# Making the mainframe great and simple again with the Zowe Command Line Interface (aka CLI). #2997

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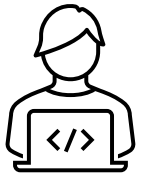
# WHY ZOWE CLI ?

# Help context switch Integrate in z/OS tooling Skills onramp



z/OS

```
  Menu  Utilities  Compilers  Options  Status  Help
------------------------------------------------------------------------------
                ISPF Primary Option Menu for MV3B
Option ===> 3.4
                                                                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

 F1=Help      F2=Split     F3=Exit      F7=Backward  F8=Forward   F9=Swap
F10=Actions   F12=Cancel
 ONLINE-TLS 1.2                                        4,17
```

Change TSO picture to be a 3.4 animated gif
AND
a TSO listds picture
Trip to the web to get the help for the command

# WHO IS ZOWE ?

# Integrated help
# PC tools integration
# Faster onboarding


Add in picture about money and MIPS
Add in graphics for Jenkins, Tekton, JIRA
Github actions, q8s, Helm

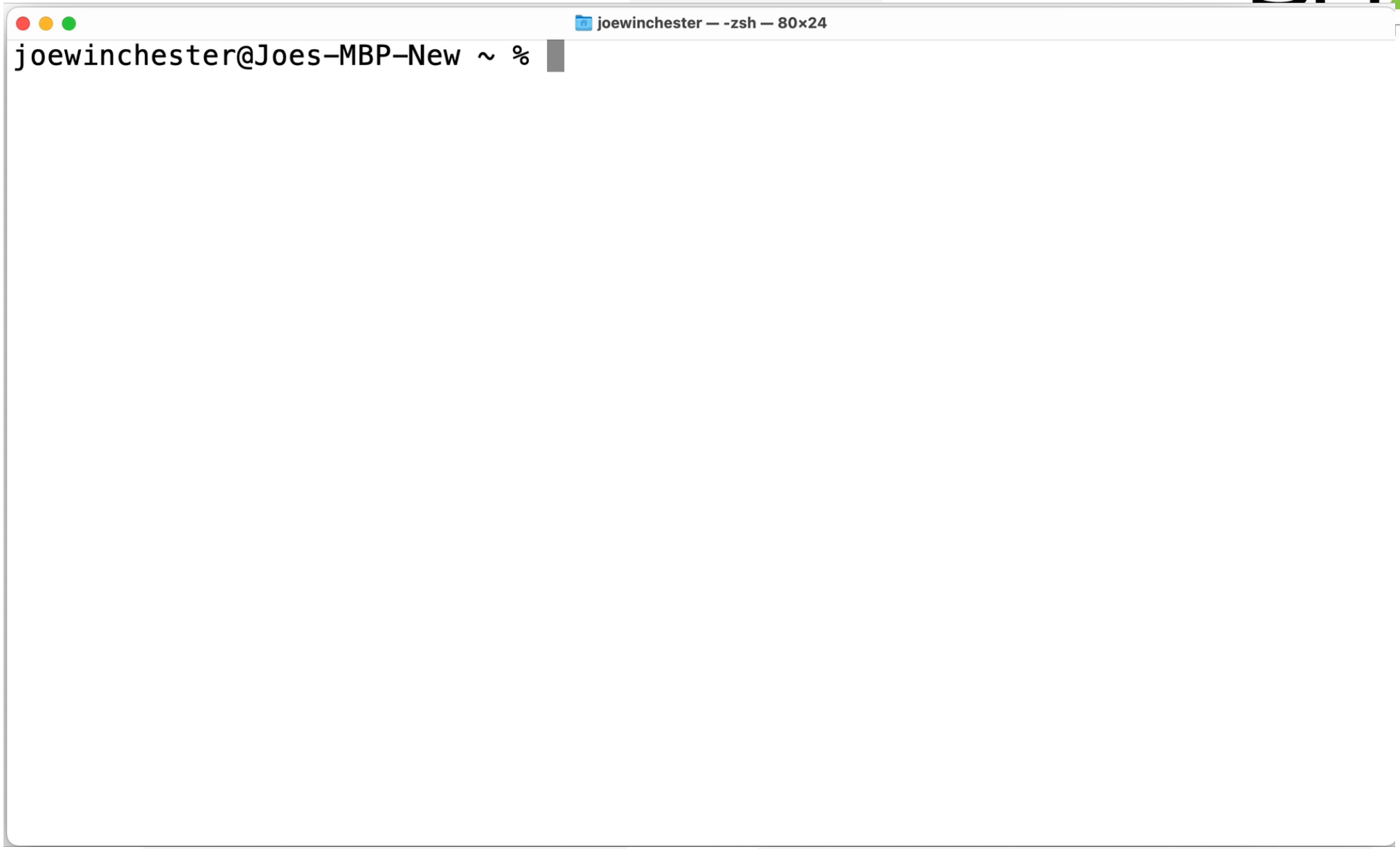
Built in help – show openssl, git, docker
Built in examples


**Zoë Alleyne Washburne**

**Biographical information**

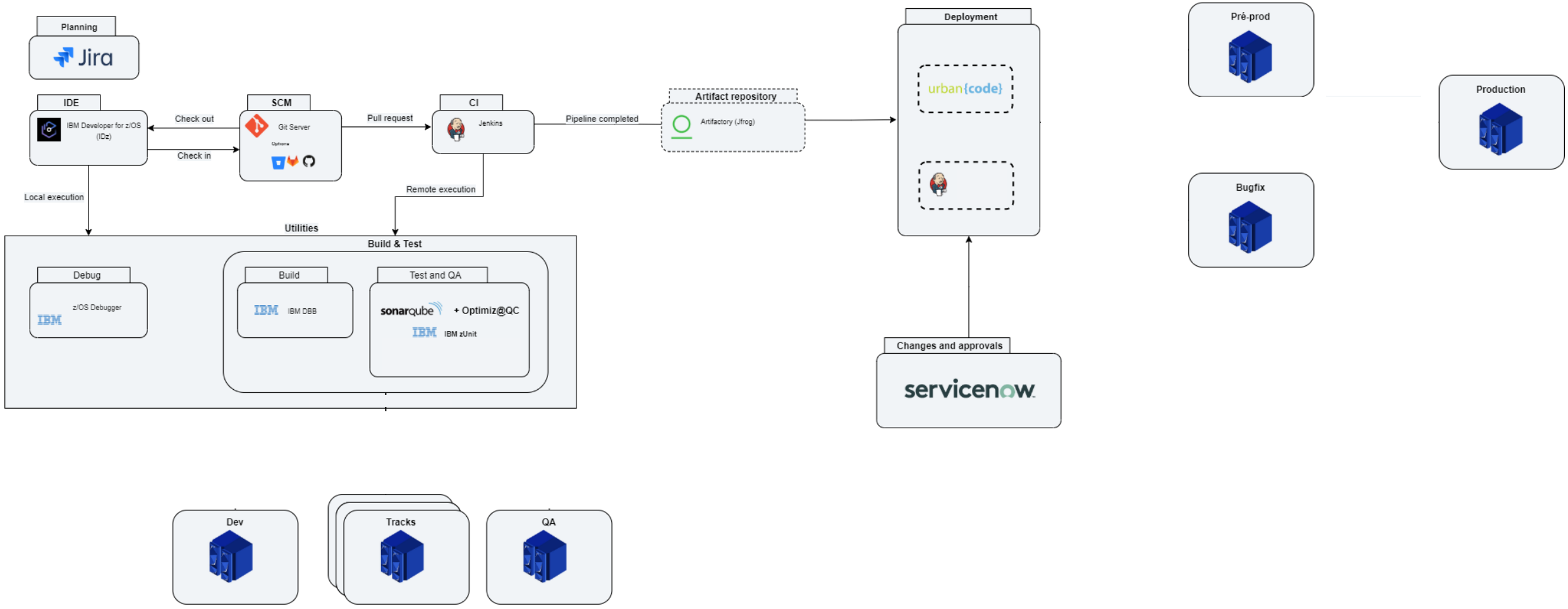
| | |
|---|---|
| Born | February 15, 2484 |
| Homeworld | None, born Vesselside |
| Gender | Female |

