agile and #zowe at the #IDUG #Canberra keynote.



Aysen Solak + 2nd Senior Product Owner at Broadcom Inc. 23h
 Don't be late to #Zowe session! Anyway this spot is actually great 🥰 Seems many people are curious about Zowe and Joe Winchester is explaining the fundamentals.. #IDUGDb2 #Db2 #Mainframe Broadcom Inc. IDUG: International Db2 Users Group



Craig Mullins @craigmullins · 23h
 #Zowe has been GA for less than a year and there have already been more than 6000 downloads #IDUGDb2



Nicola McIrvine @NicolaMcIrvine1 · Oct 15
 Love learning more and more about #Zowe? Dan Kelosky explains the use cases for #ZoweCLI, specifically as it relates to npm packages in his latest Medium #Blog. Thanks for sharing your expertise, Dan! #mainframe

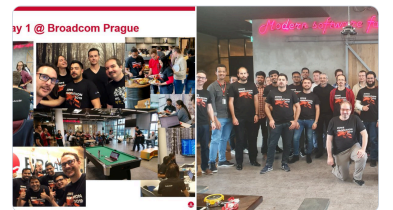


How to Quickly Build Applications Using the @zowe/cli npm Packa...
 The most common use case for Zowe CLI is to install it, create a profile, and begin issuing commands:
[z/medium.com](#)

David McInerney @davidmcinerney
 Hackathon focusing on mainframes & z/OS? Mainframe DevOps innovation by letting teams go hands-on w/ Zowe open source.

Broadcom's Petr Plavjanik: bit.ly/33P9pzG

#zowe #ibmz #mainframe #devops #OSS #hackathon



1:08 PM · Oct 21, 2019 · Twitter Web App

Phillippe Dubost @Bob2forz
 Mohit and Bala from @Broadcom #mainframe demoing #CABrightside during #IDUGDb2 India conference last week - #opensource #DevOps #Zowe



12:34 AM - 13 Mar 2019

Zowe

Modern, open source interface for the mainframe

Follow



Handling errors in a Zowe REST API

A key concept within the Zowe ecosystem is the creation of a REST infrastructure API to access the functionality of an existing...

Gene Johnston
 Oct 17 · 6 min read



Zowe Hackathon 2019

Have you ever heard about a hackathon? You likely have. But have you heard about a hackathon that focuses on mainframes and z/OS? At...

Petr Plavjanik
 Oct 15 · 5 min read



Zowe Conformance Program Explained

Users of a product, app, or distribution that leverages Zowe can expect a high level of common functionality, interoperability & UX

Petr Galik
 Oct 15 · 6 min read



How to Quickly Build Applications Using the Zowe CLI npm Package (Part 1)

The most common use case for Zowe CLI is to install it, create a profile, and begin issuing commands:

Dan Kelosky
 Oct 10 · 5 min read

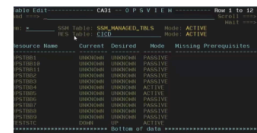
Adoption Plan: The First 90 Days

Phase	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Initial Setup
Development
Deployment
Support

3 Tips for Adoption of Zowe in the Enterprise

Tips for leading Zowe adoption in your organization

Goran Begic
 Oct 2 · 4 min read



How to connect CA OPS/MVS to CICD with ZOWE CLI

A major benefit of Zowe CLI is the ability to expose mainframe elements to off-platform tools, especially for the purpose of CICD. A great...

Jack Hartzler
 Sep 26 · 3 min read



Getting Started with Zowe CLI

Zowe CLI is for z/OS like the AWS CLI is for AWS. It's a client-side CLI that allows access to all the infrastructure services on z/OS...

Sujay Solomon



"Zowe, Is It Up and Running?"

