



SSH Server, Python, and a GUI for CMS

Neale Ferguson

neale@sinenomine.net



Agenda

- An SSH Server for CMS
 - Supporting scp/sftp/ssh
- Python 3.10+
 - Couple it with SSH for Ansible
 - A native GUI & a GUI agent
- CMS GUI
 - Python-based
 - REXX & LE-Compliant programs
 - 3270 and Experimental browser-based



Experimental SSH Server for z/VM

- Motivation
 - Use ansible to run VMSES processes
 - Open the platform to new developers
- Extension of SNA's SSH Client Suite
 - Daemon runs in a virtual machine and provides:
 - scp & sftp
 - ssh
 - As one-off command
 - As a terminal session
 - Uses private/public key, passwords, and logon by

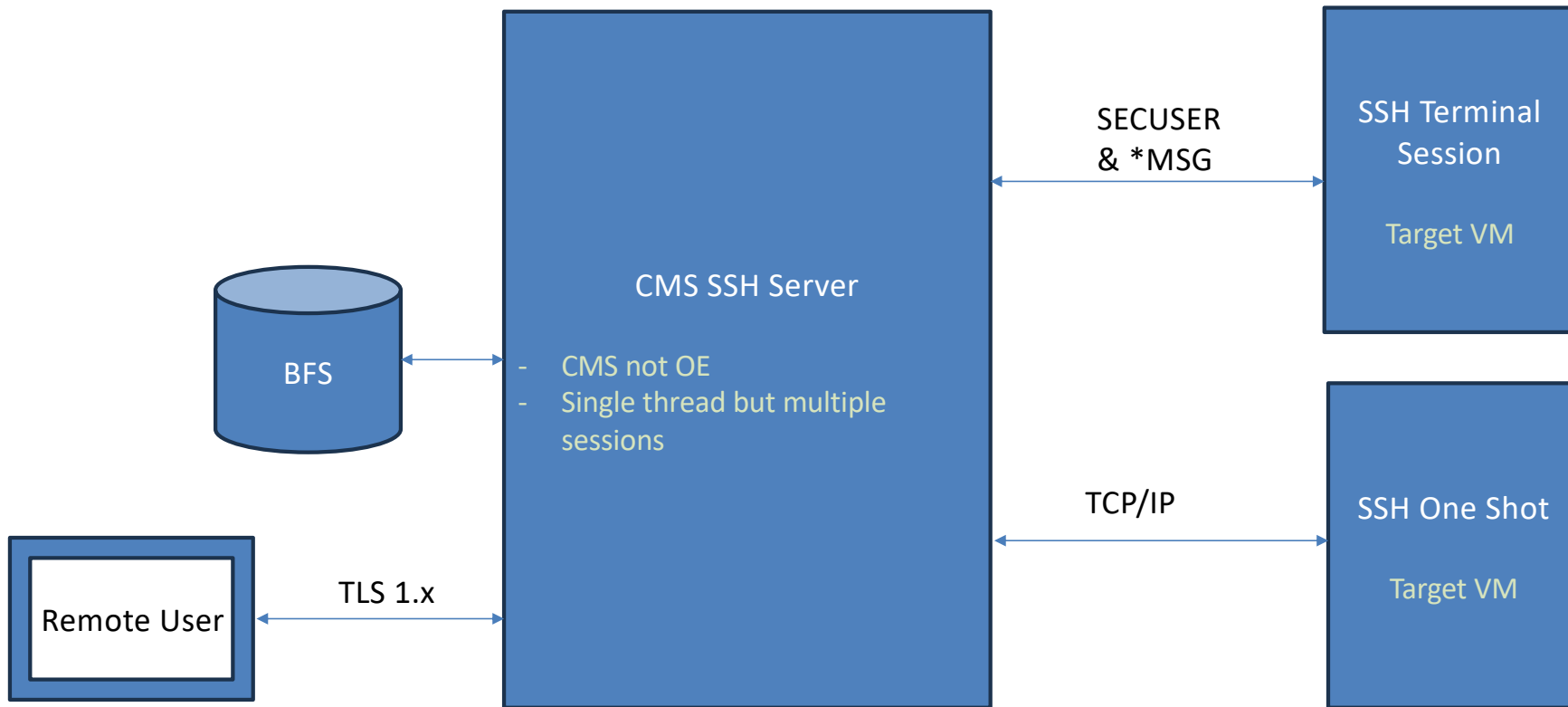


SSH Server for z/VM

- Complication for SSH under CMS
 - CMS OE doesn't support `fork()` as used by `sshd`
 - z/VM users are separate virtual machines
 - Own resources not available to an SSH daemon
 - Cannot just use `givesocket()/takesocket()` to transfer session ownership
 - `scp/sftp` can run in same VM as daemon
 - Using BFS (and later SFS) – file admin privileges like `FTPSEERVE`
 - We map file extensions for automatic code page conversion – like NFS (RIP)
 - `ssh`
 - `SECUSER` for terminal session
 - Proxy for one-off commands