# CLI in action

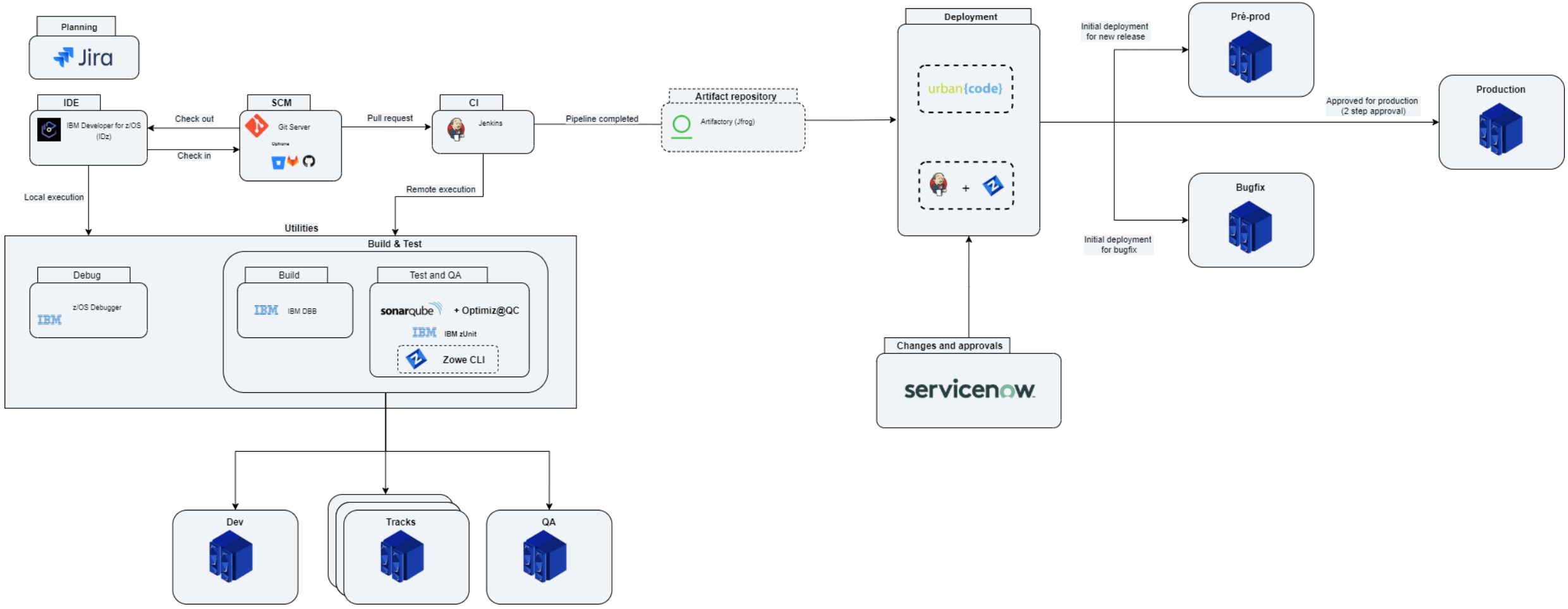


```
DEMO_PDS="STEVENH.DEMO.JCL"
ZOSMF_PROFILE=3bsh
# Check and see if pds already exists
MATCHES=`zowe zos-files list data-set "$DEMO_PDS" --zosmf-p $ZOSMF_PROFILE --response-format-json | jq -r '.data.apiResponse.returnedRows'`
if [ $MATCHES -gt 0 ]; then
    echo "Data set $DEMO_PDS already exists,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

# Distributed DevOps pipeline



# Distributed DevOps pipeline integrating z/OS



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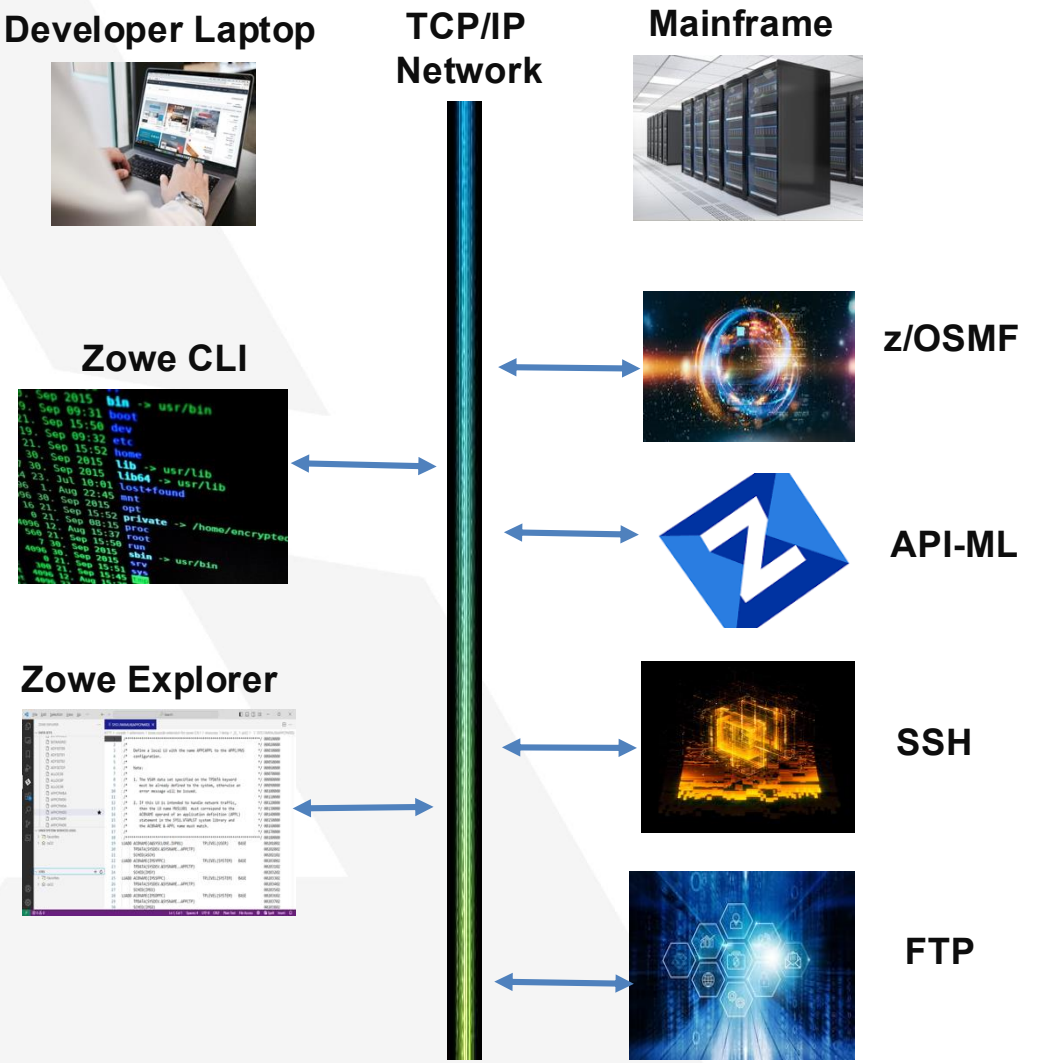
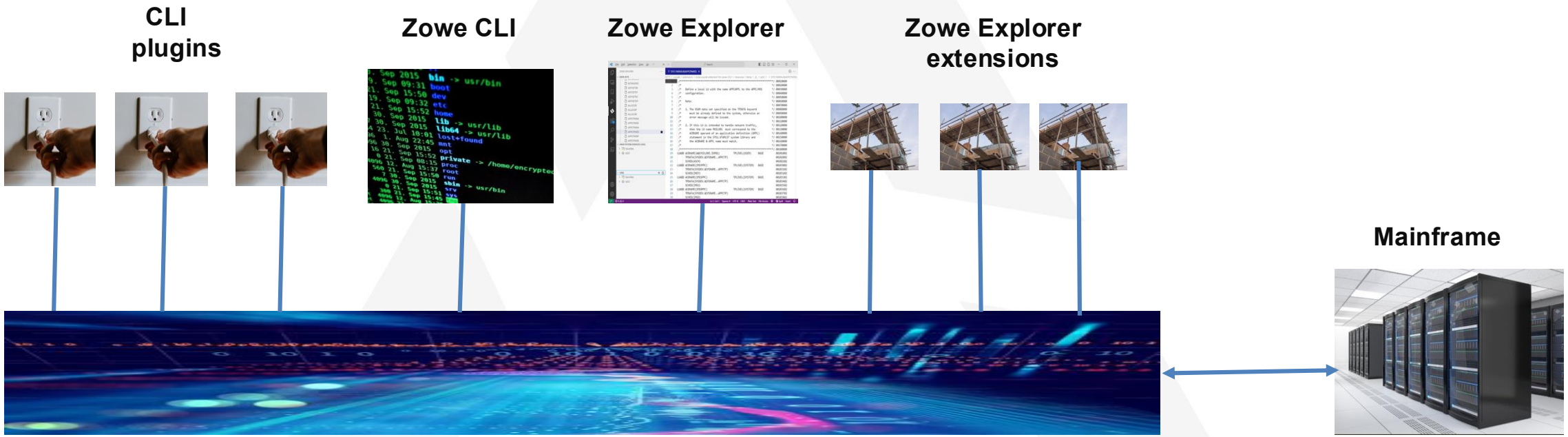
OPEN MAINFRAME PROJECT
node JS
Real-Time LINUX
GraphQL Foundation
OPEN MAINFRAME PROJECT Zowe
OPENAPI INITIATIVE
MOCHA

# Zowe clients within the mainframe ecosystem

- Install client apps on your laptop
  - Runs on Windows, Linux, & Mac
- Capabilities
  - Manage data sets
  - Submit & manage jobs
  - Issue commands to TSO and USS
  - Use CLI for automation and pipelines
  - ZE provides mainframe IDE experience
- Plugins and extensions expand these capabilities



# Client-side APIs are the foundation of our apps

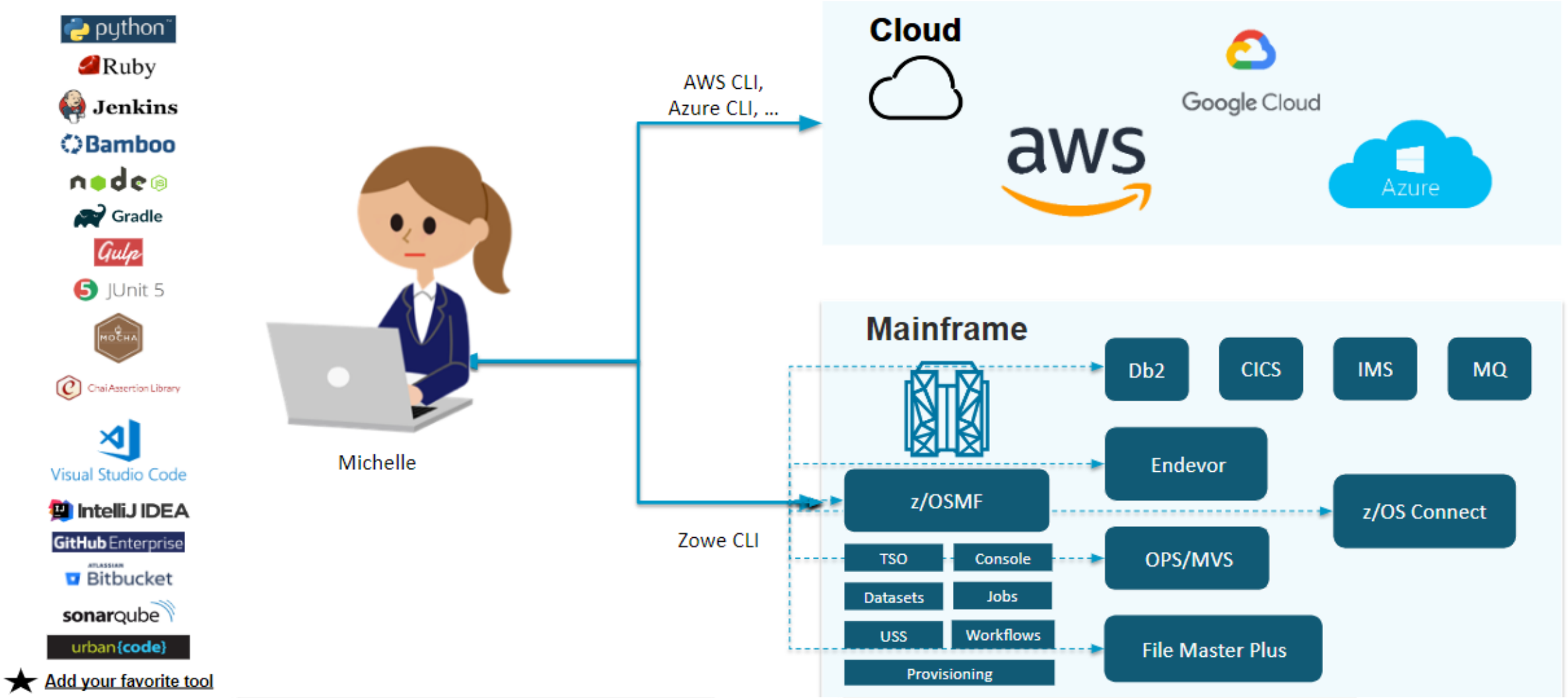


# Continuous Integration pipelines

Pipelines use scripted actions to create your app

- Compile source code
- Deploy libraries to test area
- Create test data sets
- Run jobs to test new logic
- Regression test exiting logic
- Trigger the procedures that bundle the app for release
- Sanity-test the bundle

# Include mainframe apps in CI pipelines



# WHAT'S NEW

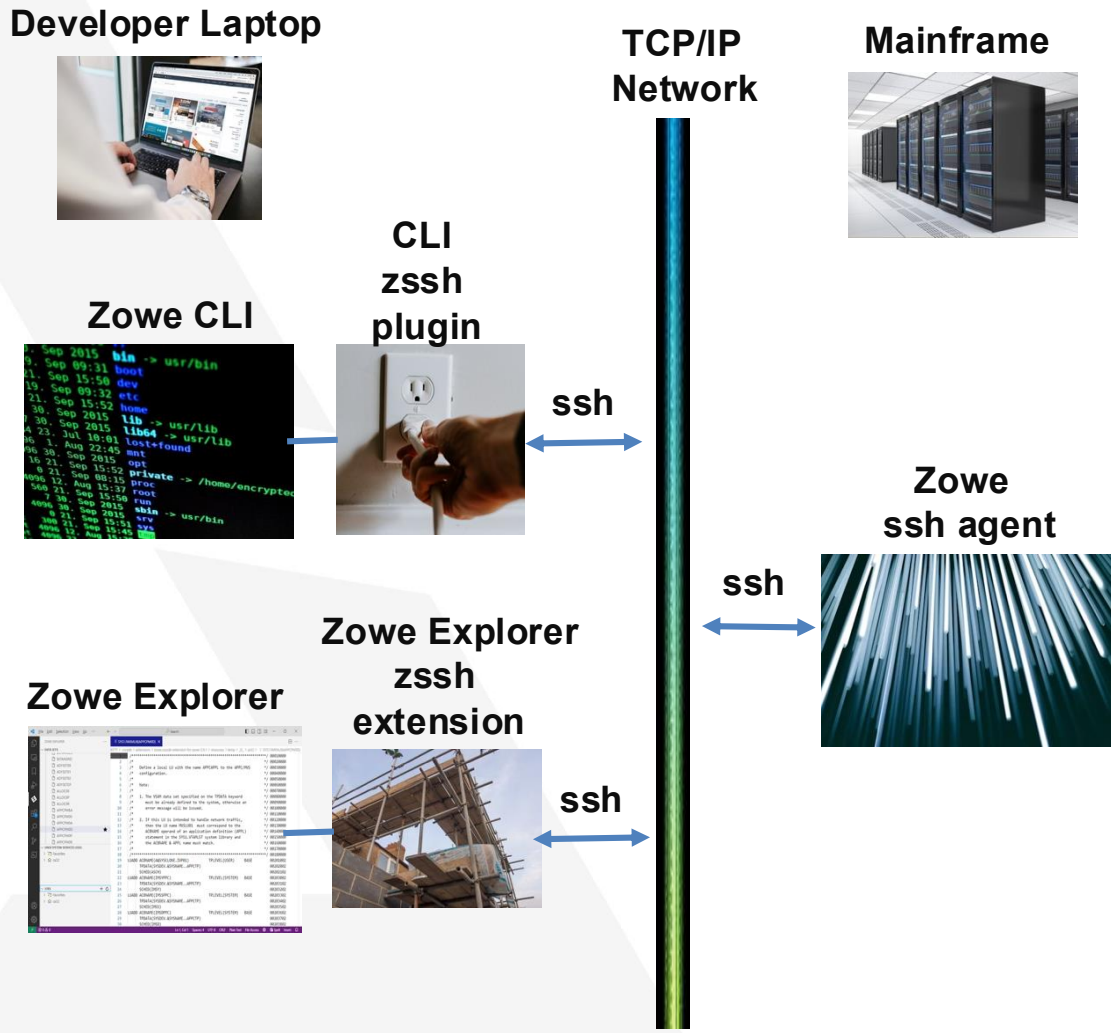
# What's new and what's cooking in our lab

- Recently delivered
  - Search for text in data-sets or PDS members
  - Download PDS members matching a pattern
  - Copy data set without having to pre-allocate target
  - Copy members from a source PDS to existing PDS
  - New option to prompt before overwriting data set
    - --safe-replace
  - New options to control timing of job download
    - --wait-for-active & --wait-for-output
- Work in progress
  - Change your mainframe password from Zowe clients
  - Allow user to control the authentication used for any profile

# SSH AGENT

# Zowe self-deploying “ssh agent” project

- Proof of concept application
  - Provides remote access to z/OS services
- Zowe client app deploys the agent
  - No mainframe installation or started task
  - The agent is provided with the client app
  - Developers upload the agent themselves
  - Useful for developers working on ZD&T and ZVDT systems
- Requires SSH on your mainframe
  - Typically available at most sites
- Requesting consumer validation
  - Basic capabilities to be expanded
  - Pre-release version on a public website soon



# Zowe ssh agent technology

- C++ / Metal-C mainframe binary code