Monitoring for Zowe Workshop Environments

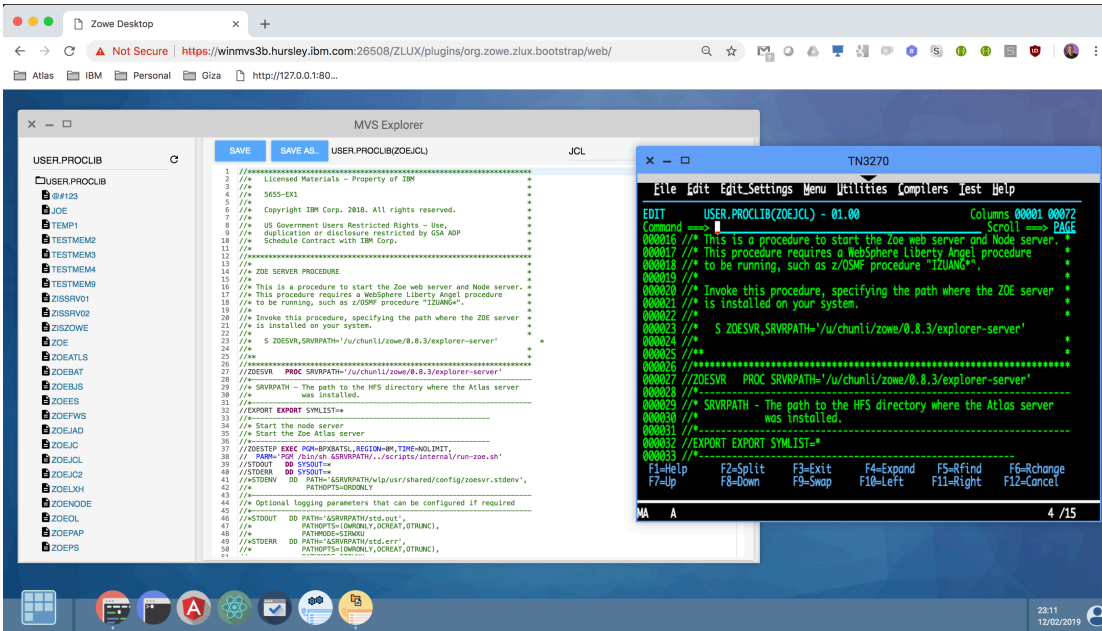
Jiri Cizek
 Aug 15 · 4 min read



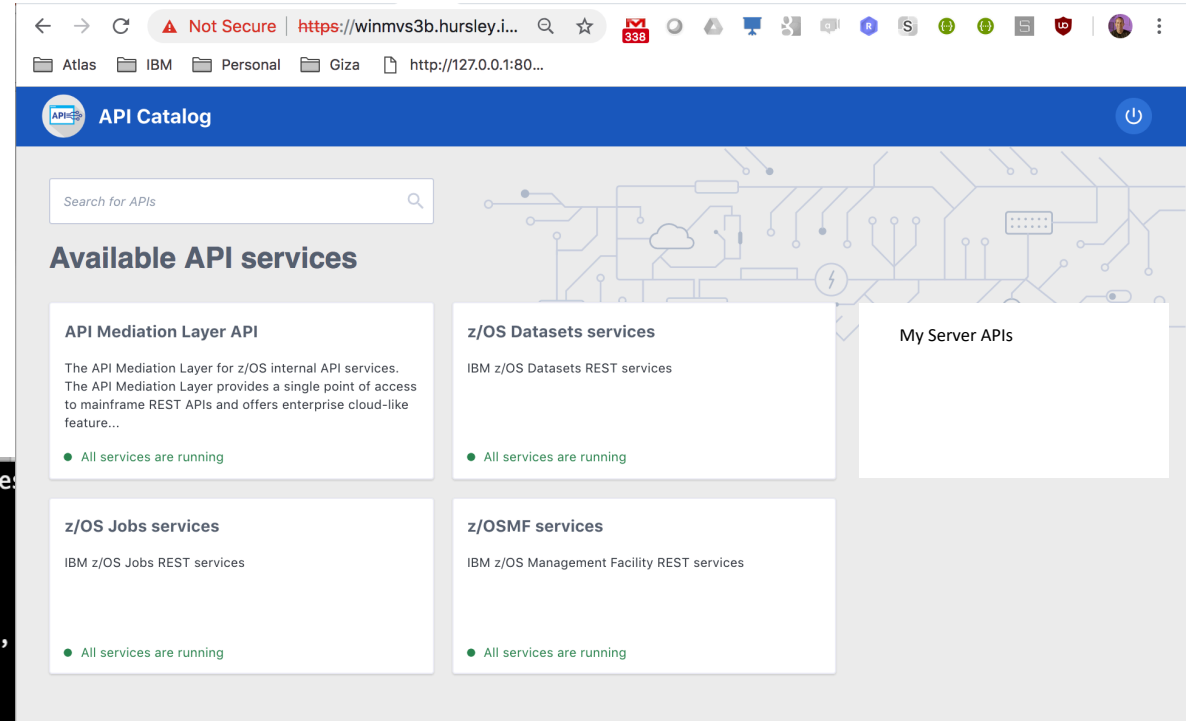
Zowe's Journey to Enterprise Grade

In June 2019, the Zowe community made supportability one of its top three priorities. What does this mean for Zowe?

Elliot Jolley



API Mediation Layer and REST APIs



stevens-ibmp.data-sets stevens zowe zos-files

DESCRIPTION

Manage z/OS data sets, create data sets,

USAGE

bright zos-files <group>

Where <group> is one of the following:

GROUPS

create | cre Create data sets
delete | del Delete a data set or Unix System Services file

Node.js- based CLI

```
Builds — -bash — 70x7
zos-console | console Issue z/OS console commands and
                collect responses
zos-files | files   Manage z/OS data sets
zos-jobs | jobs     Manage z/OS jobs
zos-tso | tso       Interact with TSO
zos-uss | uss       Issue z/OS USS commands and receive
                responses
```

```
Builds — -bash — 70x9
[joes-mbp-3:builds Joe$ zowe files list ds "WINCHJ.Z*" ]
WINCHJ.ZOWE
WINCHJ.ZOWELIB
WINCHJ.ZOWE1
WINCHJ.ZWE.SZWEAUTH
WINCHJ.ZWE.SZWESAMP
WINCHJ.ZWE130.CUST.JCL
WINCHJ.ZWE130.CUST.PROCLIB
joes-mbp-3:builds Joe$ █
```

```

DEMO_PDS="STEVENH.DEMO.JCL"
ZOSMF_PROFILE=3bsh