SSH Server Architecture





SSH Operation

- Uses CPACF instructions where available
- SCP & SFTP run in the SSH Server
- SSH session - check if user is logged on: Return as “busy” if so
- SSH terminal session
 - Use SECUSER to relay commands
 - Use *MSG to get output and forward to remote user
- SSH one-shot
 - Send “SSHSESS <port>” to target
 - Target performs the command and returns result to server which then sends to remote user [iconv error if shell hasn’t been run before]



SSH Server Characteristics

- KEX algorithms:
 - sntrup761x25519-sha512, sntrup761x25519-sha512@openssh.com
 - mlkem768x25519-sha256, mlkem1024nistp384-sha384, mlkem768nistp256-sha256
 - curve448-sha512, curve25519-sha256, curve25519-sha256@libssh.org
 - ecdh-sha2-nistp256, ecdh-sha2-nistp384, ecdh-sha2-nistp521
 - diffie-hellman-group-exchange-sha256, diffie-hellman-group-exchange-sha1, diffie-hellman-group18-sha512, diffie-hellman-group17-sha512, diffie-hellman-group16-sha512, diffie-hellman-group15-sha512, diffie-hellman-group14-sha256, diffie-hellman-group14-sha1, diffie-hellman-group1-sha1
 - rsa2048-sha256, **rsa1024-sha1**
 - kex-strict-s-v00@openssh.com



SSH Server Characteristics

- Ciphers:
 - aes256-ctr, aes256-cbc, rijndael-cbc@lysator.liu.se, aes192-ctr,
 - aes192-cbc, aes128-ctr, aes128-cbc, aes128-gcm@openssh.com,
 - aes256-gcm@openssh.com
 - 3des-ctr, 3des-cbc
 - des-cbc, des-cbc@ssh.com
 - blowfish-ctr, blowfish-cbc
 - arcfour256, arcfour128



SSH Server Characteristics

- MACs:
 - hmac-sha2-256, hmac-sha2-512 hmac-sha2-256-etm@openssh.com, hmac-sha2-512-etm@openssh.com
 - hmac-sha1, hmac-sha1-96, hmac-sha1-etm@openssh.com, hmac-sha1-96-etm@openssh.com
 - hmac-md5, hmac-md5-etm@openssh.com
- Compression
 - none, zlib, zlib@openssh.com



SSH Server

- Key Handling
 - Public keys (currently) stored in an SFS directory
 - Only 1 key per user so doesn't check a list of keys

Directory = USER01:NEALE.KEYSTORE

Cmd	Filename	Filetype	Fm	Format	Lrecl	Records	Blocks	Date	Time
	NEALE	PUB	W1	V	164	2	1	2/18/26	19:34:26
	MAINT	PUB	W1	V	113	1	1	2/10/26	2:26:15
	MIKEMAC	PUB	W1	V	573	1	1	10/24/24	13:26:06
	CWILLS	PUB	W1	V	393	1	1	9/10/24	20:55:47
	LDAPSRV	PUB	W1	V	109	1	1	8/10/22	1:59:43
	MAINT710	PUB	W1	V	109	1	1	7/20/22	4:36:57



SSH Server

- Started via EXEC
 - VM requires elevated privileges
 - Has POSIX credentials

```
CMS SSH Server Starting Up - Experimental - Not for Production
Established LE Handler at 2EFAA9A8
Establishing IUCV Handler at 2EFA4BD0 with user word 2F615BD8
Connecting to *MSG Service
*MSG Connection Established
ABEND Exit Established - 2EFA4D60
serv#0: listening on port 22
```



SSH Server - SCP

```
[neale@vsrv035 ~]$ cat test.txt
```

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

```
0123456789
```

```
[neale@vsrv035 ~]$ scp test.txt maint@vm.devlab.sinenomine.net:/tmp/test.txt
```

```
test.txt                                100%  38    0.4KB/s  00:00
```

```
id
```

```
uid=0(maint) gid=0(system)
```

```
#
```

```
ls -l /tmp/test.txt
```

```
-rw-r--r--  1 maint      system          38 Jun  4 17:50 /tmp/test.txt
```

```
#
```

```
cat /tmp/test.txt
```

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

```
0123456789
```

```
#
```



SSH Server - SFTP

```
#
cat /tmp/test.lst
A File from CMS
Second line
#
[neale@vsrv035 ~]$ sftp maint@vm.devlab.sinenomine.net
Connected to vm.devlab.sinenomine.net.
sftp> cd /tmp
sftp> ls
Makefile.shared  T9vaTHjcou  Trace.pm          getfd    openssl.cnf      perl    pip-test
retag.sh          subtest.py  test.file         test.lst  test.txt         unzip   util.pax.Z
sftp> get test.lst
Fetching /tmp/test.lst to test.lst
test.lst
100%  28    0.2KB/s   00:00
sftp> quit
[neale@vsrv035 ~]$ cat test.lst
A File from CMS
Second line
```



SSH Server

```
CMS SSH Server Starting Up - Experimental - Not for Production
Established LE Handler at 2EFAA9A8
Establishing IUCV Handler at 2EFA4BD0 with user word 2F615BD8
Connecting to *MSG Service
*MSG Connection Established
ABEND Exit Established - 2EFA4D60
serv#0: listening on port 22
conn#0: new connection to serv#0 from 192.168.96.48:52822
conn#0: MAINT authorized
conn#0: MAINT logging on
conn#0: connection terminated
conn#1: new connection to serv#0 from 192.168.96.48:37684
conn#1: MAINT authorized
conn#1: MAINT logging on
conn#1: connection terminated
```