  - Some embedded assembler
  - Communicates with underlying z/OS services
- GO language mainframe binary code
  - Handles the communications between SSH and the C++ code
- TypeScript in the Zowe clients
  - Communicates to SSH
  - Uploads the ssh agent to the mainframe
  - Sends requests to the ssh agent
  - Processes responses from the ssh agent

# Comparison of ssh agent capabilities

https://github.com/zowe/zowe-native-proto/blob/main/doc/apis.md

## API Matrix

### Legend

- ✅ Supported
- 🚧 Partially supported
- ❌ Not supported
- ➖ Not applicable
- *italic* Target for MVP

### Data Sets

| Operation | z/OSMF | FTP | Backend | Middleware | SDK | CLI | VSCE |
|---|---|---|---|---|---|---|---|
| *List data sets* | ✅ | ✅ | 🚧 [1] | ✅ | ✅ | ✅ | ✅ |
| *List data set members* | ✅ | ✅ | 🚧 [1] | ✅ | ✅ | ✅ | ✅ |
| *Read data set/member* | ✅ | ✅ | 🚧 [2] | ✅ | ✅ | ✅ | ✅ |
| *Write data set/member* | ✅ | ✅ | 🚧 [2] | ✅ | ✅ | ❌ | ❌ |
| *Create data set* | ✅ | ✅ | ✅ | ❌ | ❌ | ❌ | ❌ |
| *Delete data set/member* | ✅ | ✅ | ✅ | ❌ | ❌ | ❌ | ❌ |
| Migrate data set | ✅ | ❌ | ❌ | ❌ | ❌ | ❌ | ❌ |
| Recall data set | 🚧 [3] | ❌ | ✅ | ✅ | ✅ | ✅ | ❌ |
| Delete migrated data set | ✅ | ❌ | ❌ | ❌ | ❌ | ❌ | ❌ |
| Rename data set | ✅ | ✅ | ❌ | ❌ | ❌ | ❌ | ❌ |
| Copy data set | ✅ | ❌ | ❌ | ❌ | ❌ | ❌ | ❌ |
| Invoke AMS (VSAM) | ✅ | ❌ | ❌ | ❌ | ❌ | ❌ | ➖ |
| Search data sets | 🚧 [4] | ❌ | ❌ | ❌ | ❌ | ❌ | ❌ |

1. Not all attributes are retrieved
2. Streaming is not supported for large files
3. Does not support some migration utilities like CA Disk
4. Limited options compared to ISPF `srchfor`

# Video: Using Zowe with the ssh agent

# Zowe Secure Shell (ssh)
# Self-deploying Agent

# What did we not have time to show you

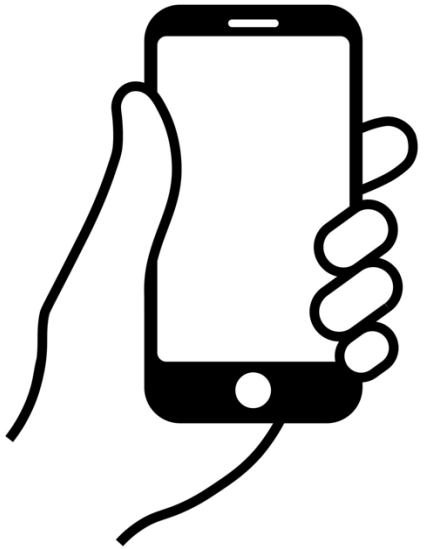
- CLI Deep Dive
  - zowe jobs submit ds “HLQ.JCL(MBR) –jcl-symbols (A=DS1 B=DS2) --wfo --vasc”
  - zowe tso ‘exec “HLQ.REXX(MBR)”’
  - zowe cics get resource CICSPRogram –criteria “PROGRAM=LG*”
- Scaling up
  - Nested and base profiles
  - Daemon. TSO Address Space start -> send -> stop
- Authentication and security
  - Secure Credentials Store
  - X509 client certificates
  - API Mediation Layer for tokenBased one time password (MFA) scenarios

# Your feedback is important!

**Submit a session evaluation** for each session you attend:

www.share.org/evaluation

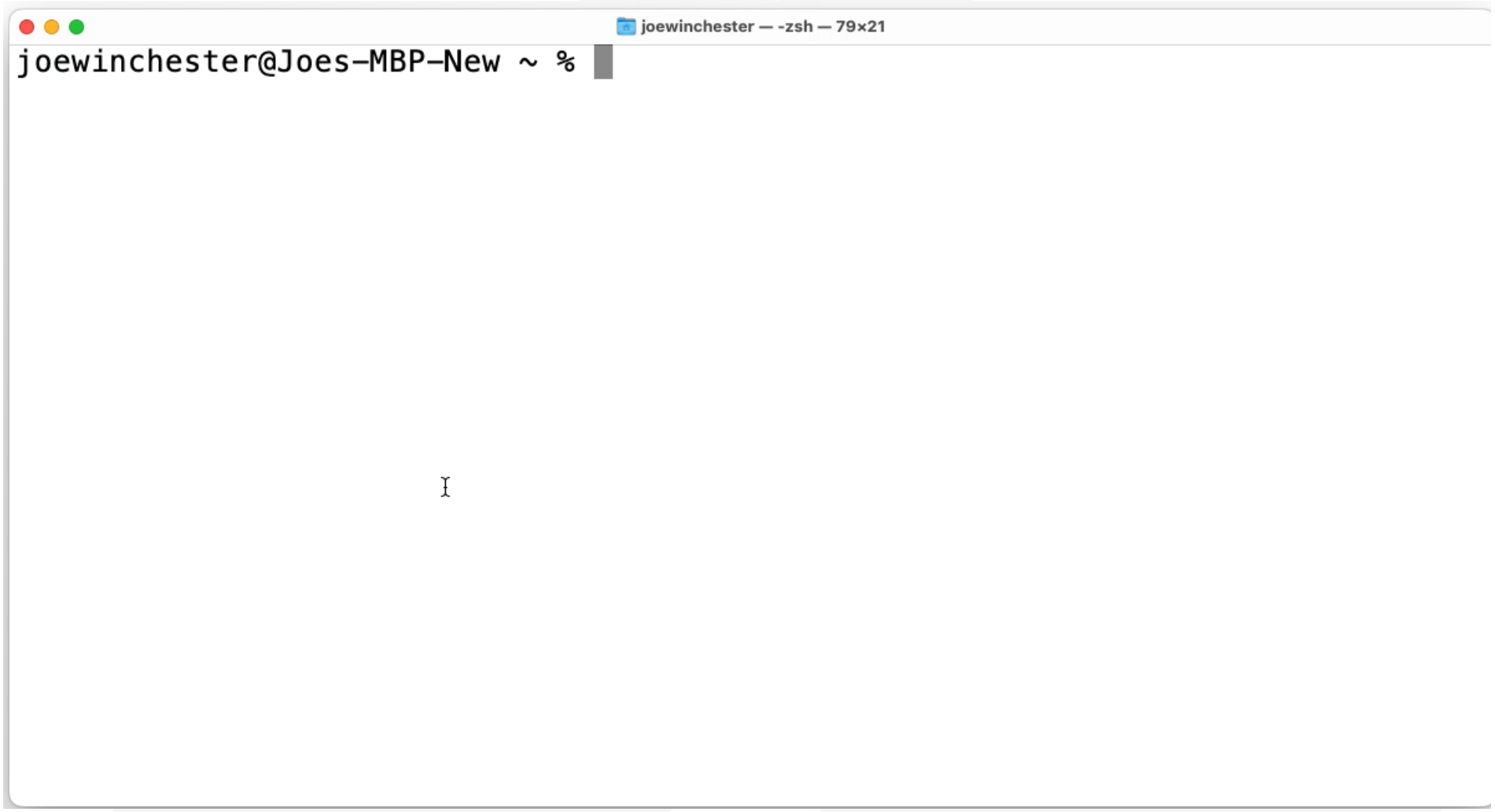
SHARE mobile app

# CLI COMMAND DIVE INTO EXAMPES

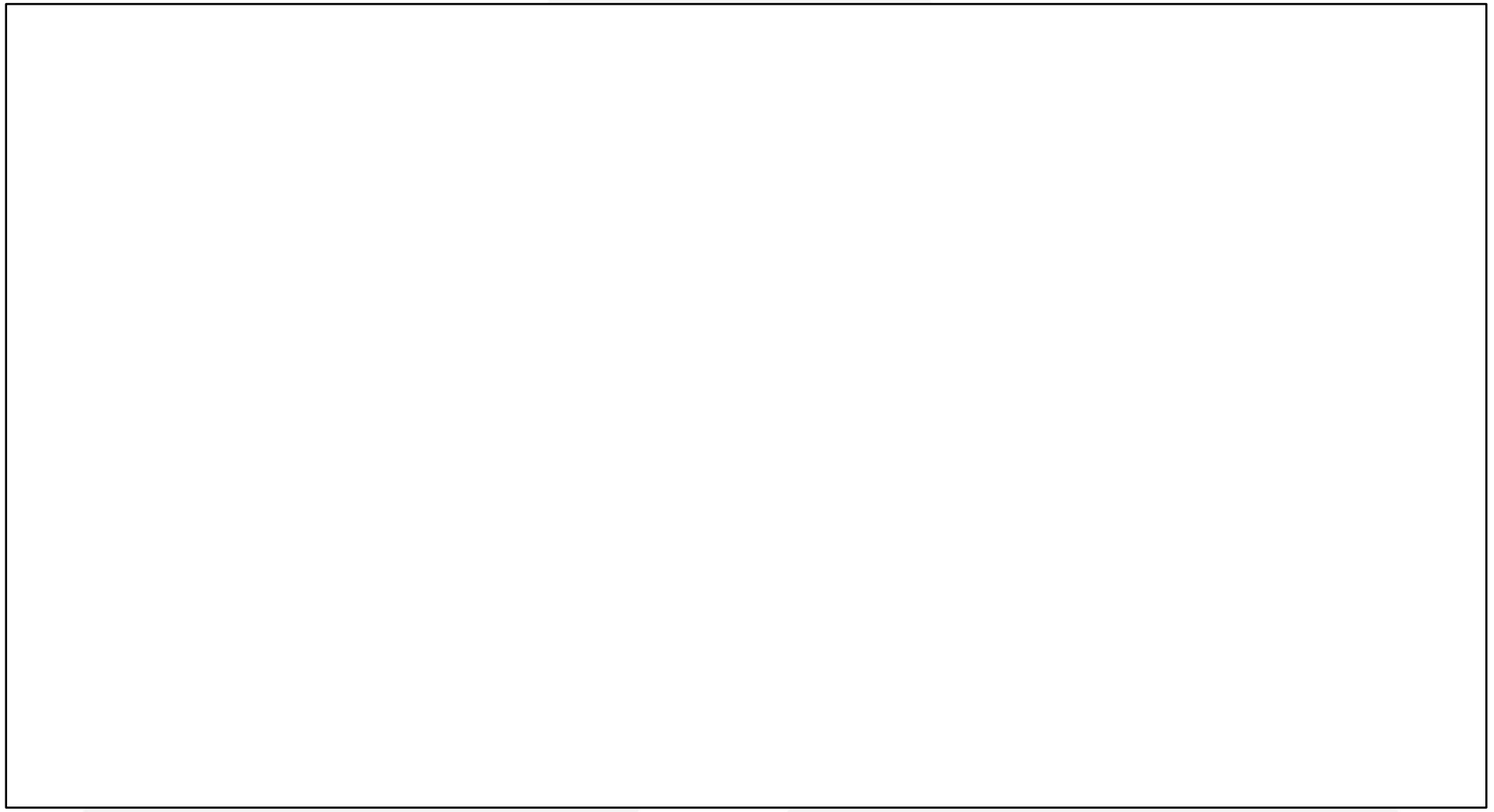
# CLI with Arguments

zowe jobs submit ds ”HLQ.JCL(MBR)” –jcl-symbols “symbol=value”



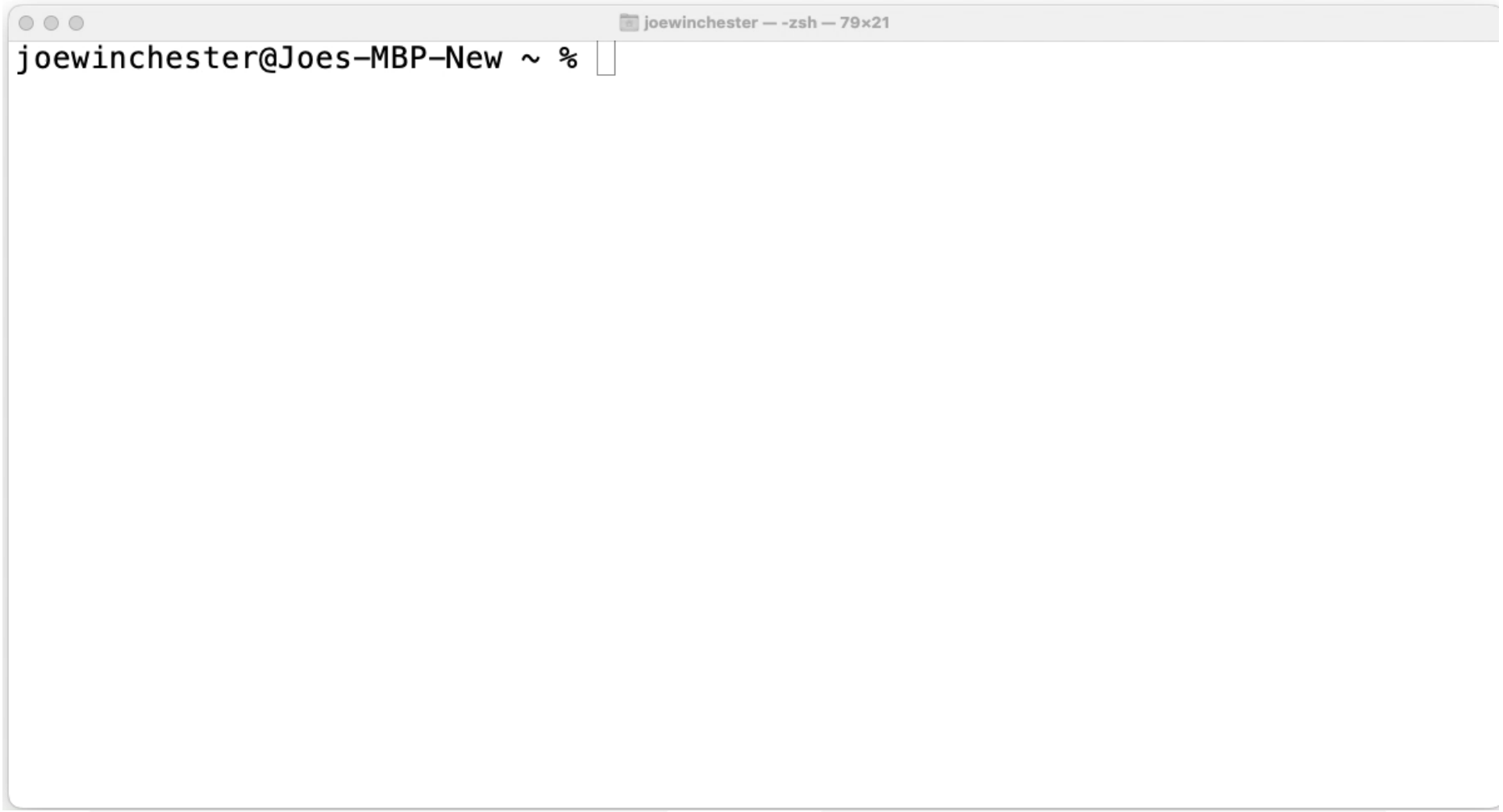
# Zowe TSO = CLI Unlimited

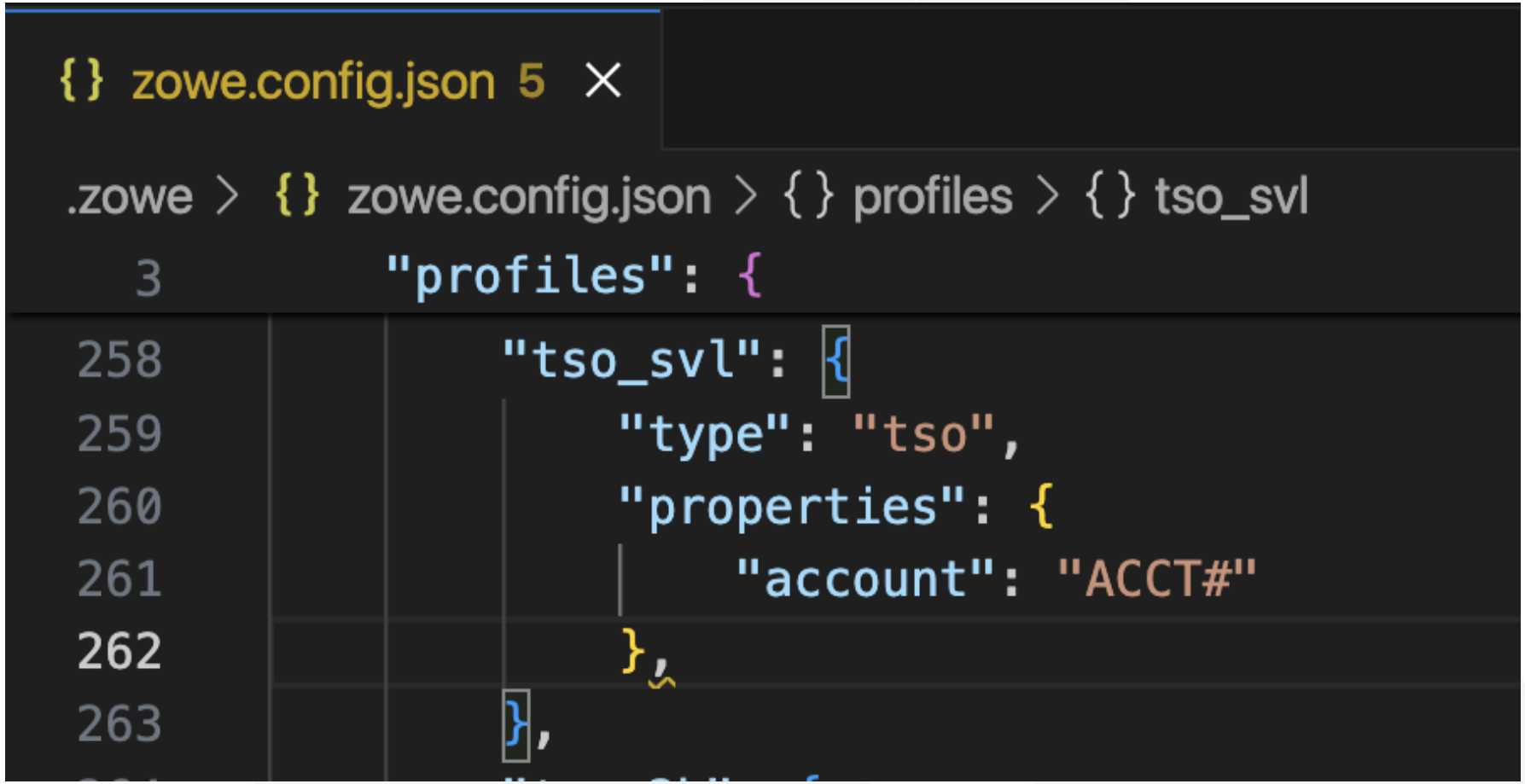
```
zowe tso issue command "TSO COMMAND"
```



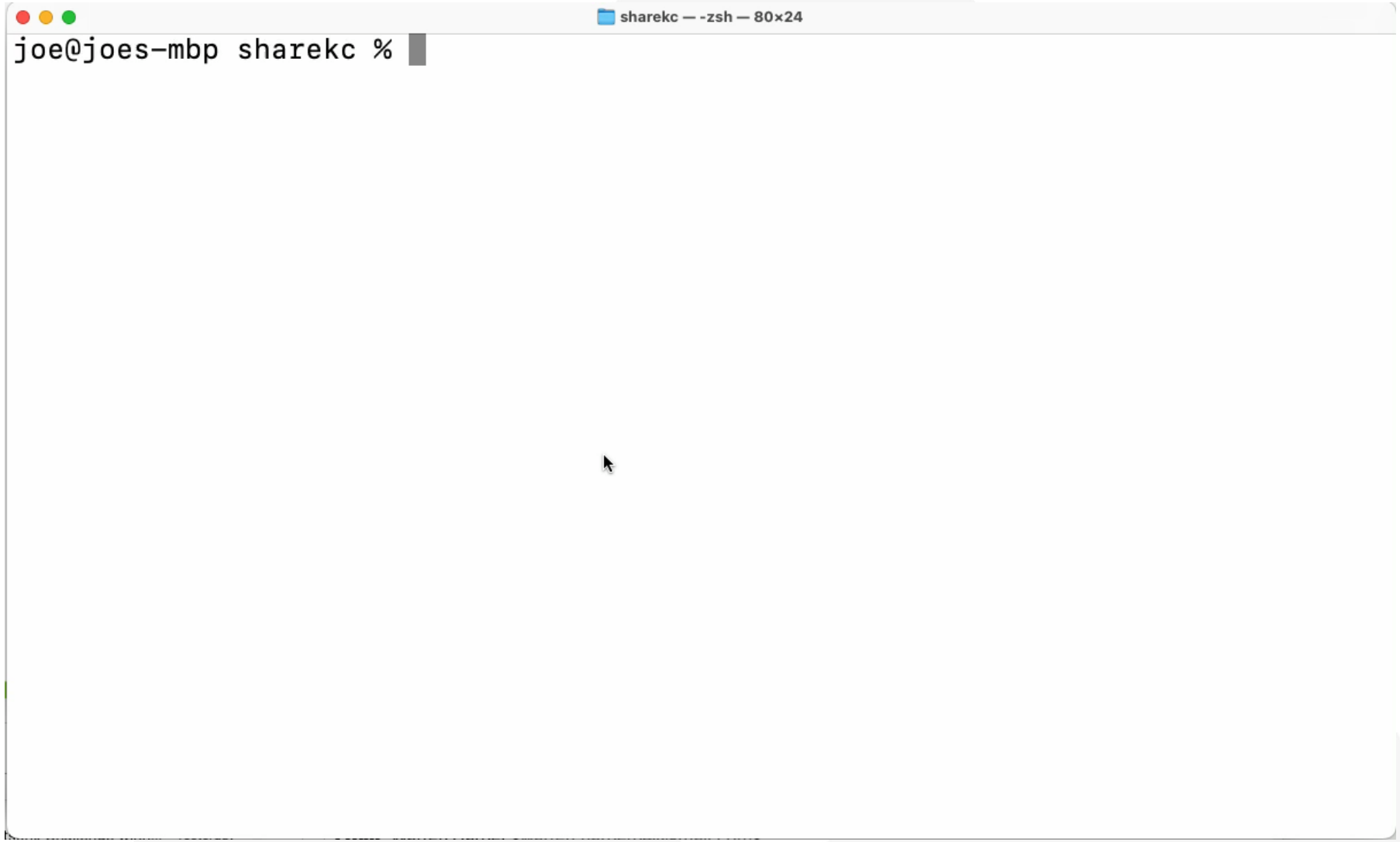
# REXX with Arguments through TSO