# Check and see if pds already exists
MATCHES=`zowe zos-files list data-set "$DEMO_PDS" --zosmf-p $ZOSMF_PROFILE --response-format-json | jq -r '.data.apiResponse.returnedRows'`
if [ $MATCHES -gt 0 ]; then
    echo "Data set $DEMO_PDS already exists, deleting"
    zowe zos-files delete data-set -f "$DEMO_PDS" --zosmf-p $ZOSMF_PROFILE
fi

```

```

zowe zos-files create data-set-classic $DEMO_PDS --zosmf-p $ZOSMF_PROFILE
zowe zos-files upload stdin-to-data-set "$DEMO_PDS(INPUT)" <<< $1 --zosmf-p $ZOSMF_PROFILE
zowe zos-files upload stdin-to-data-set --zosmf-p $ZOSMF_PROFILE "$DEMO_PDS(COPY)" <<EOF
//COPY JOB 123456, 'TSTRADM',NOTIFY='TSTRADM',
//          CLASS=A,MSGCLASS=H,MSGLEVEL=(1,1)
//STEP1    EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN    DD DUMMY
//SYSUT1   DD DISP=SHR,DSN=$DEMO_PDS(INPUT)
//SYSUT2   DD DISP=SHR,DSN=$DEMO_PDS(OUTPUT)
//STEP2    EXEC PGM=AOPBATCH,PARM='sleep 5'
EOF

```

```

JOBID=`zowe jobs submit data-set "$DEMO_PDS(copy)" --zosmf-p $ZOSMF_PROFILE --response-format-json | jq -r '.data.jobid'`
echo "JOBID is $JOBID"

i="0"
while [ $i -lt 5 ]
do
    sleep 1s
    STATUS=`zowe jobs view job-status-by-jobid $JOBID --response-format-json --zosmf-p $ZOSMF_PROFILE | jq -r '.data.status'`
    if [ "$STATUS" = "OUTPUT" ]; then
        echo "Job $JOBID has now completed"
        i=5
    else
        echo "Waiting for job output to complete. Current status is $STATUS"
    fi
    i=$((i+1))
done

