Installation procedure for the IBM 3705 emulator.

This procedure is for the installation of the IBM 3705 emulator from scratch. It gives high level instructions and assumes that the reader has full knowledge to install and operate Linux, Hercules390, MVS3.8 and RPi Debian.

It is tested with:

- Linux version 4.19.0-17-amd64 (gcc version 8.3.0)
- Hercules version 3.13
- MVS3.8j (part of TK4- Update 8)
- RPi Debian Buster Lite
- SIMH 3.11-0
- X3270

Software required:

- Comm3705 (for Hercules)
- NCP.SSP volume (for MVS3.8)
- EMU3705 (for RPi)

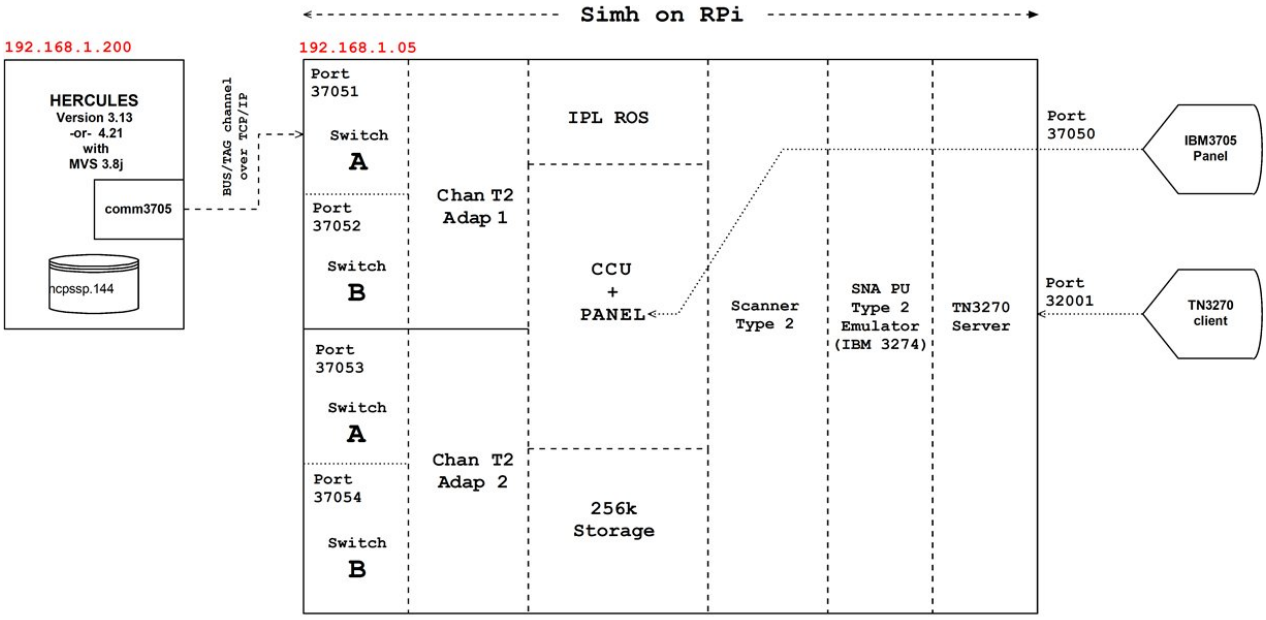
Warning: TK4- is built on Hercules 2012 source and is not supported by EMU3705 and this procedure. We only use the MVS3.8j dasd images of TK4-.

Note: in this procedure the Hercules system has IP address 192.168.1.200 and the EMU3705 has IP address 192.168.1.5

Advice: if you want to deviate from the procedure make small changes, 1 at the time.

Note: during testing we discovered that quick3270 does not work with the tn3270 server in the EMU3705. X3270 works perfect.