```
zowe tso issue command ”exec ‘HLQ.REXX(MBR)’ ‘ARG1’ ‘ARG2’”
```





# SSH Profiles



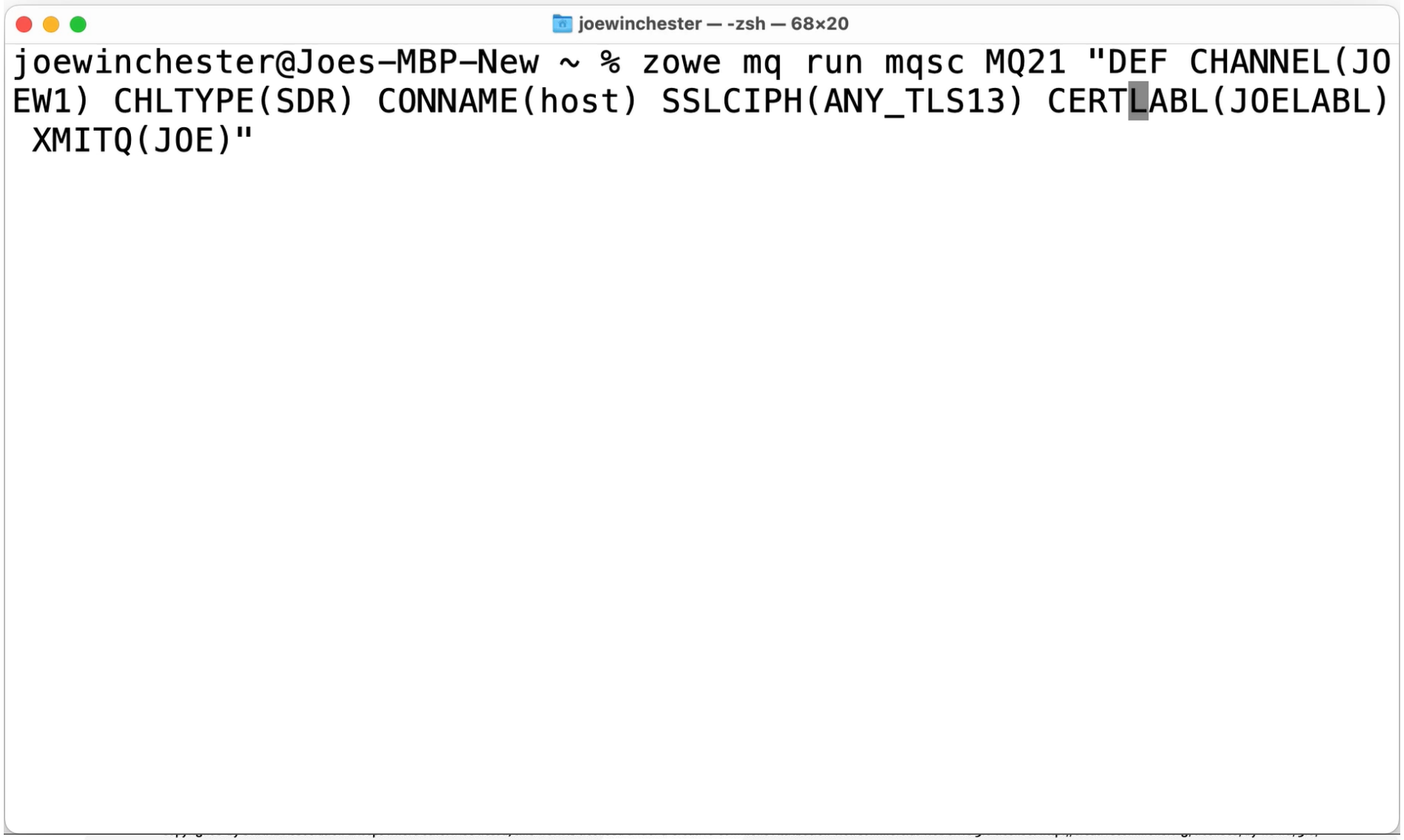
{} zowe.config.json 4 ×

.zowe > {} zowe.config.json > {} profiles > {} ssh_3b > {} properties

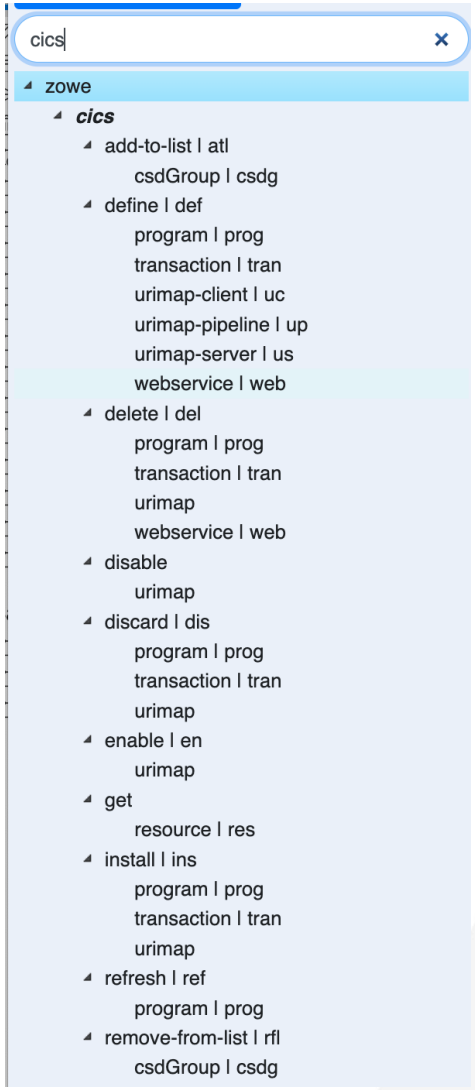
```
  3        "profiles": {
238            "ssh_svl": {
239                "type": "ssh",
240                "properties": {
241                    "host": "zowehost",
242                    "port": 22
243                },
244                "secure": [
245                    "user",
246                    "password"
247                ]
248            },
```

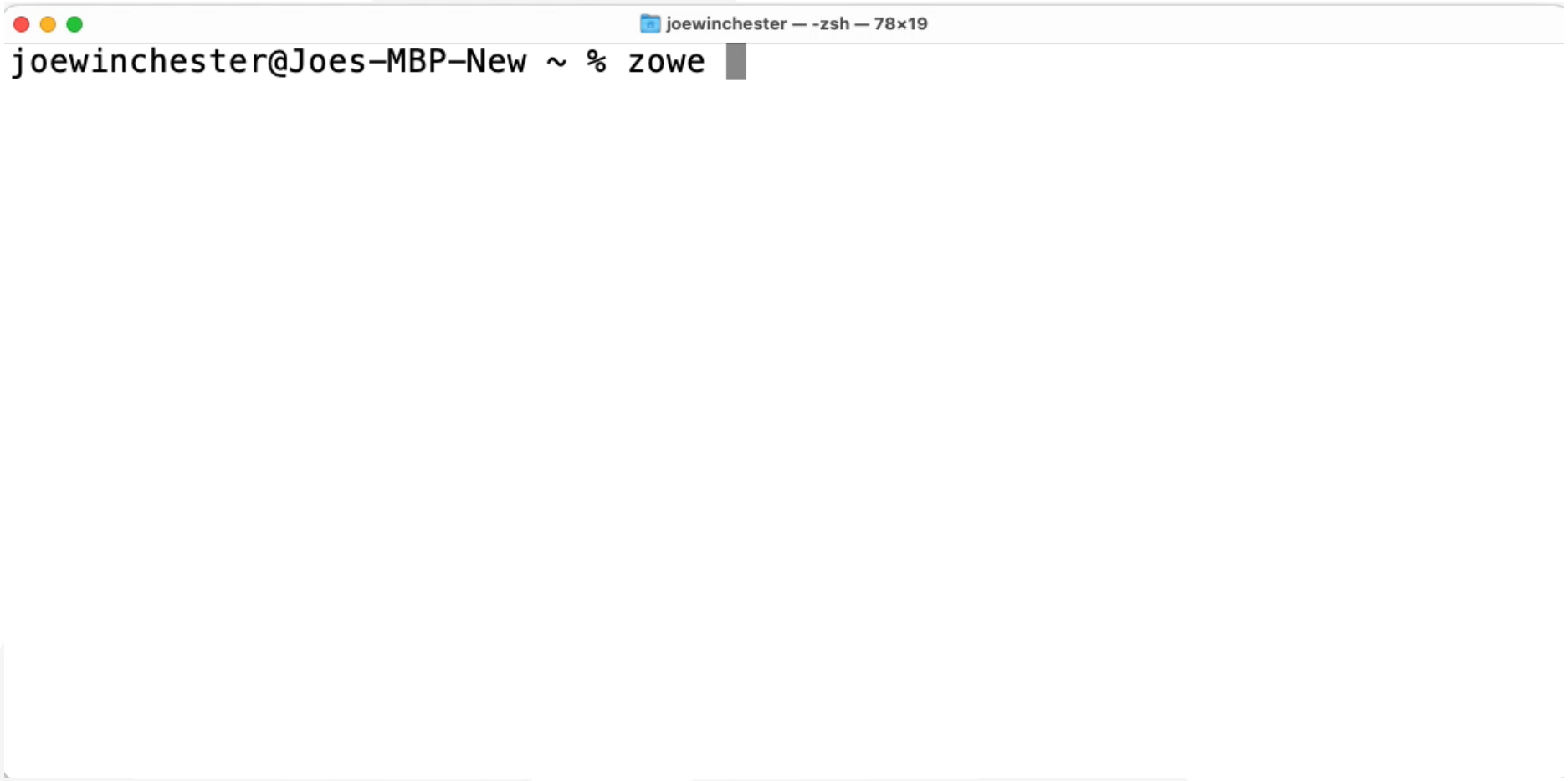
# MQ Channel Commands

zowe mq run mqsc MQ21 ”<MQSC_CMD>”



# CICS me baby one more time




- db2
  - call
    - procedure | proc | sp
  - execute
    - sql
  - export
    - table

**Examples**

- Execute a dummy SQL query:
  - `zowe db2 execute sql --query "SELECT 'Hello World' FROM SYSIBM.SYSDUMMY1"` Copy
- Retrieve the employees table and total number of rows:
  - `zowe db2 execute sql -q "SELECT * FROM SAMPLE.EMP; SELECT COUNT(*) AS TOTAL FROM SAMPLE.EMP"` Copy
- Execute a file with SQL statements:
  - `zowe db2 execute sql --file backup_sample_database.sql` Copy

# NESTED PROFILES