```

```

DEMO_PDS="STEVENH.DEMO.JCL"
ZOSMF_PROFILE=3bsh
# Check and see if pds already exists
MATCHES=`zowe zos-files list data-set "$DEMO_PDS" --zosmf-p $ZOSMF_PROFILE --response-format-json | jq -r '.data.apiResponse.returnedRows'`
if [ $MATCHES -gt 0 ]; then
    echo "Data set $DEMO_PDS already exists, deleting"
    zowe zos-files delete data-set -f "$DEMO_PDS" --zosmf-p $ZOSMF_PROFILE
fi

```

```

zowe zos-files create data-set-classic $DEMO_PDS --zosmf-p $ZOSMF_PROFILE
zowe zos-files upload stdin-to-data-set "$DEMO_PDS(INPUT)" <<< $1 --zosmf-p $ZOSMF_PROFILE
zowe zos-files upload stdin-to-data-set --zosmf-p $ZOSMF_PROFILE "$DEMO_PDS(COPY)" <<EOF
//COPY JOB 123456, 'TSTRADM',NOTIFY='TSTRADM',
//          CLASS=A,MSGCLASS=H,MSGLEVEL=(1,1)
//STEP1     EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN     DD DUMMY
//SYSUT1    DD DISP=SHR,DSN=$DEMO_PDS(INPUT)
//SYSUT2    DD DISP=SHR,DSN=$DEMO_PDS(OUTPUT)
//STEP2     EXEC PGM=A0PBATCH,PARM='sleep 5'

```

```

STATUS=`zowe jobs view job-status-by-jobid $JOBID --response-format-json --zosmf-p $ZOSMF_PROFILE | jq -r '.data.status'`
if [ "$STATUS" = "OUTPUT" ]; then
    echo "Job $JOBID has now completed"
    i=5
else
    echo "Waiting for job output to complete. Current status is $STATUS"
fi
i=$((i+1))
done

```



https://www.npmjs.com/search?q=zowe

zowe-cli-cics-deploy-plugin

IBM CICS Bundle generation and deployment for Zowe CLI

cics cli mainframe nodejs zos z/os zowe

ibmcics published 1.0.3 • 11 days ago

@zosconnect/zosconnect-zowe-cli

Z/OS Connect EE Plugin for Zowe CLI

zowe z/os

crshnburn published 1.1.2 • 2 days ago

@zowe/db2

CLI Plug-in for IBM Db2

zowerobot published 3.0.2 • 4 days ago

@zowe/perf-timing

Wrapper around the Node JS Performance Timing APIs

performance testing performance performance timing api

zowerobot published 1.0.3 • 3 months ago

eslint-config-rocketsoftware

ESLint preset configuration implemented by Newton React plugin for the Zowe framework

rvan-rocketsoftware published 1.0.0 • 3 months ago

z/OS Connect EE Plug-in for Zowe CLI



build passing npm v1.1.2

```
cics-profile | cics Create a cics profile
mq-profile | mq Create a mq profile
ssh-profile | ssh Create a ssh profile
tso-profile | tso Create a tso profile
zosmf-profile | zosmf Create a zosmf profile
```

This plugin extends the Zowe CLI to allow the management of z/OS Connect EE APIs, Services and API Requesters.

Zowe Conformant - CLI (13)					
(E)JES Phoenix Software International	CA Endeavor® SCM Broadcom	CA File Master™ Plus Broadcom	CA OPS/MVS® Broadcom	CA Secure Credential Store Broadcom	CA z/OS Extended Files Plug-in for Zowe CLI Broadcom
CA z/OS Extended Jobs Plug-in for Zowe CLI Broadcom	IBM MQ Plug-in for Zowe CLI Open Mainframe Project	IBM® CICS® Plug-in for Zowe CLI Open Mainframe Project	Db2 DevOps Experience for z/OS IBM	IBM® Db2® Database Plug-in for Zowe CLI Open Mainframe Project	z/OS Connect EE Plug-in for Zowe CLI IBM
Zowe CLI CICS deploy plug-in Open Mainframe Project					