Overview:



Hercules with MVS3.8 [IP: 192.168.1.200] and RPi with EMU3705 [IP: 192.168.1.5]

1. Preparing Hercules 3.13

Download and unpack a fresh copy of Hercules 3.13:

```
$ wget http://downloads.hercules-390.eu/hercules-3.13.tar.gz

$ tar -xpvzf hercules-3.13.tar.gz
```

We need the Linux zlib for accessing compressed Hercules dasd files.

```
$ sudo apt-get install zlib1g-dev
```

Make the Hercules directory your current working directory.

```
$ cd Hercules-3.13

$ ./util/bldlvlck
```

This utility will check the level of various utilities needed to build Hercules.
It's output must show all OK's. If not, upgrade the utility in question.

Next:

```
$ ./configure

$ make
```

It may display a lot of warnings, but it will end ok.

Download the EMU3705 package from github https://github.com/snhstq/IBM3705 and unpack it.

Copy the new version of comm3705.c to the Hercules directory:

```
$ cp EMU3705/Hercules_files/comm3705.c  Hercules-3.13/comm3705.c
cp: overwrite 'comm3705.c'?
```

Enter 'yes'

```
$ cd Hercules-3.13

$ make
```

2. Preparing MVS

Download TK4-

```
$ wget http://wotho.ethz.ch/tk4-/tk4-_v1.00_update_08.zip
```

Unzip it

```
$ unzip tk4-_v1.00_update_08.zip
```

Copy file 'ncpssp.144' (volume NCPSSP) to 'tk4-/dasd/'

Update file conf/tk4-.cnf and add ncpssp.144 to the dasd configuration.

```
...
0136 2314 dasd/sort06.136
0140 3350 dasd/work00.140
0144 3350 dasd/ncpssp.144          <=== Added
0170 3375 dasd/work01.170
0180 3380 dasd/work02.180
...
```

Update configuration file 'conf/tk4-_default.cnf'

```
#
# NCP VTAM
#
0660 3705 adaptip=192.168.1.05 port=37051 debug=yes     <=== Changed
#0660 3705 lport=${N660PORT:=37051} locncpnm=N07 rmtncpnm=N08 unitsz=252
```

TCPIP port usage:

3705 Chan Adapt	Chan Switch	IP port
1	A position	37051
1	B position	37052
2	A position	37053
2	B position	37054

Tip: set all other 3705 definition statements in this file on comment '#'.

Change to working directory 'tk4-'
Start Hercules 3.13 (**NOT** the Hercules version delivered with tk4- !!)

```
tk4-$ <path to herc-3.13>/hercules -f conf/tk4-.cnf
```

Connect your TN3270 client as master console to Hercules.

On the Hercules console:

```
==> IPL 148
```

On the MVS master console (unit addr 0010):

```
IEA101A SPECIFY SYSTEM PARAMETERS FOR RELEASE 03.8 .VS2
   R 00,U
```

After IPL completion, connect with your preferred TN3270 client to TSO and logon with user-id HERC01 / passw CUL8TR

Select RFE (Option 1 on the main menu)

RFE 3.4
Check that volume NCPSSP contains the 3705 NCP & SSP datasets.

```
NCPSSP=3350-00 CU=3830-02 ------  RFE DSLIST  ---------------- Row 1 of 9
Command ===>                                                  Scroll ===> CS
S DATA-SET-NAME- VOLUME ALTRK USTRK ORG FRMT % XT LRECL BLKSZ REFDT CREDT
' SYS1.GEN3705   NCPSSP   300   273 PO  FB  91  1    80  3520 21225 20297
' SYS1.MAC3705   NCPSSP   510   480 PO  FB  94  1    80  3520 21225 20297
' SYS1.NCPLOAD   NCPSSP    20    15 PO  U   75  1 19069 19069 21229 21225
' SYS1.NCPOBJ1   NCPSSP    60    14 PO  FB  23  1    80   400 21225 21225
' SYS1.NCPSAMP   NCPSSP¬   30     4 PO  FB  13  1    80  3520 21225 21224
' SYS1.NCPSTG1   NCPSSP¬   60     5 PS  FB   8  1    80   800 21225 21225
' SYS1.OBJ3705   NCPSSP    90    64 PO  FB  71  1    80   400 21225 20297
' SYS1.SSPLIB    NCPSSP    30    17 PO  U   56  1        1024 21228 20297
  **END**
```