SSH Server – Terminal Session

```
[neale@vsrv035 ~]$ ssh -l maint vm.devlab.sinenomine.net
z/VM V7.1.0 2026-01-19 18:53
DMSACP723I B (5E5) R/O
DMSACP723I D (51D) R/O
DMSACP723I E (551) R/O
Ready; T=0.02/0.02 13:05:43
q t
TIME IS 13:05:49 EST THURSDAY 06/04/26
CONNECT= 00:00:06 VIRTCPU= 000:00.02 TOTCPU= 000:00.06
Ready; T=0.01/0.01 13:05:49
q u
    62 USERS,      0 DIALED,      0 NET
Ready; T=0.01/0.01 13:05:51
ind user
USERID=MAINT MACH=ESA STOR=256M VIRT=V XSTORE=---
IPLSYS=DEV 0190 DEVNUM=00035
PAGES: RES=1612 WS=1388 LOCKEDREAL=1 RESVD=0
INSTAN=1612
NPREF=0 PREF=0 READS=0 WRITES=0
CPU 00: CTIME=00:00 VTIME=000:00 TTIME=000:00 IO=000167
RDR=000000 PRT=000009 PCH=000000 TYPE=CP CPUAFFIN=ON
Ready; T=0.01/0.01 13:05:53
logoff
Connection to vm.devlab.sinenomine.net closed.
```



SSH Server

```
conn#1: new connection to serv#0 from 192.168.96.48:38078
conn#1: MAINT authorized
conn#1: MAINT logging on
conn#1: MAINT has logged on
HCPQCS150A User MAINT has issued a VM read
HCPQCS150A User MAINT has issued a VM read
HCPQCS150A User MAINT has issued a VM read
HCPQCS150A User MAINT has issued a VM read
USER DSC   LOGOFF AS MAINT   USERS = 61
```



SSH Server – One Shot Commands

```
[neale@vsrv035 ~]$ ssh -l maint vm.devlab.sinenomine.net cms q disk
```

LABEL	VDEV	M	STAT	CYL	TYPE	BLKSZ	FILES	BLKS USED-(%)	BLKS LEFT	BLK TOTAL
MNT191	191	A	R/W	175	3390	4096	63	1069-03	30431	31500
MNT5E5	5E5	B	R/O	18	3390	4096	132	1282-40	1958	3240
MNT2CC	2CC	C	R/W	10	3390	4096	7	449-25	1351	1800
MNT51D	51D	D	R/O	26	3390	4096	218	993-21	3687	4680
PMT551	551	E	R/O	40	3390	4096	9	128-02	7072	7200
MNT190	190	S	R/O	207	3390	4096	696	17572-47	19688	37260
MNT19E	19E	Y/S	R/O	500	3390	4096	1122	35119-39	54881	90000
TCM592	120	Z	R/O	240	3390	4096	601	11880-28	31320	43200

```
[neale@vsrv035 ~]$ ssh -l maint vm.devlab.sinenomine.net pwd
```

```
/home/maint
```

```
[neale@vsrv035 ~]$ ssh -l maint vm.devlab.sinenomine.net vmcp q T
```

```
TIME IS 13:12:05 EST THURSDAY 06/04/26
```

```
CONNECT= 00:03:59 VIRTCPU= 000:00.92 TOTCPU= 000:01.38
```



Python 3.10+ for CMS

- Motivation
 - Use ansible to run VMSES processes
 - Open the platform to new developers
- Requirements
 - ASCII layer
 - OpenSSL (1.1.1k and 3.6.0)
 - ncurses
 - readline
 - libffi



Python 3.10+ for CMS

- Changes
 - File tagging (ASCII/EBCDIC contents)
 - Replace `fork()`/`exec()` with `spawn()`
 - `vfork()` is supported but is restrictive
 - Python calls an API that CMS OE objects to
 - If `exec()` fails then you just can't `exit()` that process
 - Overriding certain APIs (e.g. `write()` and `select()`)



Installing Packages

- pip is available as a module

```
TERM=dumb python -mpip list
Package      Version
-----
pip          23.0.1
pyasn1       0.6.2
pysnmp       7.1.22
remi         2022.7.27
setuptools   65.5.0
websockets   16.0
```

```
[notice] A new release of pip is available: 23.0.1 -> 26.1.2
[notice] To update, run: pip3 install --upgrade pip
```



ASCII Layer

- Motivation
 - Minimal changes to python / openssl
 - Ability to use pip3 to install scripts
- Provides APIs that will convert between ASCII/EBCDIC, e.g.:
 - `<stdio.h>` defines mapping for `fopen()` depending on character set:
 - "FOPEN" – for EBCDIC v "@@A00246" – for ASCII
 - `libascii.so` implements "@@A00246" to convert arguments and invoke "FOPEN"
- 335 APIs provided