Exploiting the MQ REST API through the Zowe CLI – MQ plugin

Colin Stone

Published on 07/23/2019 / Updated on 07/25/2019

<https://developer.ibm.com/mainframe/2019/07/23/exploiting-the-mq-rest-api-through-the-zowe-cli-mq-plugin/>

```
zowe plugins install @zowe/mq
zowe mq run mqsc MQ21 "DEF QL(COLIN.TESTQ)"
```

```
Running MQSC command: 'DIS QSTATUS(ZOWE.TEST.DONT.USE) CURR
CSQM441I  MQ21 QSTATUS(ZOWE.TEST.DONT.USE)
          TYPE(Queue)
          CURDEPTH(1)
          LPUTDATE(2019-07-23)
          LPUTTIME(08.38.40)
          QSGDISP(QMGR)
CSQ9022I  MQ21 CSQMDRTS ' DIS QSTATUS' NORMAL COMPLETION
```



Open Mainframe Project

<https://docs.zowe.org/v1-2-x/user-guide/cli-db2plugin.html#use-cases>

Calling a stored procedure

```
$ zowe db2 call sp "DEMOUSER.EMPBYNO('000120')"
```

```
$ zowe db2 call sp "DEMOUSER.SUM(40, 2, ?)" --parameters 0
```

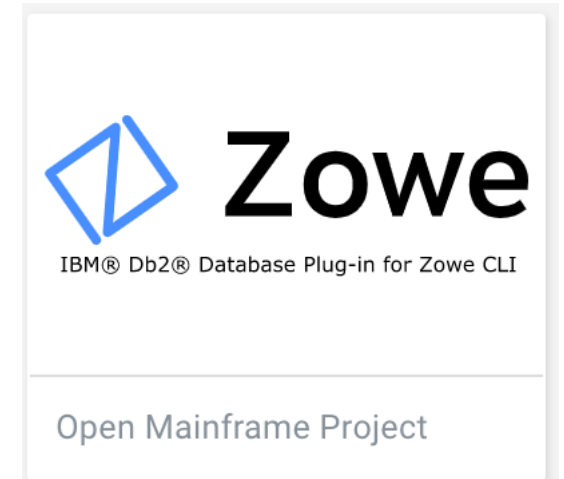
Executing an SQL statement

```
$ zowe db2 execute sql -q "SELECT COUNT(*) AS TOTAL FROM DSN81210.EMP;"
```

Exporting a table in SQL format

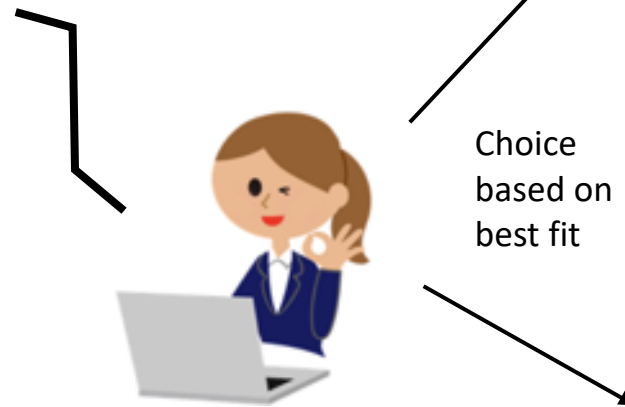
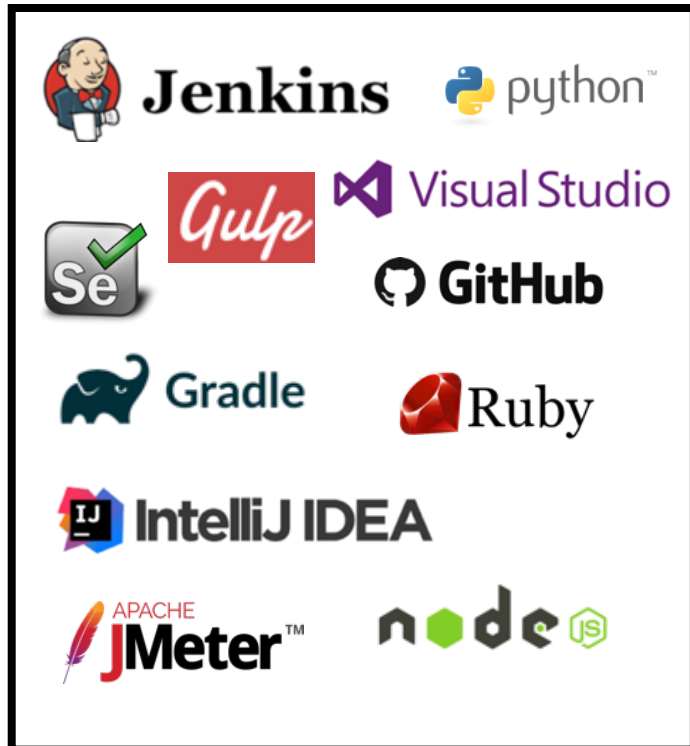
```
$ zowe db2 export table DSN81210.PROJ
```

```
$ zowe db2 export table DSN81210.PROJ --outfile projects-backup.sql
```