Catalog (enter C in front of DSN) the following datasets on volume NCPSSP:
   SYS1.GEN3705
   SYS1.MAC3705
   SYS1.NCPLOAD
   SYS1.NCPOBJ1
   SYS1.OBJ3705
   SYS1.SSPLIB

RFE 2
Update SYS1.PARMLIB(LNKLST00)
   SYS1.LINKLIB,
   SYS1.PPLIB,
   SYS1.CMDLIB,
   SYS2.LINKLIB,
   SYS2.CMDLIB,
   SYS1.PL1LIB,
   SYS2.DSSLIB,
   SYS1.SSPLIB   <=== Added

RFE 2
Update SYS1.PARMLIB(IEAAPF00)
   SYS1.VTAMLIB MVSRES,
   SYS1.NCPLOAD NCPSSP,   <=== Added
   EXH.EXHLIB PUB012,
   EXH.ESPLIB PUB012

RFE 2
Update SYS1.PROCLIB(NET)

```
   //NET     PROC
   //IEFPROC EXEC PGM=ISTINM01,TIME=1440,REGION=4096K,DPRTY=(14,15)
   //VTAMLST  DD  DSN=SYS1.VTAMLST,DISP=SHR
   //VTAMLIB  DD  DSN=SYS1.VTAMLIB,DISP=SHR
   //VTAMOBJ  DD  DSN=SYS1.VTAMOBJ,DISP=SHR
   //NCPLOAD  DD  DSN=SYS1.NCPLOAD,DISP=SHR     <=== Added
```

RFE 3.3
The IFLOADN used by TK4- is a special version for loading fake IBM 3705's.

Restore the original IFLOADRN of IBM:
Copy 'SYS1.SSPLIB(IFLOADRN)' on NCPSSP to 'SYS1.LINKLIB(IFLOADRN)' on MVSRES with replace existing member option on.

Note: the old IFLOADRN version is now not avail anymore.

Shutdown MVS and Re-IPL MVS with all these updates.

3. NCP generation

After IPL, connect and logon to TSO.

RFE 2
Open member 'NCPGEN' in SYS1.NCPSAMP. It contains a sample NCP generation job for an NCP with:

- 1 Channel adaptor type 2
- 1 Scanner type 2
- 1 Half duplex SDLC line
- 1 PU type 2 with
- 1 LU

Note: for full NCP V1 R2 details see:
http://bitsavers.org/pdf/ibm/sna/acf/SC30-3142-0_ACP_NCP_VS_Network_Control_Program_System_Support_Programs_Installation_Rel_2_197502.pdf

Submit this job.
Stage 2 (composed of 14 jobs!) of the NCP generation will now be written to SYS1.NCPSTG1.

Note: the last job wants to allocate SYS1.NCPLOAD with DISP=OLD. SYS1.NCPLOAD is allocated by VTAM, so you need to stop VTAM it to free it. This can be avoided by changing it to DISP=SHR (see job step S15 and below).

```
//S15 EXEC PGM=IEWL,REGION=320K,
//         PARM='LIST,LET,DC,NCAL,XREF,SIZE=(310K,48K)'
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD UNIT=SYSDA,SPACE=(1024,(50,20))
//SYSLMOD DD DSN=SYS1.NCPLOAD,DISP=SHR    <=== Changed from OLD to SHR
//TEMP DD DSN=&PCUTEMP,DISP=(OLD,PASS)
//PCULIB DD DSN=SYS1.OBJ3705,DISP=SHR
//SYSLIB DD DSN=SYS1.NCPOBJ1,DISP=SHR
//SYSLIN DD *
```

Stop all JES2 initiators except one.
Keep one initiator active with C=A

```
$HASP000    INIT  1 INACTIVE ******** C=A
```

Submit SYS1.NCPSTG1

This will submit 14 jobs to JES2.