ASCII Layer

- How do I know what file is ASCII v EBCDIC?
 - USS uses `chattr()` and the `chtag` command
 - We use `chaudit()` and our own `chtag` command to emulate this behaviour
 - When a file is opened we check the user tag information and perform conversions if required
 - ISO8859-1 and IBM-1047 code pages are supported
- Also contains APIs that OE doesn't but which we can implement:
 - e.g. `pthread_sigmask()` is emulated via `sigprogmask()`
 - `strftime()` doesn't support "%s" (epoch) format
- Also provides a shadow `**environment` for maintaining ASCII values



ASCII Support Script

- By default, files are written as UTF-8 so XEDIT will show “garble”

```
RC=0
if [ $# -gt 0 ]; then
  PN=$1
  ORIG_PN=${PN}
  if [ -f ${PN} ]; then
    CHK=`chtag -p ${PN} | grep -q 8859`
    if [ $? -eq 0 ]; then
      FILE=`basename ${PN}`
      iconv -f iso8859-1 -t ibm1047 ${PN} > /tmp/${FILE}.ascii
      cms "X /tmp/${FILE}.ascii (NAM BFS"
      RC=$?
      rm -f /tmp/${FILE}.ascii
    else
      cms "X ${PN} (NAM BFS"
      RC=$?
    fi
  else
    cms "X ${PN} (NAM BFS"
    RC=$?
  fi
else
  RC=3
fi
```



openSSL

- Ported 1.1.1k and 3.6.0
 - Uses ASCII layer
 - Very few mods required
 - Doesn't exploit hardware instructions
 - Porting perl 5.2.4 so I can run the test suite



Other Packages Required

- Python requires a couple of other packages that build with little modification:
 - ncurses
 - readline
 - libffi



Python and Pre-reqs

- Available on github
 - <https://github.com/nealef/openssl> (s390x branch for 1.1.1k; cms for 3.6.1)
 - <https://github.com/nealef/libascii>
 - <https://github.com/nealef/cpython> – zvm branch
 - <https://github.com/nealef/readline> – zvm branch
 - <https://github.com/nealef/ncurses> – zvm branch
 - <https://github.com/nealef/libffi> – zvm branch
- Requires ZCMS for ZARCH instructions it uses



Python and Pre-reqs

- All these packages are built on USS
 - xplink compiler with inline assembler
 - Configure script like `zvmconfig.sh` that defines the APIs available:

```
export ac_cv_func_accept4='no'  
export ac_cv_func_clock_gettime='no'  
export ac_cv_func_copysign='no'  
export ac_cv_func_dup3='no'
```
 - CMS OE piping bug under investigation
 - VM66913 required to fix dynamic library load crash



Python in Action



Giving CMS a GUI

- REMI - Turns your virtual machine into a web server
 - Installed via PIP
 - Python only – no GTK/X11/...

```
remi.server      INFO      Started httpserver http://0.0.0.0:8081/
remi.request     INFO      built UI (path=/)
remi.gui         DEBUG    dropdown selected item with value DropDownItem 0
remi.gui         DEBUG    dropdown selected item with value DropDownItem 1
remi.gui         DEBUG    dropdown selected item with value DropDownItem 0
remi.request     DEBUG    get: /
192.168.69.6 - - [04/Jun/2026 17:21:33] "GET / HTTP/1.1" 200 -
remi.request     DEBUG    get: /res:style.css
192.168.69.6 - - [04/Jun/2026 17:21:33] "GET /res:style.css HTTP/1.1" 200 -
remi.request     DEBUG    get: /res:logo.png
192.168.69.6 - - [04/Jun/2026 17:21:33] "GET /res:logo.png HTTP/1.1" 200 -
remi.server.ws  INFO      connection established: ('192.168.69.6', 62409)
remi.server.ws  DEBUG    handle
remi.server.ws  DEBUG    handshake
remi.server.ws  INFO      handshake complete
remi.server.ws  DEBUG    send_message: 0754943696... -> ('192.168.69.6', 62409)
remi.request     DEBUG    get: /res:font.woff2
192.168.69.6 - - [04/Jun/2026 17:21:33] "GET /res:font.woff2 HTTP/1.1" 200 -
```



Giving CMS a GUI

File View Dialog

REM REMOIG REWOLG

Running Time: 15
This is a LABEL!

Press me!

This is a TEXTAREA

1

Label checkbox

Open InputDialog

File Selection Dialog

[download test](#)

Choose File No file chosen

DropDownItem 0


04/13/2015

Item1
Item2
Item3

ID	First Name	Last Name
101	Danny	Young
102	Christine	Holand
103	Lars	Gordon
104	Roberto	Robitaille
105	Maria	Papadopoulos

Danny Young
Christine Holand
Lars Gordon
Roberto Robitaille

[A link to here](#)