```
{
  "$schema": "./zowe.schema.json",
  "profiles": {
    "tvt_zosmf": {
      "type": "zosmf",
      "properties": {
        "host": "zowehost",
        "port": 443,
        "rejectUnauthorized": false,
        "protocol": "https"
      },
      "secure": [
        "user",
        "password"
      ]
    },
    "tvt_ssh": {
      "type": "ssh",
      "properties": {
        "host": "zowehost",
        "port": 22,
      },
      "secure": [
        "user",
        "password"
      ]
    },
  },
  "defaults": {
    "zosmf": "tvt_zosmf",
    "ssh": "tvt_ssh",
  },
}
```

# Profile information duplication problem

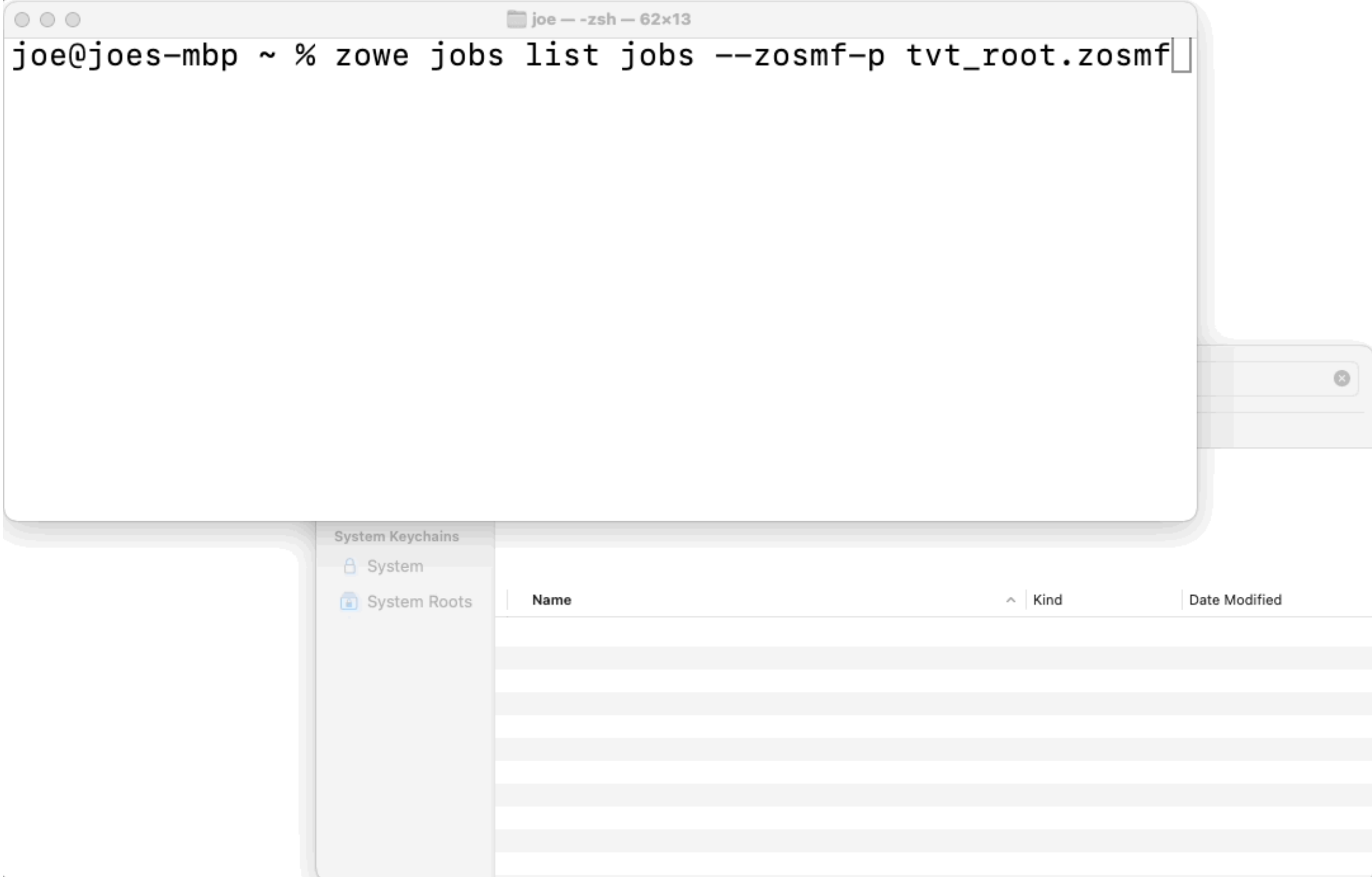
User ID and password are defined twice

```
{
    "$schema": "./zowe.schema.json",
    "profiles": {
        "tvt_base": {
            "type": "base",
            "properties": {
                "host": "zowehost",
                "rejectUnauthorized": false
            },
            "secure": [
                "user",
                "password"
            ]
        },
        "tvt_zosmf": {
            "type": "zosmf",
            "baseProfile": "tvt_base",
            "properties": {
                "protocol": "https",
                "port": 443
            }
        },
        "tvt_ssh": {
            "type": "ssh",
            "baseProfile": "tvt_base",
            "properties": {
                "port": 22
            }
        }
    },
    "defaults": {
        "zosmf": "tvt_zosmf",
        "ssh": "tvt_ssh",
        "base": "tvt_base"
    },
    "autoStore": true
}
```

# Base profile is parent of child profiles

Common shared attributes defined in base and shared across children, e,g

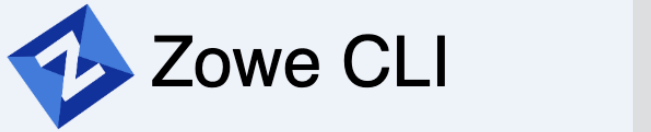
- host
- user
- password
- …


joe — -zsh — 62×13
joe@joes-mbp ~ % zowe jobs list jobs --zosmf-p tvt_root.zosmf
System Keychains
System
System Roots
Name
Kind
Date Modified

```
{
  "$schema": "./zowe.schema.json",
  "profiles": {
   "tvt_root": {
     "properties": {
       "host": "zowehost"
     },
     "secure": [
       "user",
       "password"
     ],
     "profiles": {
       "zosmf": {
         "type": "zosmf",
         "properties": {
           "protocol": "https",
           "rejectUnauthorized": false,
           "port": 443
         }
       },
       "ssh": {
         "type": "ssh",
         "properties": {
           "port": 22
         }
       }
     }
   }
}
```

# Profiles can have child profiles

User ID and password are defined in the parent that has two child profiles




Tree View | Flat View

config

- zowe
  - *config*
    - auto-init
    - convert-profiles | convert
    - edit
    - import
    - init
    - list | ls
    - profiles
    - report-env | re
    - schema
    - secure
    - set
    - update-schemas | us

# zowe › config › secure

prompt for secure configuration properties

### Usage

zowe config secure [options]

### Options

- `--global-config` | `--gc` *(boolean)*
  - Secure properties in global config.

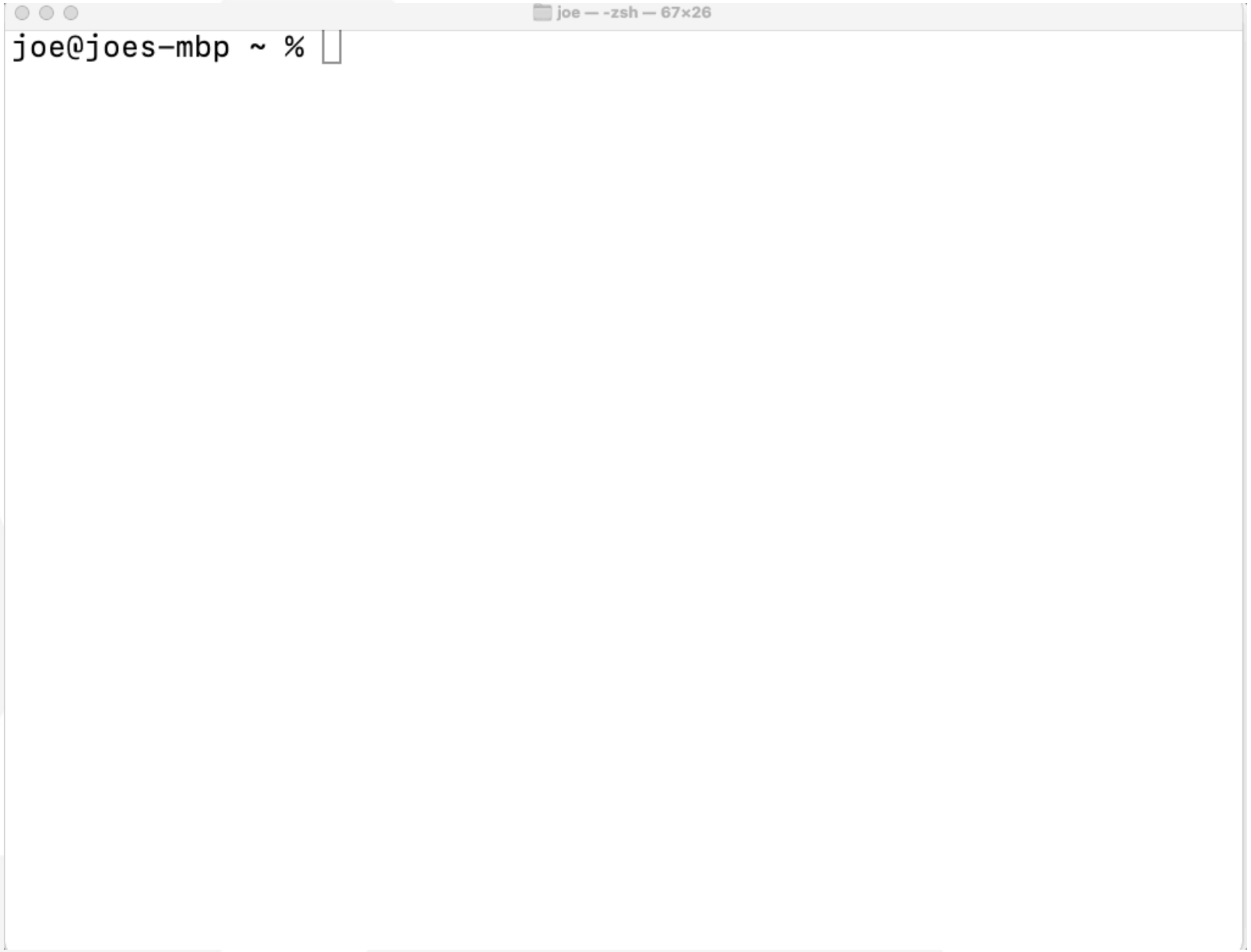
    Default value: false
- `--user-config` | `--uc` *(boolean)*
  - Secure properties in user config.

    Default value: false
- `--prune` | `-p` *(boolean)*
  - Delete properties stored in the vault for team config files that do not exist.

    Default value: false

`zowe config secure`

lists and lets you edit properties



# zowe › config › set

create or update a configuration property

### Usage

zowe config set <property> [value] [options]

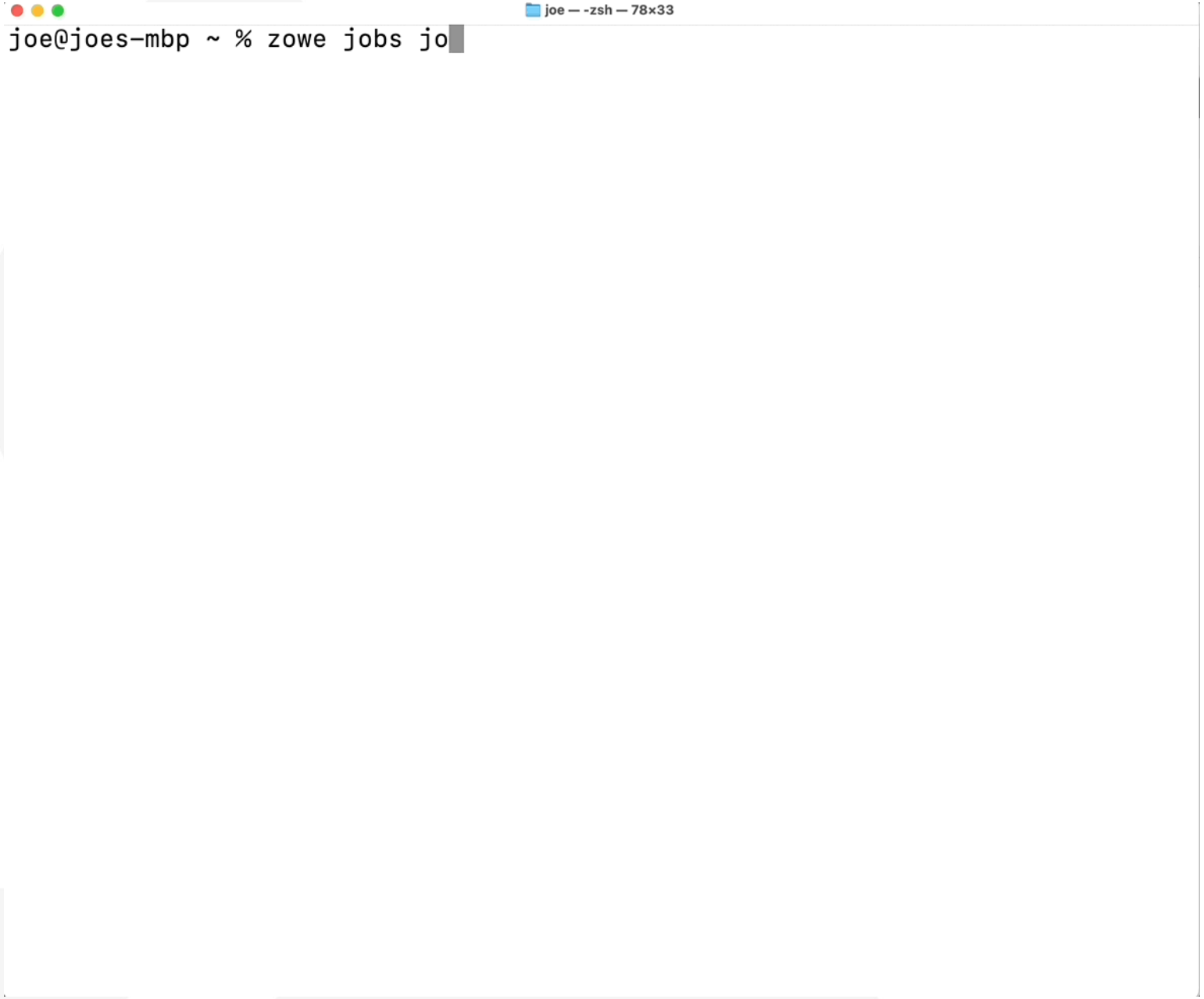
### Positional Arguments

- `property` *(string)*
  - The property to set. You may specify a path using dot notation (e.g. profiles.host1.profiles.service1.properties.setting)
- `value` *(string)*
  - The property value to set. The value may be JSON. Use '--json' to indicate.

- Set the property in global config:
  - `zowe config set "profiles.host1.profiles.service1.properties.setting" "value" --global-config` Copy
- Set the property in user config:
  - `zowe config set "profiles.host1.profiles.service2.properties.setting" "value" --user-config` Copy
- Set property value to JSON:
  - `zowe config set "profiles.host1.profiles.service3.properties.setting" "{"property":"value"}" --json` Copy
- Store the property value:
  - `zowe config set "profiles.host1.profiles.service1.properties.setting" "value" --secure` Copy

