The Container Security in Healthcare Data Exchange System

Bachelor's degree graduation project

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v1.1

Outline

Not expecting:

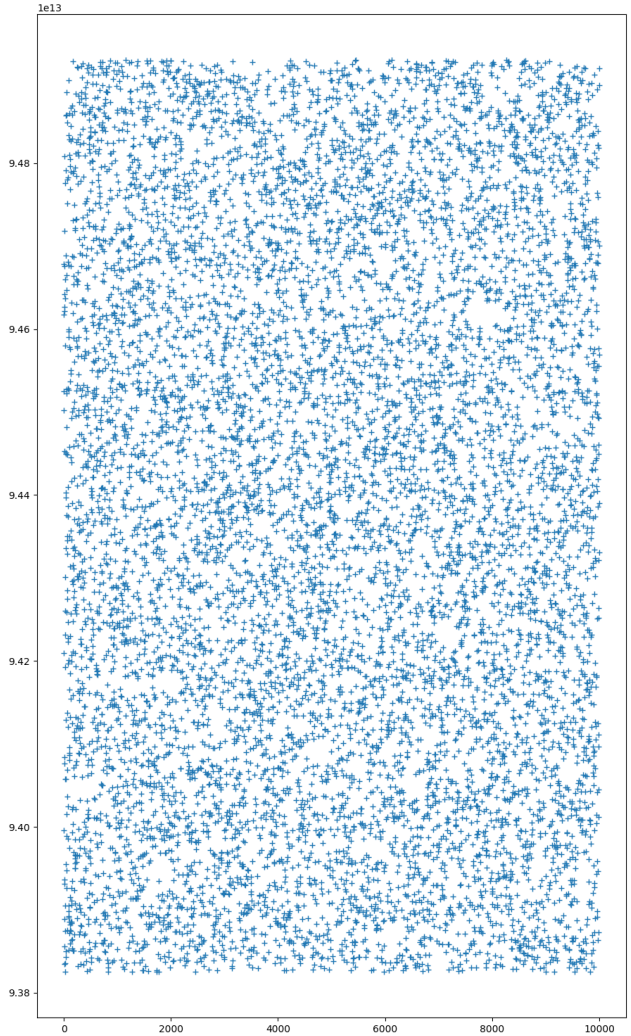
Realize what I will say.

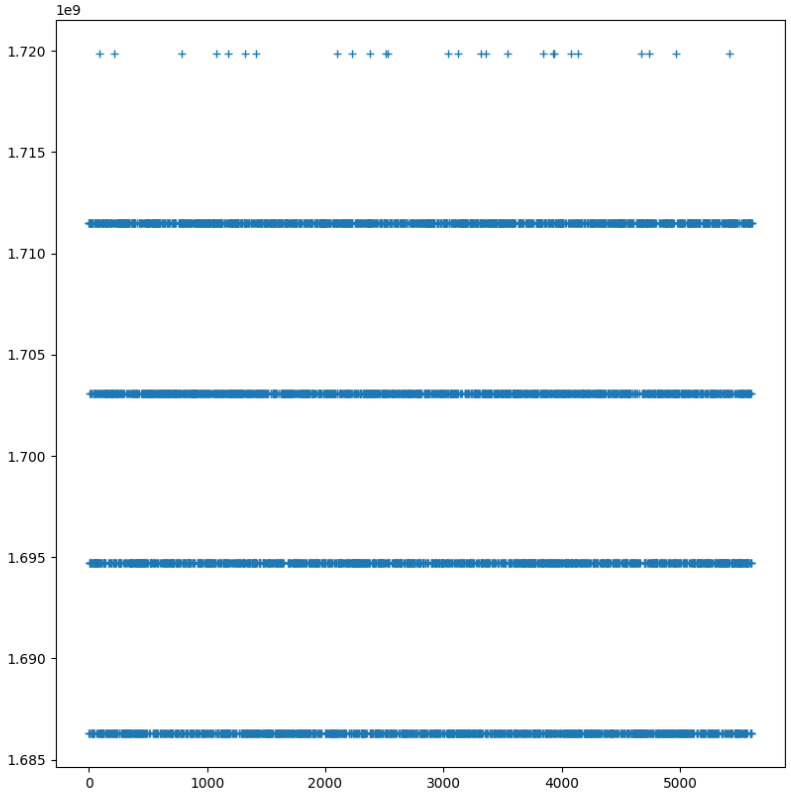
Too many difficult details.