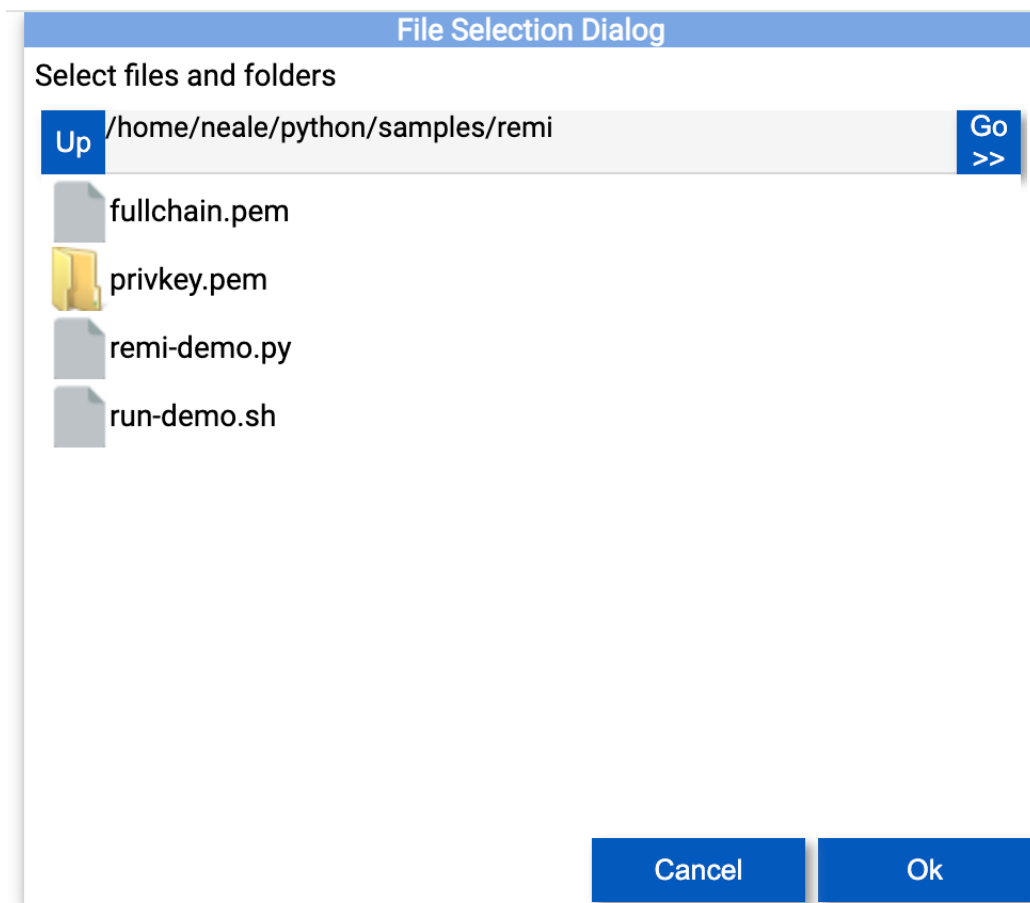
Running Time: 73

Button pressed!

Hi!

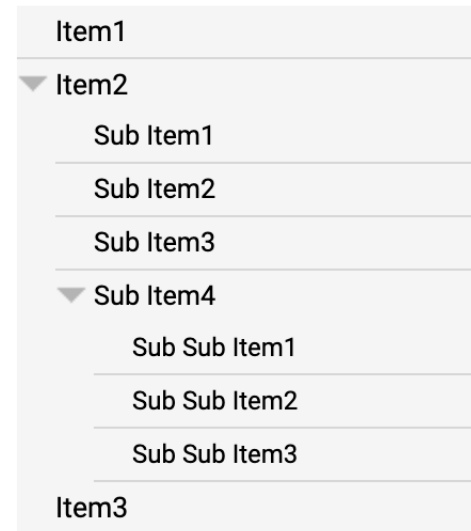
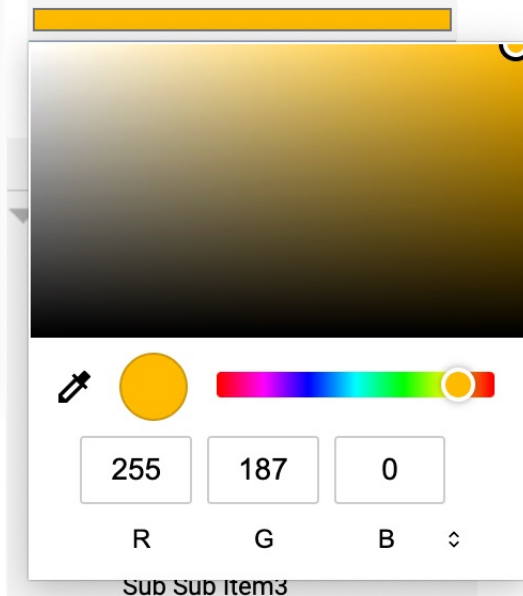
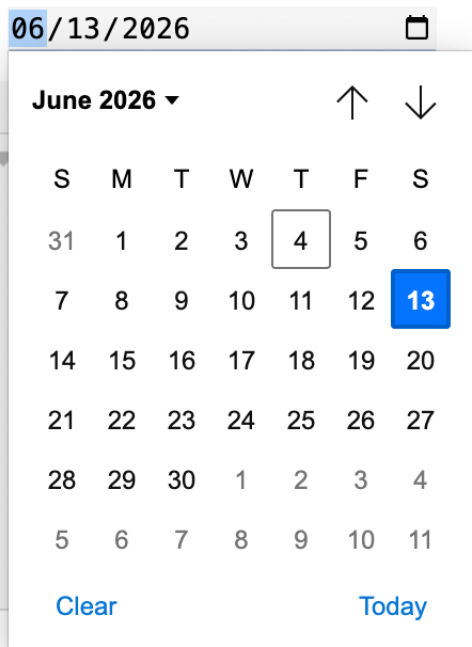