```
zowe config set
“key” “value”
```

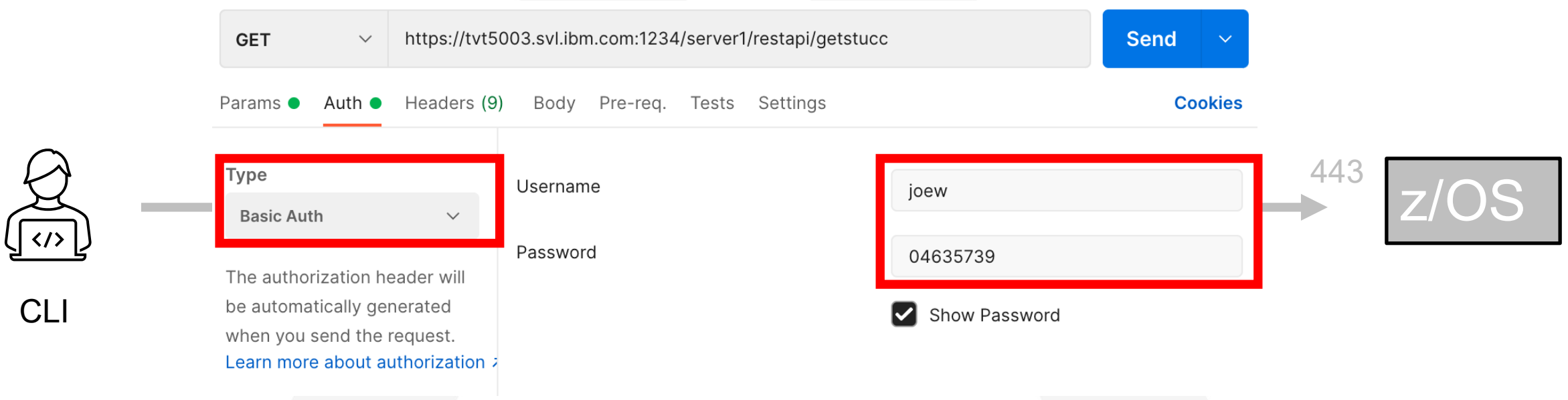
lets you fine grain edit properties

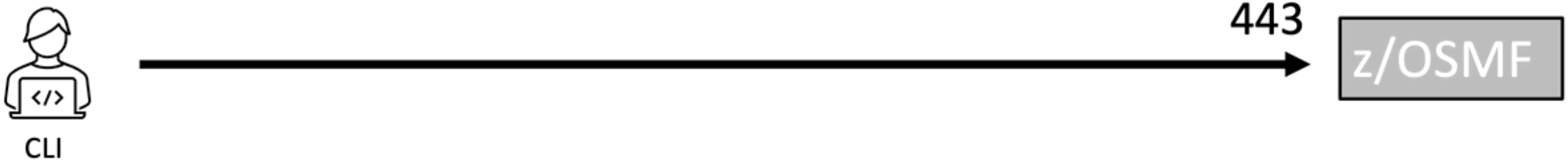


# CLI AUTHENTICATION

# How does z/OS know who I am ?

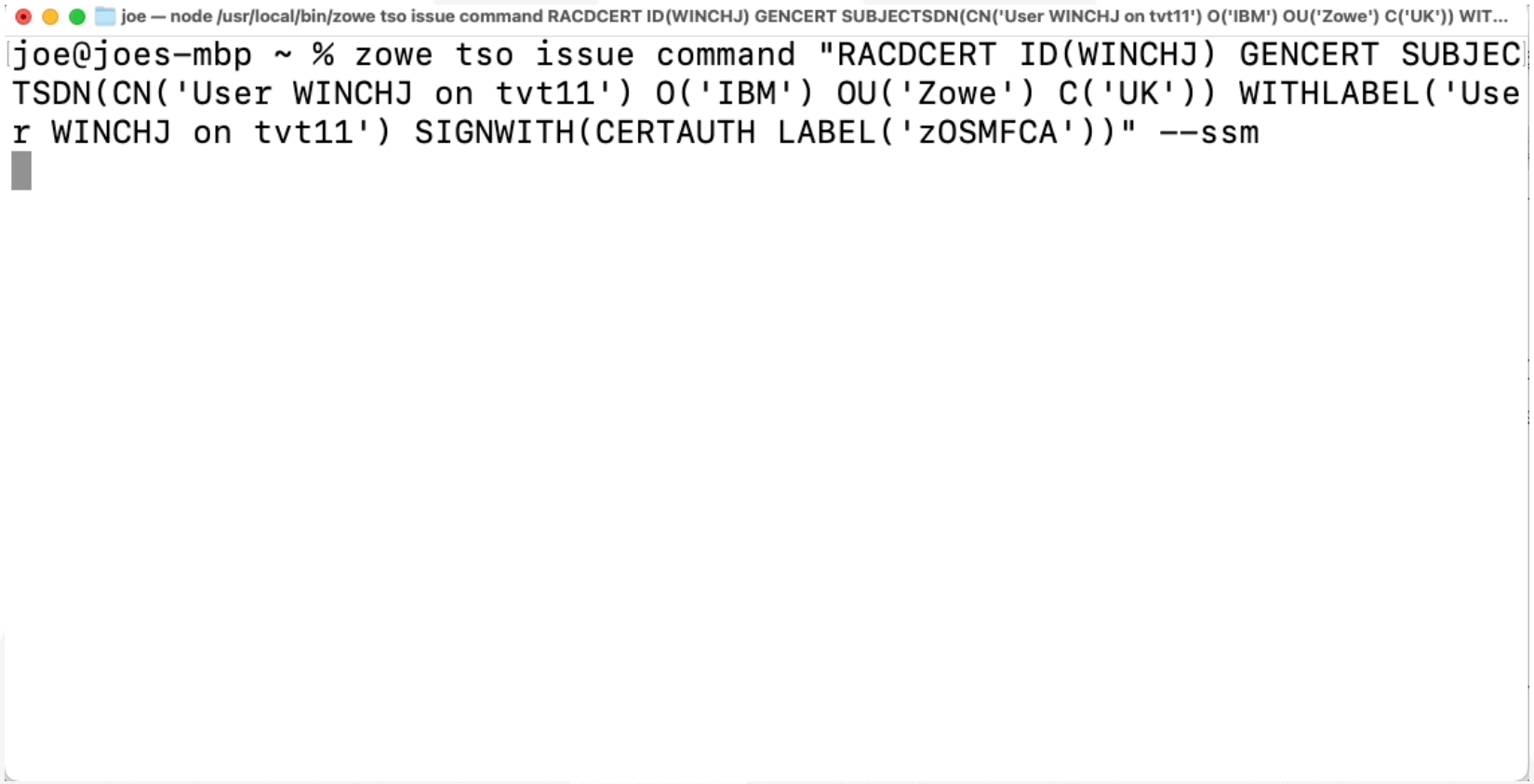
# TSO user ID and password




443
z/OSMF
CLI

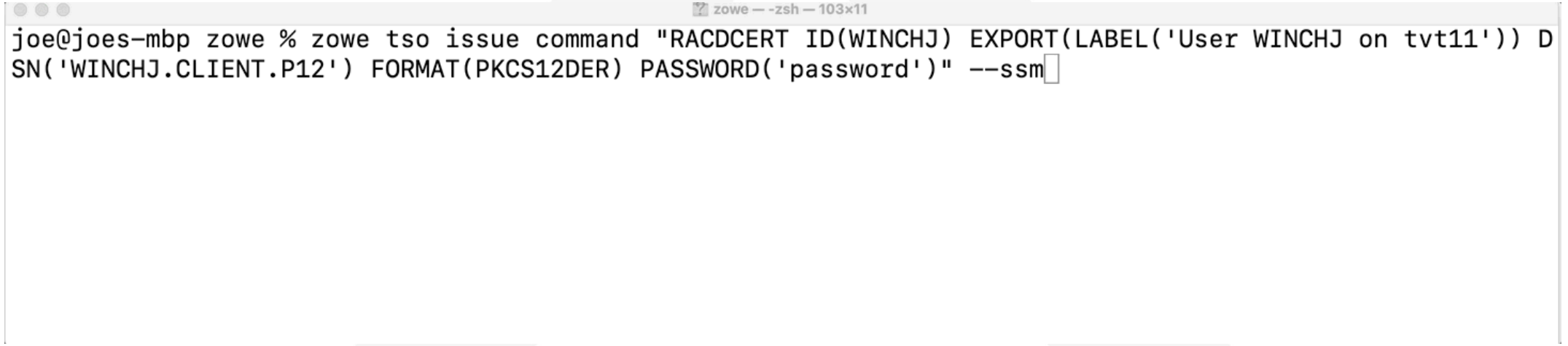
# Step 1: Create a z/OS personal certificate

RACDCERT ID(WINCHJ) GENCERT SUBJECTSDN(CN('User WINCHJ on tvt11') O('IBM') OU('Zowe') C('UK')) WITHLABEL('User WINCHJ on tvt11') SIGNWITH(CERTAUTH LABEL('**zOSMFCA**')



# Step 2: Export the cert to a sequential DS

RACDCERT ID(WINCHJ) EXPORT(LABEL('User WINCHJ on tvt11')) DSN('WINCHJ.CLIENT.P12') FORMAT(**PKCS12DER**) PASSWORD('password')




# Step 3: Download the certificate to your PC

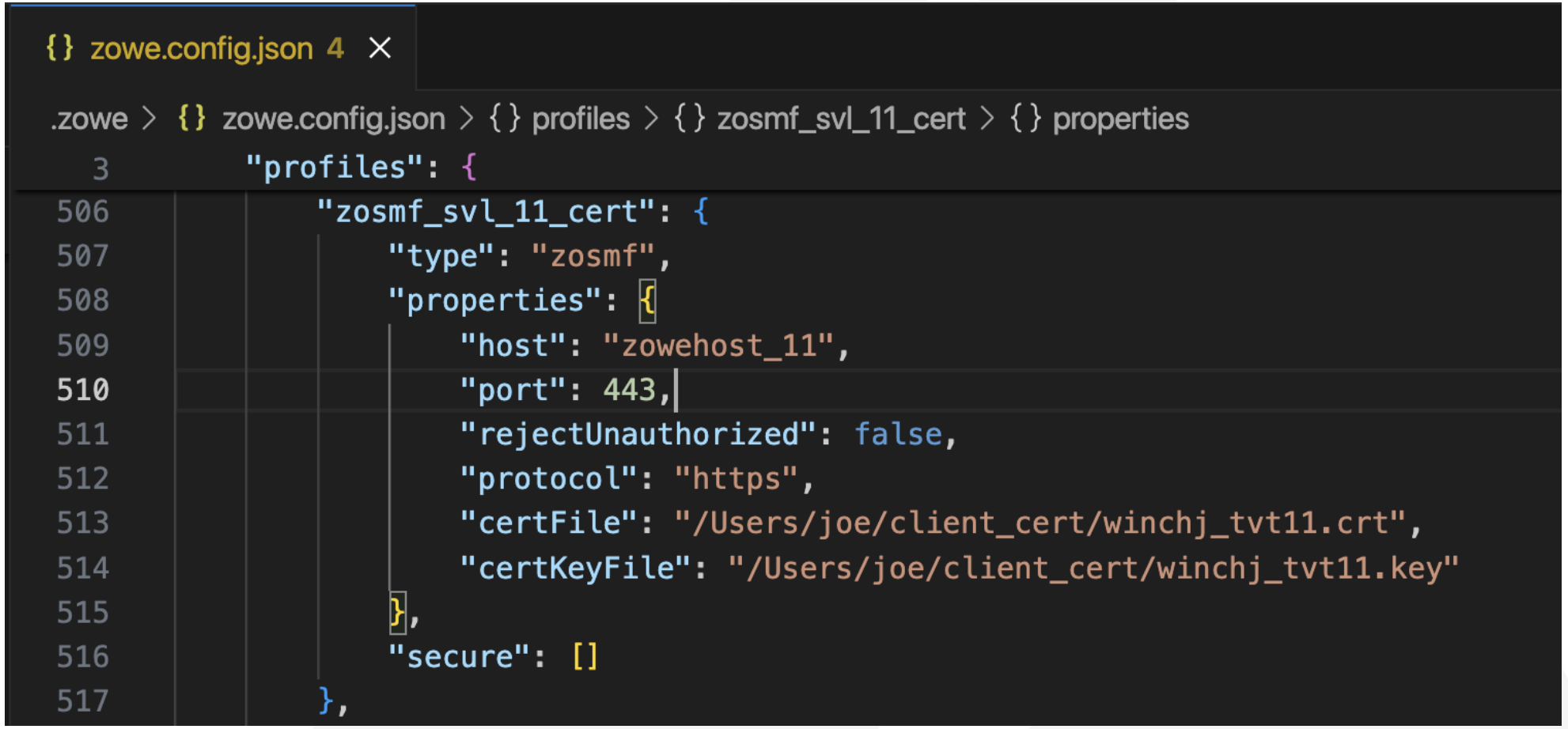
zowe files download ds "WINCHJ.CLIENT.P12" -b -f winchj_tvt11.12

# Step 3: Crack the cert apart into its private .key and public .crt

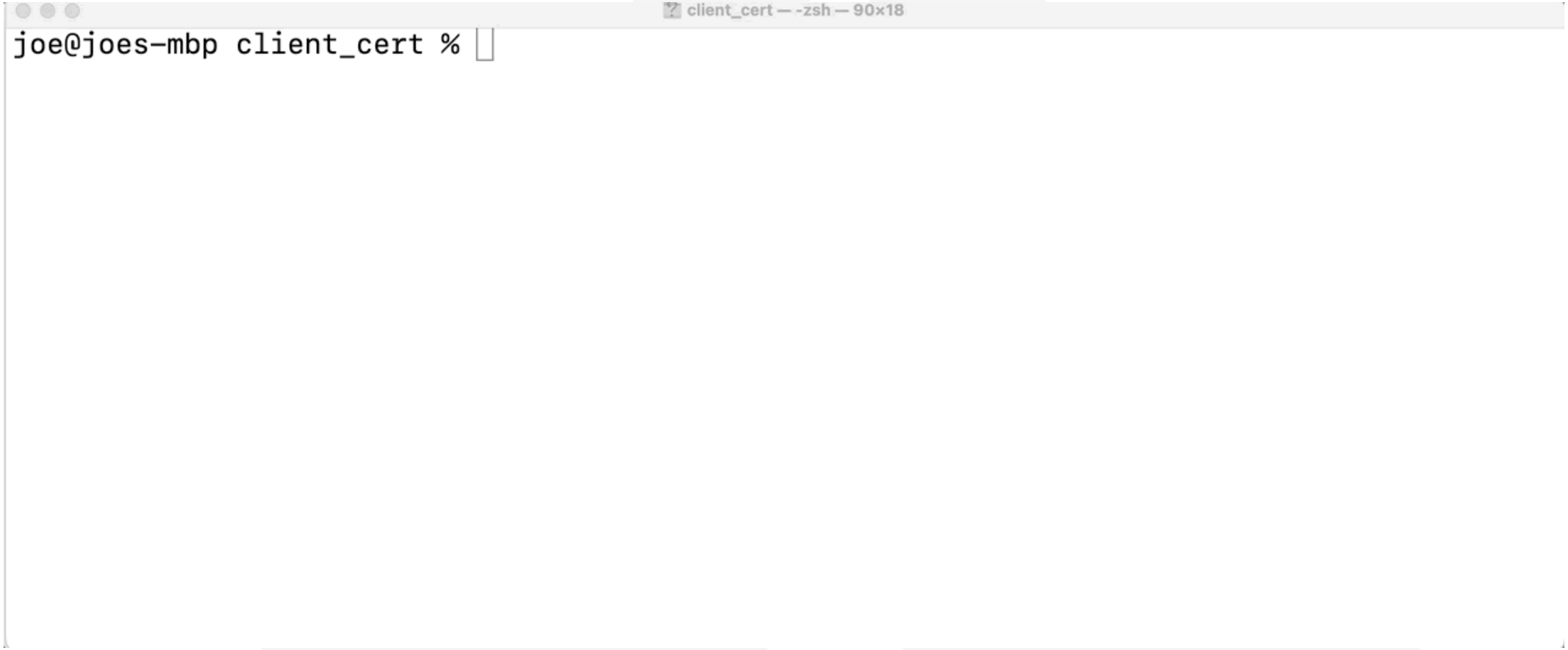
openssl pkcs12 -in winchj_tvt11.p12 -nocerts -**nodes** -out winchj_tvt11.key


openssl pkcs12 -in winchj_tvt11.p12 -clcerts -nokeys -out winchj_tvt11.crt

# Point to .crt and .key and remove user and password

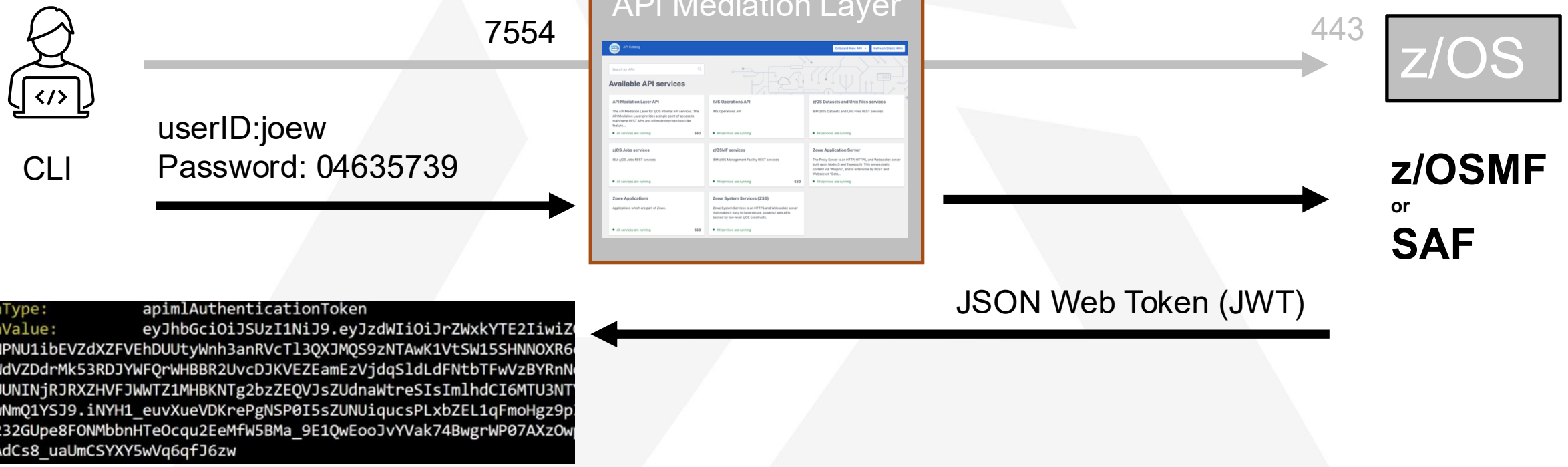


# `--show-inputs-only` is your CLI friend

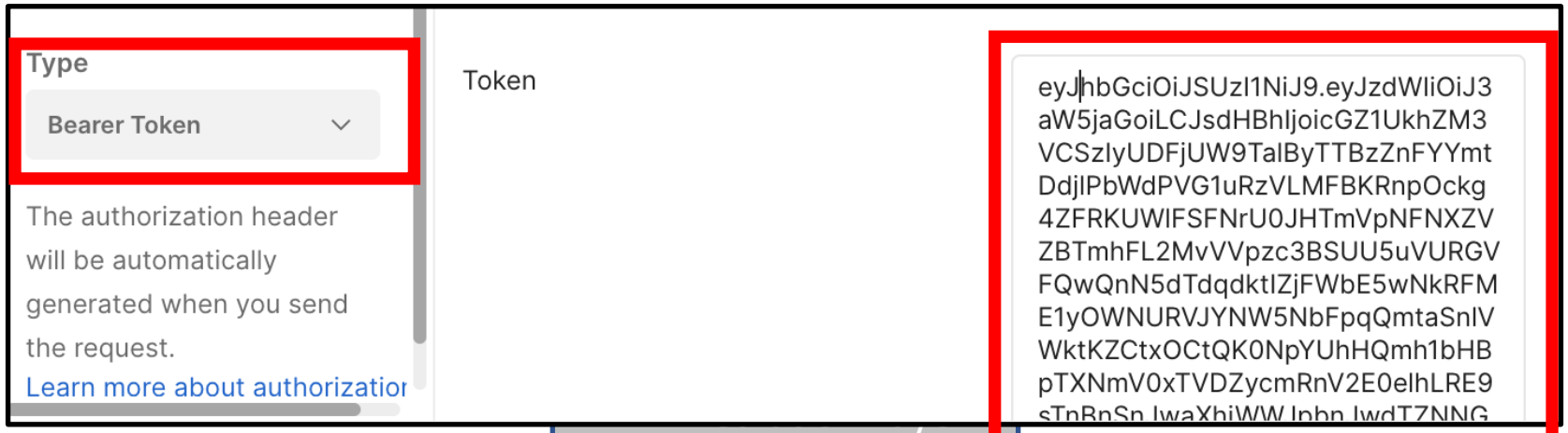


# APIML AND BASE PROFILES

# Exchange password for a token

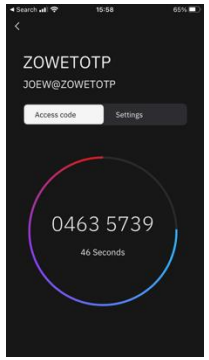


# Use Token on Subsequent requests

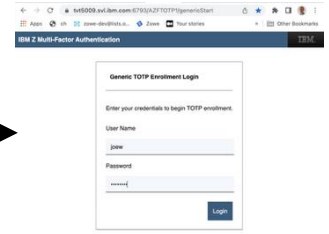


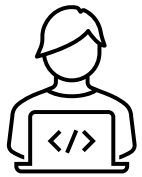