After completion, check all return codes: rc=00 and rc=04 are ok.
SYS1.NCPLOAD will now contain an updated 'HJS3705' and 'HJS3705R'.

Copy 'SYS1.NCPSAMP(HJS3705)' on NCPSSP to 'SYS1.VTAMLST'

Note: delete (if present) 'SYS1.VTAMOBJ(HJS3705)' every time you update HJS3705 in SYS1.VTAMLST.

4. Preparing Raspberry Pi

Download Debian Buster Lite image:
https://downloads.raspberrypi.org/raspios_lite_armhf/images/raspios_lite_armhf-2021-05-28/2021-05-07-raspios-buster-armhf-lite.zip

Write this image to a microSD card of 8Gb or more. Insert it in a RPi 4 (or 3) and power it on.

Assign a fixed IP address 192.168.1.5 to the RPi in /etc/network/

Install required packages:
```
# apt-get install git gcc make
```

Download EMU3705 package from github to your RPi:
```
# git clone https://github.com/snhstq/IBM3705.git
```
(note: this download includes simh)

Unzipped it. Go to working directory 'SIMH files'

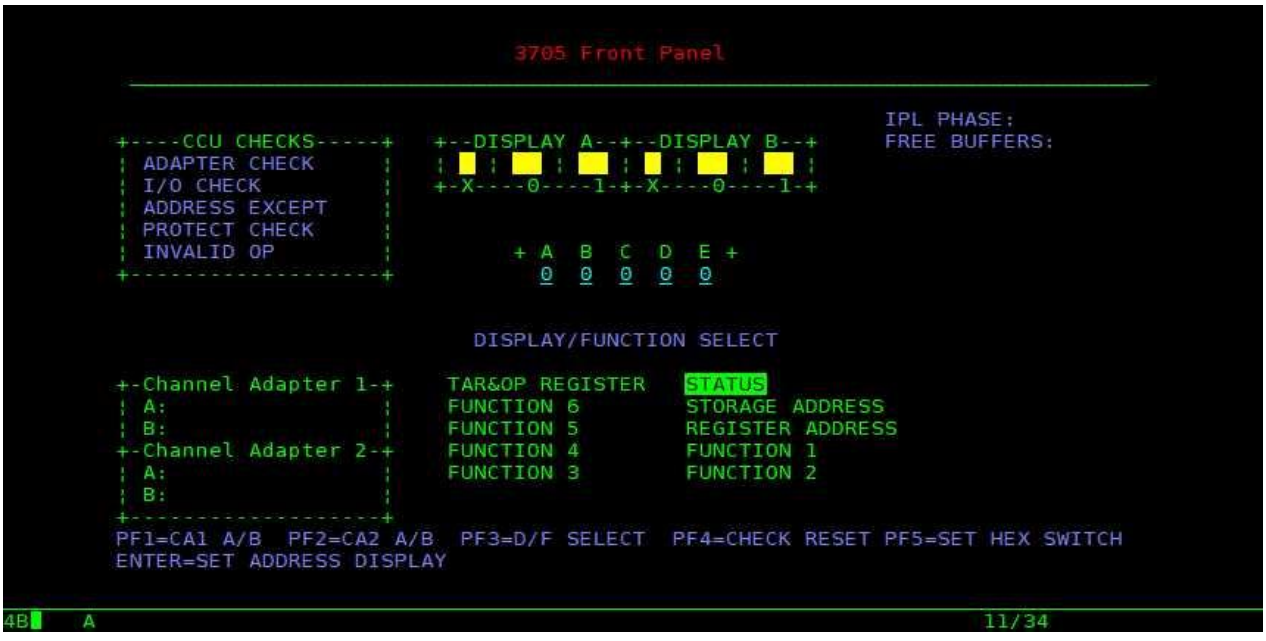
```
root@RPi-pico:~/i3705/IBM3705-main/SIMH files# make i3705
  lib paths are: /lib/ /lib/arm-linux-gnueabihf/ /opt/vc/lib/ /usr/lib/
  /usr/lib/arm-linux-gnueabihf/ /usr/lib/arm-linux-gnueabihf/libfakeroot/
  include paths are:  /usr/lib/gcc/arm-linux-gnueabihf/8/include