Giving CMS a GUI





Giving CMS a GUI





Ansible Playbook

- hosts: all

tasks:

- name: Get current working directory
ansible.builtin.shell: cms vmfsetup servp2p cms
register: output
- name: Show output
ansible.builtin.debug:
msg: "VMFSETUP output: {{ output.stdout }}"



```
[neale@vsrv035 ~]$ ansible-playbook vmses_playbook.yml
```

```
PLAY [all]
```

```
*****
```

```
TASK [Gathering Facts]
```

```
*****
```

```
ok: [172.17.16.60]
```

```
TASK [Get current working directory]
```

```
*****
```

```
changed: [172.17.16.60]
```

```
TASK [Show output]
```

```
*****
```

```
ok: [172.17.16.60] => {
```

```
  "msg": "VMFSETUP output: VMFSETUP processing started for SERVP2P CMS\nLinking MAINT710 3C4 as 3C4 with link mode MR\nLinking MAINT710 3C2 as 3C2 with link mode MR\nLinking MAINT710 3D2 as 3D2 with link mode MR\n\nVMFSETUP processing completed successfully"}
```

```
PLAY RECAP
```

```
*****
```

```
172.17.16.60      : ok=3  changed=1  unreachable=0  failed=0  skipped=0  rescued=0  ignored=0
```



Syslog daemon

- Created with gemini: *“create simple syslog daemon in python that supports UDP and IUCV, uses logging to stdout and /var/log/messages, and document with sphinx markup”*

```
"""
```

```
Syslog Server Module.
```

```
This module implements a dual-protocol syslog server that simultaneously listens for remote network messages over UDP and local system logs via the standard Unix domain socket.
```

```
"""
```

```
import os  
import socket
```



Syslog daemon

```
2026-06-04 19:50:28,117 [INFO] Listening for UDP syslog on 0.0.0.0:514
2026-06-04 19:50:28,120 [ERROR] Failed to bind AF_IUCV socket: AF_IUCV is not
supported or compiled into this Python/OS layer.
2026-06-04 19:50:28,122 [INFO] Syslog server running. Press Ctrl+C to stop.
```

```
[neale@vsrv035 ~]$ logger --server 172.17.16.60 Test message
```

```
2026-06-04 19:56:02,810 [INFO] [UDP:192.168.96.48:47248] <13>1 2026-06-
04T14:55:35.806019-05:00 vsrv035.svc.sinenomine.net neale - -
[timeQuality tzKnown="1" isSynced="1" syncAccuracy="105206"] Test message
```

```
# tail -f /var/log/messages | iconv -f iso8859-1 -t ibm-1047
```

```
2026-06-04 20:01:30,262 [INFO] Listening for UDP syslog on 0.0.0.0:514
```

```
:
```

```
2026-06-04 20:02:17,244 [INFO] [UDP:192.168.96.48:49038] <13>1 2026-06-04T15:01:50.240840-05:00
vsrv035.svc.sinenomine.net neale - -
[timeQuality tzKnown="1" isSynced="1" syncAccuracy="33507"] Test message
```



Syslog daemon

```
6 if $programname == 'NJE' then {
7     action(type="omfile" file="/var/log/nje/nje.log")
8     action(type="omfwd" target="vm.devlab.sinenomine.net" port="514" protocol="udp")
9 }
```

```
2026-06-04 20:28:00,218 [INFO] [UDP:192.168.96.48:34473] <134>Jun  4 15:27:32 vsrv035 NJE[36361]: NJE0095I Stop requested for line 0
by neale
2026-06-04 20:28:00,227 [INFO] [UDP:192.168.96.48:34473] <132>Jun  4 15:27:32 vsrv035 NJE[36361]: NJE0026W Error retrieving queue ev
ent for line RHEL8 - Bad file descriptor
2026-06-04 20:28:00,233 [INFO] [UDP:192.168.96.48:34473] <134>Jun  4 15:27:32 vsrv035 NJE[36361]: NJE0175I RHEL8 link cleanup and re
start commencing
2026-06-04 20:28:07,427 [INFO] [UDP:192.168.96.48:34473] <134>Jun  4 15:27:39 vsrv035 NJE[36361]: NJE0094I Start requested for line
0 by neale
2026-06-04 20:28:45,468 [INFO] [UDP:192.168.96.48:34473] <131>Jun  4 15:28:17 vsrv035 NJE[36361]: NJE0009S Error connecting to peer
RHEL8 - No route to host
2026-06-04 20:28:45,477 [INFO] [UDP:192.168.96.48:34473] <134>Jun  4 15:28:17 vsrv035 NJE[36361]: NJE0175I RHEL8 link cleanup and re
start commencing
2026-06-04 20:28:46,369 [INFO] [UDP:192.168.96.48:34473] <134>Jun  4 15:28:18 vsrv035 NJE[36361]: NJE0040I Accepted connection to RH
EL8 on socket 16
2026-06-04 20:28:46,375 [INFO] [UDP:192.168.96.48:34473] <134>Jun  4 15:28:18 vsrv035 NJE[36361]: NJE0083I Signon complete with RHEL
8
```