```
    tokenType:          apimlAuthenticationToken
    tokenValue:         eyJhbGciOiJSUzI1NiJ9.eyJzdWIiOiJrZWxkYTE2IiwiZ
RESjk2VzNPNU1ibEVZdXZFVEhDUUtyWnh3anRVcTl3QXJMQS9zNTAwK1VtSW15SHNNOXR6
nh6Vmd5UWdVZDdrMk53RDJYWFQrWHBBR2UvcDJKVEZEamEzVjdqSldLdFNtbTFwVzBYRnN
dDJpK0FTUUNINjRJRXZHVFJWWTZ1MHBKNTg2bzZEQVJsZUdnaWtreSIsImlhdCI6MTU3NT
iMmJlMWIwNmQ1YSJ9.iNYH1_euvXueVDKrePgNSP0I5sZUNUiqucsPLxbZEL1qFmoHgz9p
4HlhnPdB232GUpe8FONMbbnHTeOcqu2EeMfW5BMa_9E1QwEooJvYVak74BwgrWP07AXzOw
f7MGq2bSAdCs8_uaUmCSYXY5wVq6qfJ6zw
```

# MFA Flow Alongside Token based SSO




Out of Band

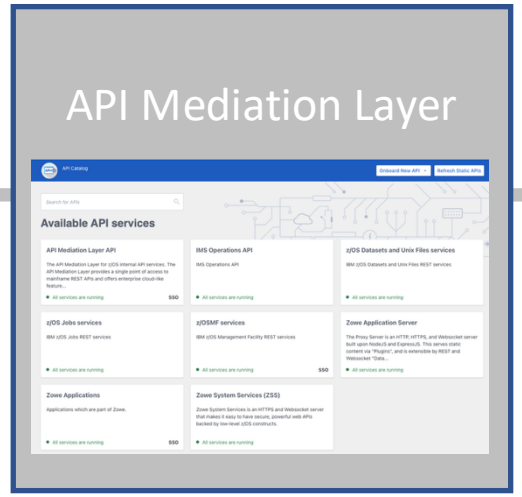


CLI

7554

userID:joew
Password: 04635739




443

z/OS

**z/OSMF**
or
**SAF**

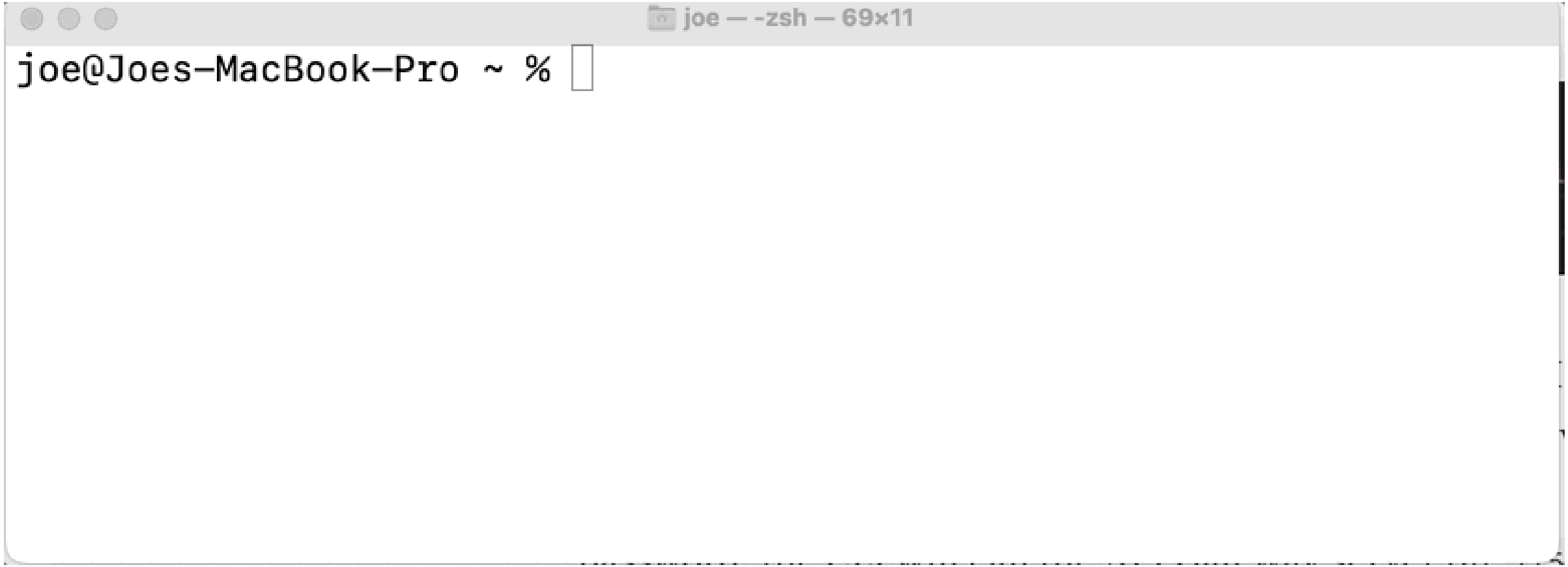
JSON Web Token (JWT)