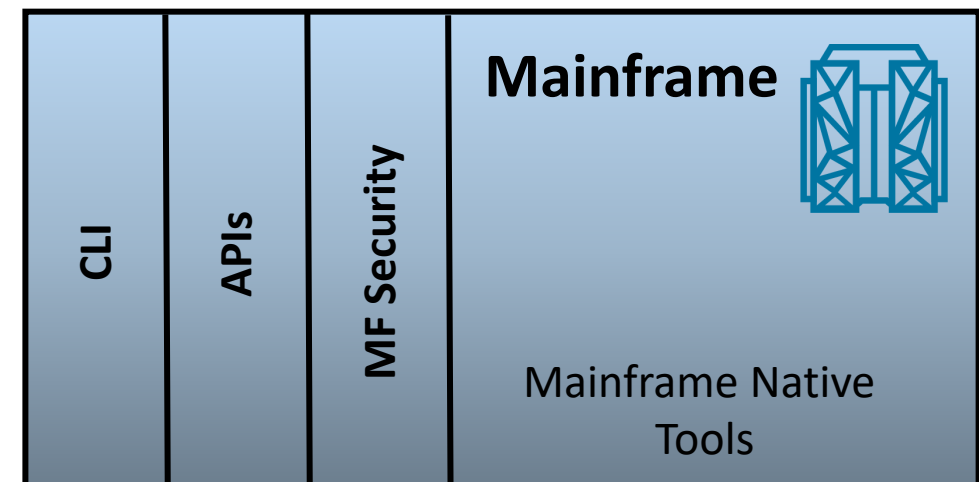
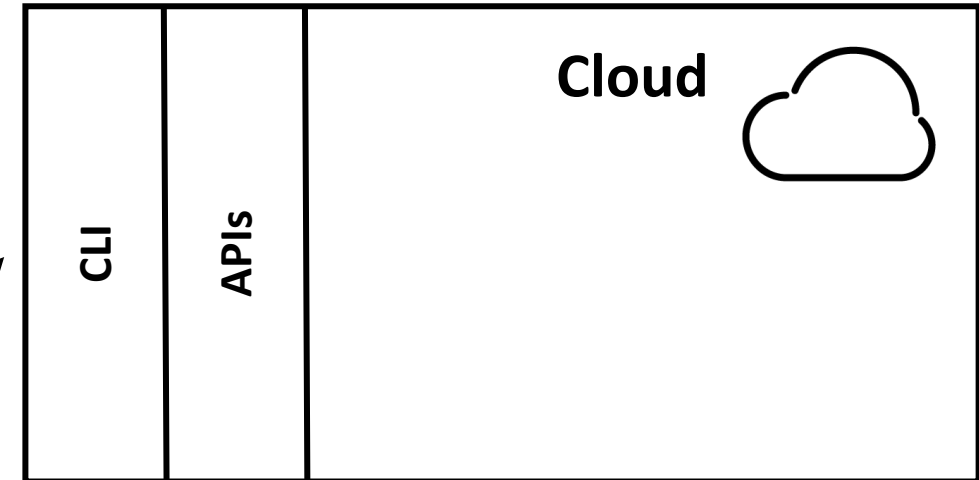
Our Guiding Principle: **Mainframe as Easy as Cloud**