CMS/VSE 3270 Interface

- Used my CMS RXFS package
 - Originally built for REXX
 - Implemented in VSE as ARXFUSER, in CMS as RXUSERFN

```
/*-----*/  
/* In this example we'll create the screen from scratch */  
/*-----*/  
Hello='Hello World'      /* Variable to use in RXFSWRIT */  
call RXFSOPEN 'DEV=D72L304' /* Establish the RXFS environment */  
Dimension=SCR_Width 'x' Scr_Height      /* Get dimensions got by OPEN */  
/*  
 * Write two lines to the screen buffer  
 */  
call RXFSWRIT "R=12 C=30 L=12 COLOR=RED VNAME='Hello'"  
call RXFSWRIT "R=15 C=30 L=20 COLOR=TUR EXTHI=UND VNAME='Dimension'"  
call RXFSREAD          /* Write screen buffer to screen and read */  
Color_Hello='WHI'      /* Change the color of the Hello field */  
call RXFSREAD          /* Send to screen and read */  
ExtHi_Hello='REV'      /* Change the extended highlighting of hello */  
Prot_Hello='N'         /* Unprotect the field */  
Cursor_Hello='Y'      /* Insert the cursor at this field */
```

DEV= LU (VSE)
CUU (CMS)
Defaults to
console

Changing the
attributes of a field by
changing a REXX
variable associated
with the field



3270 Interface

- PANELS/WINDOW definitions as a flat file "xxx CMSPANEL"
 - RXFSWRIT "PANEL=xxxx"
 - Rc = RXFSWRIT("WINDOW=BCPCONF H=8 W=65 SR=5 SC=5")

```
R=1 C=1 L=8 Color=GRE F=B V='device_name'  
R=9 C=1 L=8 Color=Red T='COMRG'  
R=14 C=1 L=8 Color=Red T='SYSCOM'  
R=11 C=1 L=8 Color=TUR V='PCOMRG.1'  
R=11 C=10 L=8 Color=GRE V='COMLine.1.1'  
R=11 C=20 L=8 Color=GRE V='COMLine.1.2'  
R=11 C=30 L=8 Color=GRE V='COMLine.1.3'  
R=11 C=40 L=8 Color=GRE V='COMLine.1.4'  
R=11 C=50 L=8 Color=TUR V='HexCom.1'  
R=12 C=1 L=8 Color=TUR V='PCOMRG.2'  
R=12 C=10 L=8 Color=GRE V='COMLine.2.1'  
R=12 C=20 L=8 Color=GRE V='COMLine.2.2'  
R=12 C=30 L=8 Color=GRE V='COMLine.2.3'  
R=12 C=40 L=8 Color=GRE V='COMLine.2.4'
```

T= associates a field with
a string constant

V= associates a field with
a REXX variable



3270 Interface

- Extended it to support a LE-compatible API

```
SET_TEST_device_name(test, "DEVNAME");
rc = RXFSWRIT(req, "PANEL=TEST");
if (rc == 0) {
    if (argc == 1) {
        RXFSRECB(req, NULL, &ecb);
        rc = RXFSREAD(req, "WAIT=N");
    :
        rc = RXFSRECV(req, NULL);
        waitForWork(&ecb);
        rc = RXFSCHCK(req, NULL);
    } else {
        RXFSCALB(req, NULL, waitForWork);
        rc = RXFSREAD(req, NULL);
    :
        var_fetch("ACTION_KEY", (char *) &key, sizeof(key));
        printf("Key Hit: %s\n", key);
    }
    rc = RXFSCLOS(req, NULL);
}
```



```
VMA VMA VMA +
Reset Erase EOF New Line PA1 PA2 PA3 Attn SysReq Clear Dup Erase Input Field
DEVNAME
COMRG
PCOMRG.1 COMLINE. COMLINE. COMLINE. COMLINE. HEXCOM.1
PCOMRG.2 COMLINE. COMLINE. COMLINE. COMLINE.
SYSKOM
PSYSKOM. SYCLINE. SYCLINE. SYCLINE. SYCLINE.
PSYSKOM. SYCLINE. SYCLINE. SYCLINE. SYCLINE. HEXSYC.2
F01=None F02=None F03=None F04=None F05=None F06=None F07=None F08=None
F13=None F14=None F15=None F16=None F17=None F18=None F19=None F20=None
```



Experimental

- Web-based GUI
 - Unmodified code
 - Just set a parameter

```
SET WORKSTATION IP vm.devlab.sinenomine.net 8445
```

```
// SETPARAM PWRJOB,WSADDR= 'IP:vm.devlab.sinenomine.net:8445'
```