Outcome - light weight container

```
→ container git:(main) ✗ gcc *.[ch] -o c
→ container git:(main) ✗ sudo ./c "bash"
Success on creating container
Start container: bash with clone id: 193761
In container PID: 1
bash-5.0# ./test.sh
This is the self test script in contaiiner!
Support bash cat echo ls rm hostname, 5 commands.
./test.sh
-----------FILE: test.sh ------------
     1  #!/bin/bash
     2
     3  echo "This is the self test script in contaiiner!"
     4  echo "Support bash cat echo ls rm hostname, 5 commands."
     5
     6  echo $0
     7
     8  echo "-----------FILE: test.sh ------------"
     9  cat -n test.sh
    10  echo "-------------------------------------"
    11
    12  echo $(hostname) >天竺鼠車車
    13  cat 天竺鼠車車
    14  rm 天竺鼠車車
    15  ls
-------------------------------------
container
bin  dev  etc  home  lib  lib64  mnt  opt  proc  root  run  sbin  sys  test.sh  tmp  usr  var
bash-5.0# exit
exit
→ container git:(main) ✗
```

Outcome - (k)ASLR





Outcome - kernel module

```
Run /init.sh as init process
  with arguments:
    /init.sh
  with environment:
    HOME=/
    TERM=linux
    hostfs=./rootfs
    mem=64M
kaslr: loading out-of-tree module taints kernel.

1694699525
random: fast init done
random: crng init done
```

```
➜  0326 git:(main) ✗ less /proc/$$/maps
➜  0326 git:(main) ✗ python -c 'print(1694699525)'
➜  0326 git:(main) ✗ python
Python 3.8.5 (default, Jan 27 2021, 15:41:15)
[GCC 9.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import math
>>> math.log(1694699525, 2)
30.658382356126655
>>> exit()
➜  0326 git:(main) ✗
```

Outcome - chroot

```
→  cont git:(main) ✗ sudo ./c ./picosh
Success on creating container
Start container: ./picosh with clone id: 2106853
In container PID: 1
$ ls
bin         dev  home  lib    mnt  picosh  root  sbin  test.sh  usr
chroot-dir  etc  jb    lib64  opt  proc    run   sys   tmp      var
$ ./jb
root@container:/# ls /media/d/git/nsysu/cs/report/presentation/0409/
images     main.bib      main.fdb_latexmk  main.nav  main.run.xml     main.tex  methFlow.pdf
main.aux   main.blg      main.fls          main.out  main.snm         main.toc  src
main.bbl   main-blx.bib  main.log          main.pdf  main.synctex.gz  Makefile
root@container:/#

→  0409 git:(main) ✗ ls
images     main.bib      main.fdb_latexmk  main.nav  main.run.xml     main.tex  methFlow.pdf
main.aux   main.blg      main.fls          main.out  main.snm         main.toc  src
main.bbl   main-blx.bib  main.log          main.pdf  main.synctex.gz  Makefile
→  0409 git:(main) ✗
```

Next steps

1. Studies
   1. Linux features
   2. Papers
2. Formal Verification
3. The Healthcare Data Exchange System part

The 3Ws

1. What this issue?
2. Why this issue?
3. How this issue?

What this issue

The medical cyber security issue of the next-generation.

Why this issue

Microservice
Scalability
Manageability

How this issue

Exactly microservice
Security
Performance

FAQ

1. Docker, container and virtual machine
2. FHIR? Why need container?
3. User Mode Linux
4. clone, io_uring

Q&A

Feel free to give your comments.