Modern DevOps Tools



Next-gen Dev

Choice based on best fit

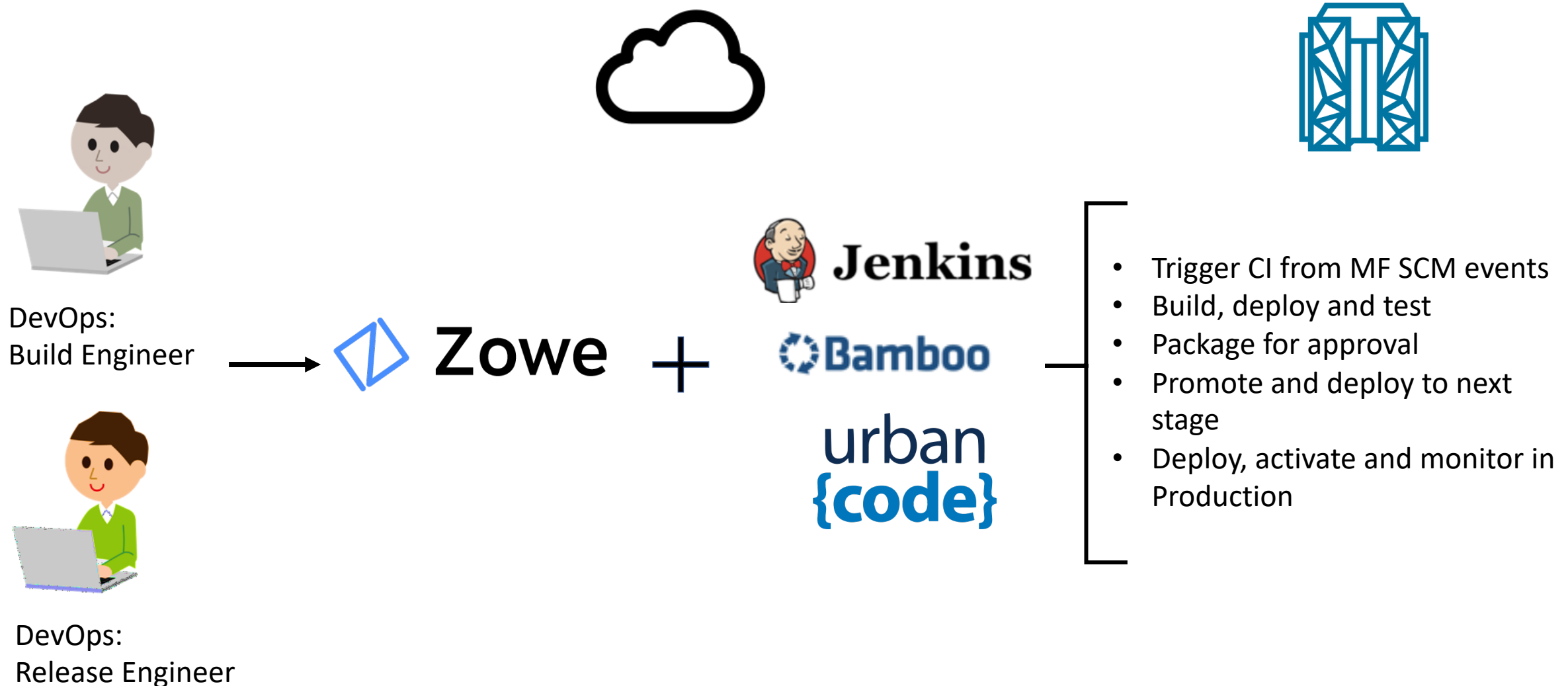


Why CLI?

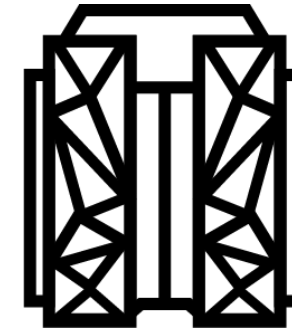
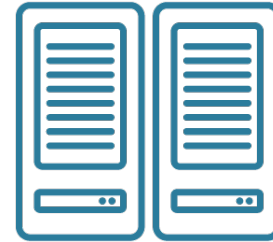
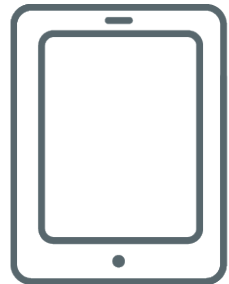
- Common, comfortable, Cloud Developer method of access
- **Script-capable = AUTOMATION**
- Remote access to mainframe services
- Pair with a **WIDE RANGE** of open source frameworks
- Serves as a “**bridge-tool**” connecting Mainframe to open source