Experimental

- Relies on an agent written in python
- Same application different end-points:
 - RXFS detects if end-point is 3270 or GUI
 - Generates 3270 data stream or HTML/CSS (falls back to 3270 if GUI not found)



```
python wsServer.py
2026-06-02 19:14:02,244 - INFO - TLS context loaded successfully.
2026-06-02 19:14:06,857 - INFO - server listening on 0.0.0.0:8443
2026-06-02 19:14:06,859 - INFO - Main WSS server listening on wss://0.0.0.0:8443
2026-06-02 19:14:22,257 - INFO - connection open
2026-06-02 19:14:22,261 - INFO - [WSS_Handler] Active
2026-06-02 19:14:22,263 - INFO - [Bridge] New instance created for WSS client: 192.168.69.6:56957
2026-06-02 19:14:30,298 - INFO - [Bridge] Listeners running (TCP:8445 / TLS:8444).
2026-06-02 19:14:43,909 - INFO - [Bridge] TCP client requested connection to ('172.17.16.194', 4125)
2026-06-02 19:14:43,913 - INFO - [Bridge] TCP client connected: ('172.17.16.194', 4125)
2026-06-02 19:14:43,920 - INFO - [TCP->WSS] Client disconnected (Graceful).
2026-06-02 19:14:43,928 - INFO - [Bridge] Dedicated connection finished. Ready for new connection.
2026-06-02 19:14:43,930 - INFO - [Bridge] TCP client requested connection to ('172.17.16.194', 4126)
2026-06-02 19:14:43,931 - INFO - [Bridge] TCP client connected: ('172.17.16.194', 4126)
```



Not Secure https://vsrv035.svc.sinenomine.net/wsClient.html?server_url=vm.devlab.sinenomine.net:8443

Bookmarks ABC News YouTube Wikipedia Google Maps News Popular Block of Hours 3 -... RT Pa

Connected to WebSocket Server



PF01	PF02	PF03	PF04	PF05	PF06	PF07	PF08	PF09	PF10	PF11	PF12	CLEAR			
PF13	PF14	PF15	PF16	PF17	PF18	PF19	PF20	PF21	PF22	PF23	PF24	PA1	PA2	PA3	

DEVNAME

COMRG

PCOMRG.1	COMLINE.	COMLINE.	COMLINE.	COMLINE.	HEXCOM.1
PCOMRG.2	COMLINE.	COMLINE.	COMLINE.	COMLINE.	

SYSKOM

PSYSKOM.	SYCLINE.	SYCLINE.	SYCLINE.	SYCLINE.	HEXSYC.2
PSYSKOM.	SYCLINE.	SYCLINE.	SYCLINE.	SYCLINE.	

F01=None F02=None F03=None F04=None F05=None F06=None F07=None F08=None F09=None
 F13=None F14=None F15=None F16=None F17=None F18=None F19=None F20=None F21=None



VSEn SSH Client - SNAPSFTP

2026-06-01
14:25:27

SNAPSFTP: Using username "neale".

Remote working directory is /home/neale

psftp>

ls test.*

Listing directory /home/neale

```
-rw-rw-r-- 1 neale neale 64800 Feb 2 2025 test.ascii
-rw-rw-r-- 1 neale neale 116 May 8 2024 test.c
-rw-r--r-- 1 neale neale 640000 Feb 4 2025 test.copy
-rw-rw-r-- 1 neale neale 640000 Feb 2 2025 test.data
-rw-r--r-- 1 neale neale 640000 Jan 10 2023 test.data.new
-rw-r--r-- 1 neale neale 16320 Mar 4 20:17 test.data.2
-rw-rw-r-- 1 neale neale 51 Apr 14 2025 test.file
-rw-r--r-- 1 neale neale 640000 Feb 6 2025 test.file.bin
-rw-r--r-- 1 neale neale 399 Dec 1 2020 test.rsapub
-rw-rw-r-- 1 neale neale 777 May 8 2024 test.s
```

psftp>



What's Next



Further Development

- SSHD
 - Extend to SFS
 - Add AES-GCM and ECC hardware support (available in s/w now)
- Python
 - JIT in 3.14+ but this means another ABI implementation
 - Add AF_IUCV support to `Modules/socketmodule.c`
- Build repeatability
 - Enabling others to build
- Incorporation of OpenSSL 3.6.1



Outstanding Issues

- PIP
 - Problem with tar files and codecs
- IEEE FP needs to be enabled
 - Default in CMS?
 - New SET command?
- LE fetches from PSATOLD (0x21C) – TCB old pointer
 - Not what it expects (z/OS-specific)
 - CMS BINDER patches the location for the duration of the command

```
R00000210 F0F2F660 F0F160F1 F940F1F8 7AF5F340 F6 *026-01-19 18:53 *
```
- OE piping hangs, so running ./configure fails



Wishlist

- Additional APIs:
 - `chattr()` – can BFS store this metadata?
 - Additional APIs currently provided by `libascii.so` (and thus avoid the configure hack)
 - `poll()` or `select()` that supports pipe file descriptors
 - `spawn2()` API
 - Equivalent C/C++ compiler for CMS
 - Inline assembler – used to implement several BFP math APIs
 - `ARCHMODE > 4` instructions
 - Improve `BIND` command performance
 - XC-mode handles PC/PR instructions
 - `dbx` and/or `bpctrace` commands
 - Automatic dump/trace on `abend`