  /usr/local/include /usr/lib/gcc/arm-linux-gnueabihf/8/include-fixed
  /usr/include/arm-linux-gnueabihf /usr/include
  using libm: /usr/lib/arm-linux-gnueabihf//libm.so
  using librt: /usr/lib/arm-linux-gnueabihf//librt.so
  using libpthread: /usr/lib/arm-linux-gnueabihf//libpthread.so
  /usr/include/pthread.h
  using semaphore: /usr/include/semaphore.h
  using mman: /usr/include/arm-linux-gnueabihf/sys/mman.h
  using libdl: /usr/lib/arm-linux-gnueabihf//libdl.so /usr/include/dlfcn.h
  ***
  *** i3705 Simulator being built with:
  *** - compiler optimizations and no debugging support. GCC Version: 8.3.0.
  ***
  gcc -std=c99 -U__STRICT_ANSI__  -O2 -finline-functions -fgcse-after-reload -
  fpredictive-commoning -fipa-cp-clone -fno-unsafe-loop-optimizations -fno-
  strict-overflow -Wno-unused-result -I . -D_GNU_SOURCE -DUSE_READER_THREAD -
  DHAVE_SEMAPHORE -DHAVE_SHM_OPEN -DHAVE_DLOPEN=so  I3705/i3705_cpu.c
  I3705/i3705_chan_T2.c I3705/i3705_scan_T2.c I3705/i3705_panel.c
  I3705/i3705_sys.c I3705/i3705_sdlc.c I3705/i3705_client.c scp.c
  sim_console.c sim_fio.c sim_timer.c sim_sock.c sim_tmxr.c sim_ether.c
  sim_tape.c sim_shmem.c -I I3705 -o BIN/i3705 -lm -lrt -lpthread -ldl
```