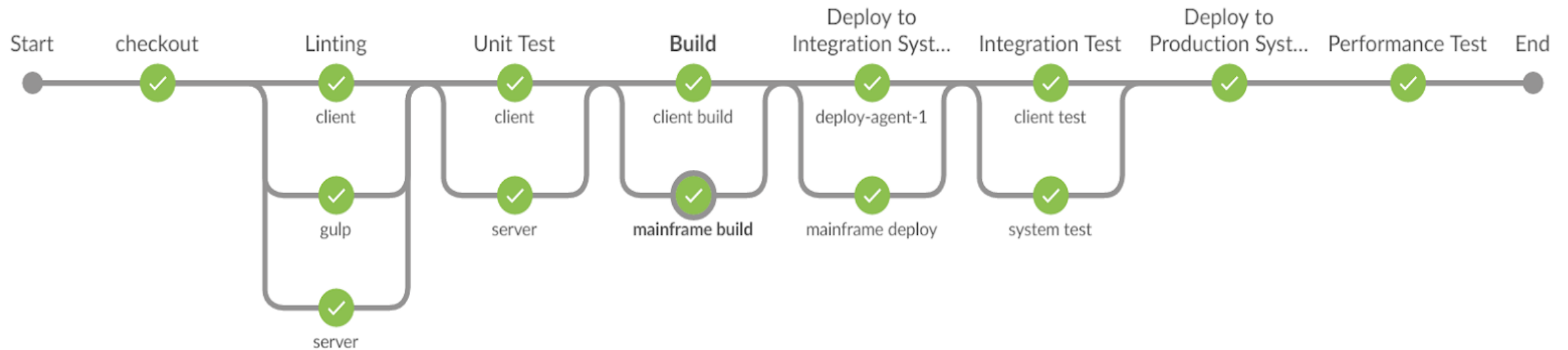
Continuous Integration and Continuous Delivery



Jenkins Example – Cross Platform Continuous Integration



Zowe



Demo

Objectives

- Understand how Zowe CLI commands can be abstracted into scripts and used with popular open source build and test frameworks like Gulp and Mocha
- Understand how continuous integration tools like Jenkins can be used with mainframe application development to increase the quality of applications and reduce time to deliver
- Learn how the Zowe z/OS Explorer* can be used to interact with z/OS data sets remotely

* Visual Studio Code Extension

Agenda

- Introduce mainframe application called Marbles that we will be working with
- Discuss DevOps pipeline that we will be using that makes use of the Zowe CLI
- We will then introduce a code change and verify the code passes all stages of a CI pipeline. Along the way, we will learn how Jenkins interacts with z/OS via the Zowe CLI.

Marbles

- Marbles is a COBOL CICS application. It manages an inventory of Marbles stored in a Db2 table.
- It currently just manages inventory. However, we will introduce a change to the CICS program to allow the CICS transaction to accept a cost parameter.

DevOps Pipeline


- Use Jenkins as our CI/CD tool
- Each Jenkins pipeline runs in a Docker container that has the Zowe CLI installed
- The build and deploy stages of the pipeline make use of Gulp, a popular framework for automating tasks. The tasks use the Zowe CLI to drive interaction with z/OS.
- The test stage of the pipeline makes use of Mocha, a popular JavaScript testing framework. The test scripts also use the Zowe CLI to drive interaction with z/OS

Please submit your session feedback!

- Do it online at <http://conferences.gse.org.uk/2019/feedback/nn>
- This session is **MD**



1. What is your conference registration number?


 This is the three digit number on the bottom of your delegate badge

2. Was the length of this presentation correct?

 1 to 4 = "Too Short" 5 = "OK" 6-9 = "Too Long"

1 2 3 4 5 6 7 8 9

3. Did this presentation meet your requirements?

 1 to 4 = "No" 5 = "OK" 6-9 = "Yes"

1 2 3 4 5 6 7 8 9

4. Was the session content what you expected?

 1 to 4 = "No" 5 = "OK" 6-9 = "Yes"

1 2 3 4 5 6 7 8 9

Title and content slide

Section header slide

Two content slide

Title only slide