```
tokenType:          apimlAuthenticationToken
tokenValue:         eyJhbGciOiJSUzI1NiJ9.eyJzdWIiOiJrZWxkYTE2IiwiZ
RESjk2VzNPNU1ibEVZdXZFVEhDUUtyWnh3anRVcTl3QXJMQS9zNTAwK1VtSW15SHNNOXR6
nh6Vmd5UWdVZDdrMk53RDJYWFQrWHBBR2UvcDJKVEZEamEzVjdqSldLdFNtbTFwVzBYRnN
dDJpK0FTUUNINjRJRXZHVFJWWTZ1MHBKNTg2bzZEQVJsZUdnaWtreSIsImlhdCI6MTU3NT
iMmJlMWIwNmQ1YSJ9.iNYH1_euvXueVDKrePgNSP0I5sZUNUiqucsPLxbZEL1qFmoHgz9p
4HlhnPdB232GUpe8FONMbbnHTeOcqu2EeMfW5BMa_9E1QwEooJvYVak74BwgrWP07AXzOw
f7MGq2bSAdCs8_uaUmCSYXY5wVq6qfJ6zw
```

# APIML endpoint is base profile

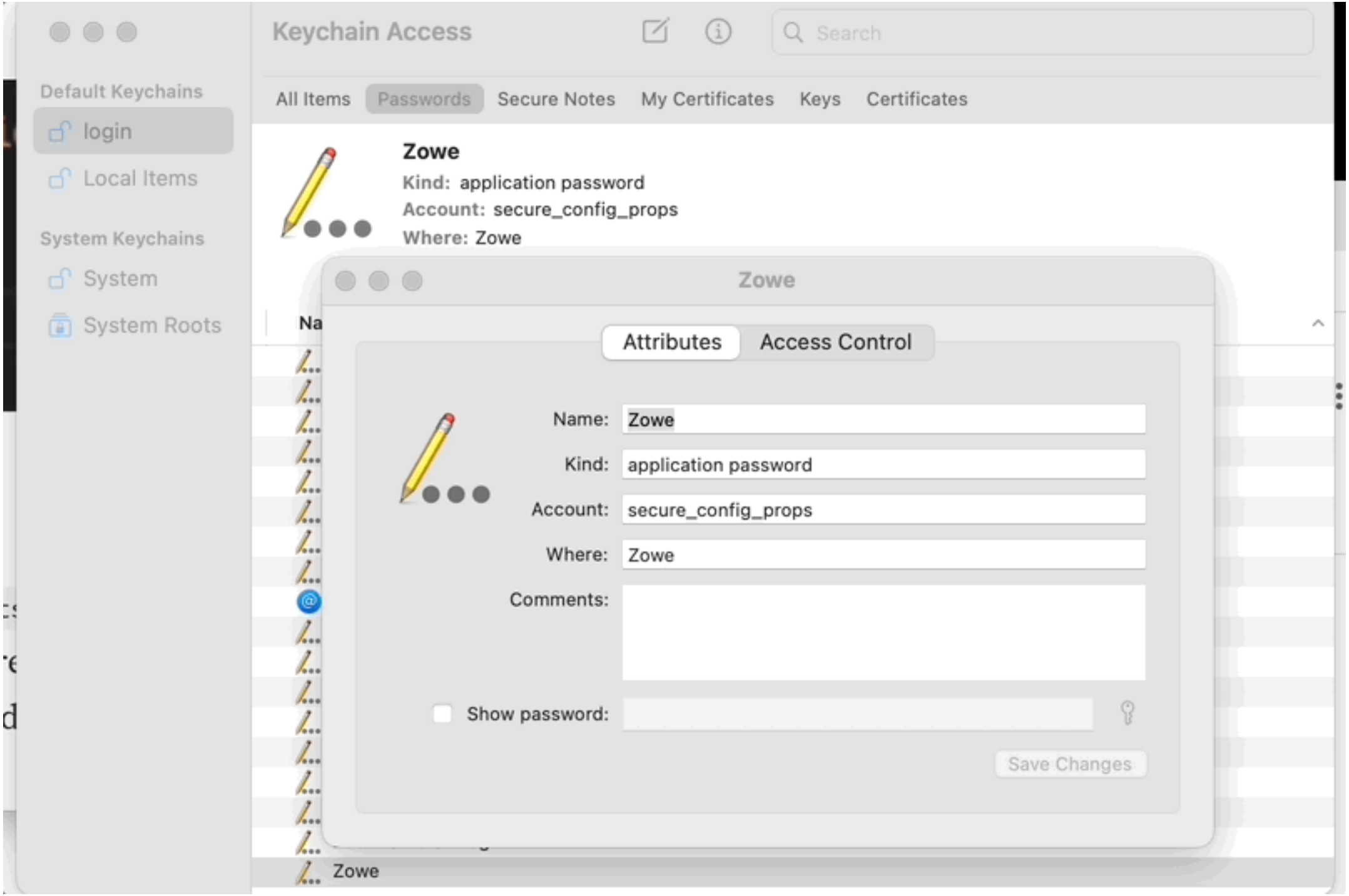
```
400         "zoweapiml": {
401             "type": "base",
402             "properties": {
403                 "host": "zowehost",
404                 "port": 27554,
405                 "rejectUnauthorized": true,
406                 "tokenType": "apimlAuthenticationToken"
407             },
408         }
409     },
```

# Zowe auth login apiml to get token



# tokenValue secured in SCS

```
400         "zoweapiml": {
401             "type": "base",
402             "properties": {
403                 "host": "zowehost",
404                 "port": 27554,
405                 "rejectUnauthorized": true,
406                 "tokenType": "apimlAuthenticationToken"
407             },
408             "secure": [
409                 "tokenValue"
410             ]
```


Keychain Access
Search
Default Keychains
login
Local Items
System Keychains
System
System Roots
All Items
Passwords
Secure Notes
My Certificates
Keys
Certificates
Zowe
Kind: application password
Account: secure_config_props
Where: Zowe
Zowe
Attributes
Access Control
Name: Zowe
Kind: application password
Account: secure_config_props
Where: Zowe
Comments:
Show password:
Save Changes
Zowe

# basePath is /dialing code for the southbound endpoint

```
393         "zosmf_svl": {
394             "type": "zosmf",
395             "properties": {
396                 "host": "tvt5003.svl.ibm.com",
397                 "port": 443,
398                 "rejectUnauthorized": false,
399                 "protocol": "https"
400             },
401             "secure": [
402                 "user",
403                 "password"
404             ]
405         },
```

```
394         "zosmf_via_apiml": {
395             "type": "zosmf",
396             "baseProfile": "zoweapiml",
397             "properties": {
398                 "basePath": "/ibmzosmf/api/v1"
399             }
400         },
```

https://zowehost:27554/ibmzosmf/api/v1/zosmf/restjobs/jobs?prefix=IZU*&owner=*

Type

Bearer ...

Token

The authorization header will be automatically generated when you send the request. Learn more about authorization ↗

eyJhbGciOiJSUzI1NiJ9.eyJzdWIiOiJ3aW5jaG
oiLCJpYXQiOjE2ODYzMDQ4NDMsImV4cCI6
MTY4NjMzMzY0MywiaXNzIjoiQVBJTUwiLCJ
qdGkiOiIzMTNlY2M3NS0zNDA4LTRmYjUtOG
QwYS04NDRkNzI3OGZhNjkiLCJsdHBhIjoiMV
hEbGdaanRSVUpRUmtiQVlkUlBwOGM2VlNG
N3VyVHBkUXV3NnNkZEgzektGaXFUNmk5V
2RWZ1BVVkNNWkRrOEliVVNBa2lwSXVmS05

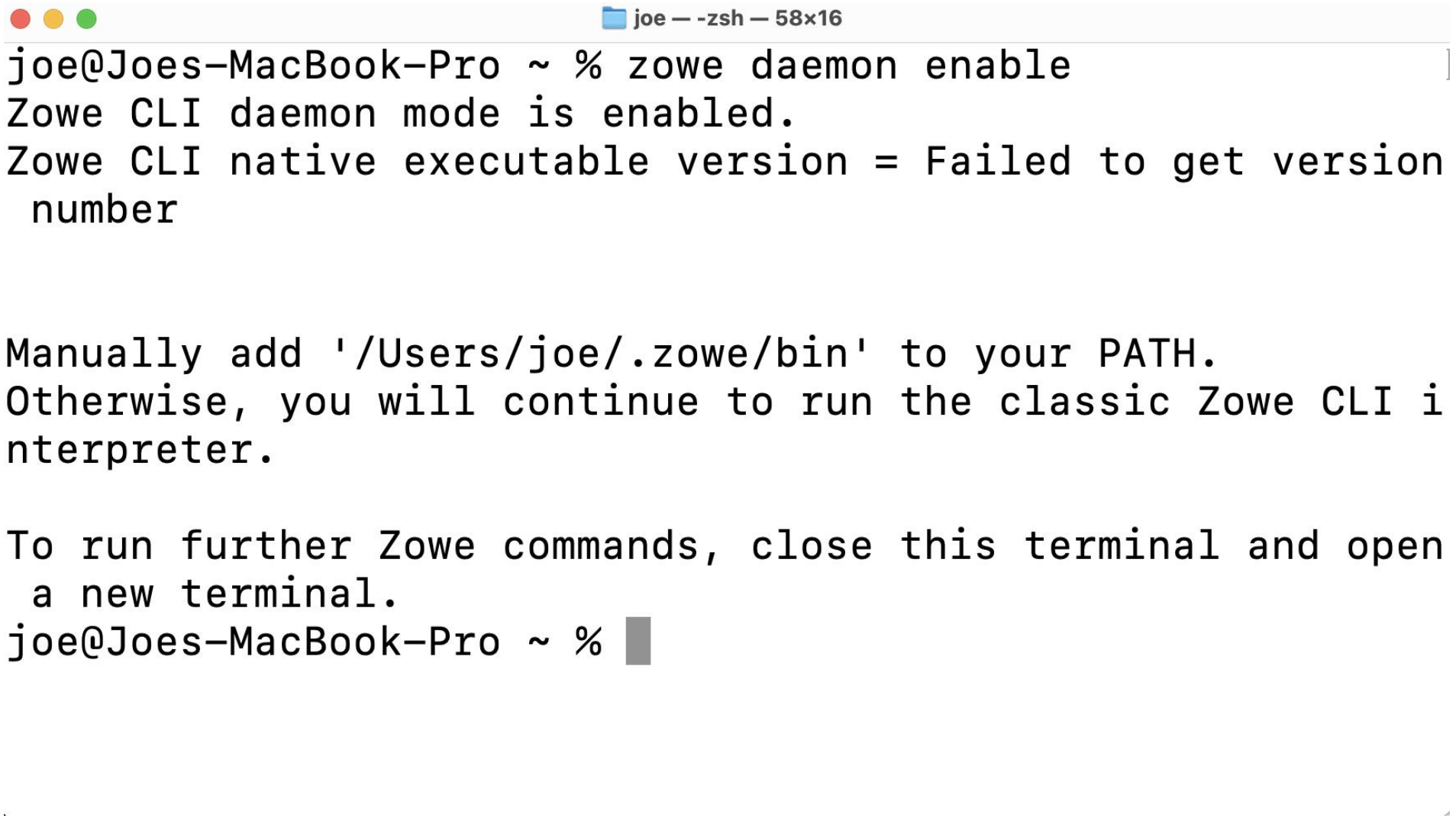
https://zowehost:443/zosmf/restjobs/jobs?prefix=IZU*&owner=*

Pretty Raw Preview Visualize JSON


```
[
    {
        "owner": "IZUSVR",
        "phase": 14,
        "subsystem": "JES2",
        "phase-name": "Job is actively executing",
        "job-correlator": "S0008622TVT5011.DD405CFB.......:",
        "type": "STC",
        "url": "https:/ XXXXXXXXXXXXXXX /zosmf/restjobs/jobs/S0008622TVT5011.DD405CFB.......%3A",
        "jobid": "STC08622",
        "class": "STC",
        "files-url": "https:/ XXXXXXXXXXXXXXX /zosmf/restjobs/jobs/S0008622TVT5011.DD405CFB.......
            %3A/files",
        "jobname": "IZUSVR1",
```

# SQUEEZING THE CLI

# Embrace your inner daemon



# Use Zowe TSO Start and Send for Stateful client server


DevOps



For zowe ssh issue command <CMD> consider sending a script and executing remotely to save latency

# Your feedback is important!

**Submit a session evaluation** for each session you attend:

www.share.org/evaluation

SHARE mobile app