This build should end without problems.

Start the 3705 emulator with:

```
#./BIN/i3705 I3705/3705.cnf

  CS2: thread 2142 started successfully...
  PNL: Thread 2143 started successfully...

  CA-T2: Main thread 2141 started successfully...

  TEL: thread 2144 started successfully...

  TEL: Using network Address 192.168.1.144 on eth0 for 3270 client connections
  PNL: Using network Address 192.168.1.144 on eth0 for 3270 panel connections
  PNL: Waiting for 3270 connection
  CPU: Reset...
  CPU: MEMORYSIZE 262144 bytes...

  IBM 3704/3705 simulator V3.11-0
  CPU: Reset...
  CPU: MEMORYSIZE 65536 bytes...
  CPU: Loading MaxiROS...
  CPU: Booting...

  CA-T2: ATTN thread 2145 started succesfully...
  CA1: Waiting for channel connection on TCP port 37051
  CA2: Waiting for channel connection on TCP port 37053
```

The 3705 operator panel may be accessed with a tn3270 client by connecting to port 37050 of the emulator's IP address.



5. Loading the NCP

Now we can load the generated NCP.

Restart Hercules and...

```
  ADX00003E 1:0660: bus 20 failed, retry in 10 sec...
  ADX00005D 1:0660: CCW count=0001
  ADX00001E 1:0660: socket 20 Transport endpoint is not connected
  ADX00003E 1:0660: bus 20 failed, retry in 10 sec...
  ...
  ADX00003I 1:0660: tag connection established on socket 21
  ADX00003I 1:0660: bus connection established on socket 20
  ADX00008D 1:0660: connections on port 37051; Bus socket: 20, Tag socket: 21
```

...re-ipl MVS. (just to be sure).

```
   ==> ipl 148
```

Note: comm3705 will always display informational (ADXnnnnI) and error (ADXnnnnE) messages. When debug=yes is specified in the hercules 'conf/tk4-default' file all Debug (ADXnnnnD) messages will be displayed too.
With standard Hercules command 't+ cua' (e.g. t+ 660) you can activate the CCW trace and 't- 660' will disabled it again.

Check that the 3705 device address is online in MVS:

```
  -           d u,,,660,1
 IEE450I 09.34.55 UNIT STATUS         FRAME LAST         F      E     1A
 UNIT TYPE STATUS  VOLSER VOLSTATE
 660  3705 O
```

Load the generated NCP into the IBM 3705

```
  -           v net,act,id=hjs3705
    STC  439  IST097I  VARY     ACCEPTED
    STC  439  IST197I  SAVED CONFIGURATION HJS3705  READ FROM VTAMOBJ
  - STC  439  IEC130I INITEST  DD STATEMENT MISSING
  | STC  439 *00 IST272A  370X HJS3705  NO INITIAL TEST- REPLY U TO BYPASS-
  |  OR CANCEL
  -           r 00,u
              IEE600I REPLY TO 00 IS; U
    STC  439  IST270I  370X HJS3705  NOW LOADED WITH LOADMOD HJS3705
    STC  439  IST093I  HJS3705  ACTIVE
00  STC  439  IST093I  SDLC3274 ACTIVE
```

Connect your TN3270 client to the EMU3705 IP address 192.168.1.5 port 32001.

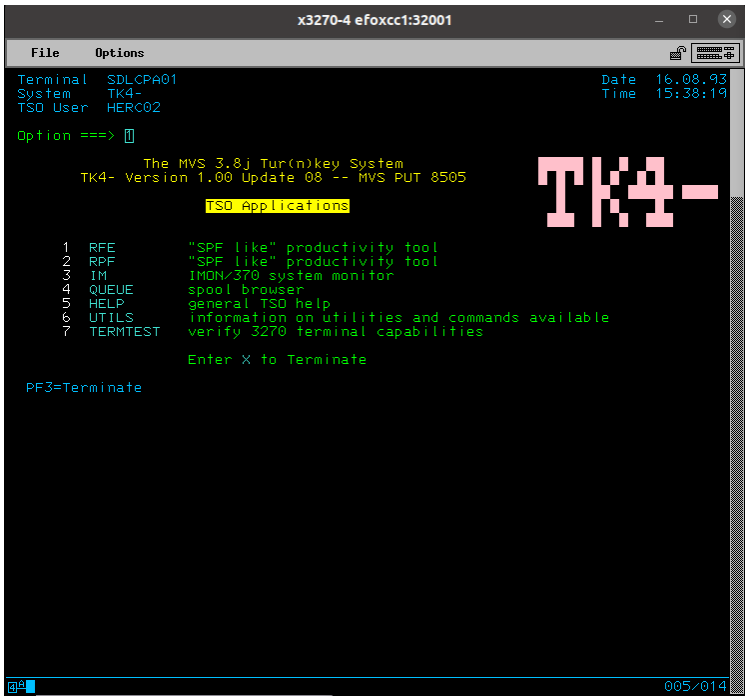
Note: during testing we discovered that quick3270 does not work with the tn3270 server in the EMU3705. x3270 works perfect.

```
   ...
   ..
   Connected to device 000
```

Press
   [RESET]
   [CLEAR]
   [RESET]

Type: 'logon applid(tso) logmode(mhp3278e)' and press [SYS-REQ] (not [ENTER]!)

Wait for the TSO login prompt and login:



== // ==