從企業看 SA/NA 及經驗分享

小明(曾祺元)

2019.11.28

PIXNET

簡介

姓名 : 曾祺元

綽號 : 小明

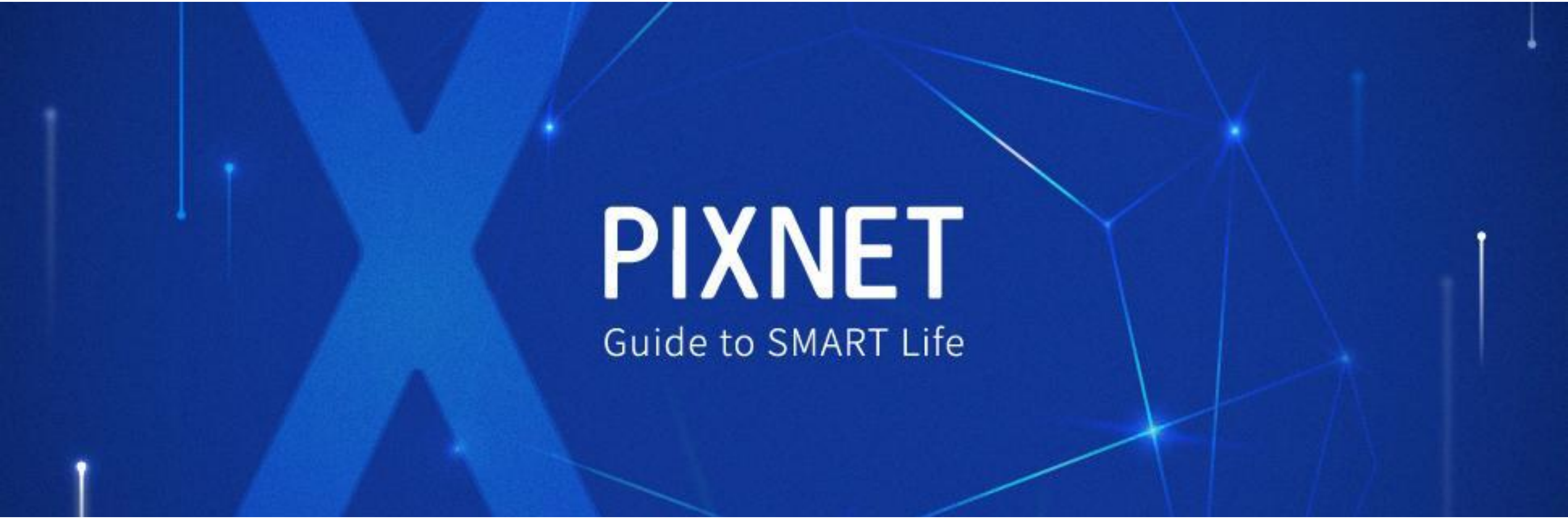
現任 : PIXNET SRE 組組長

經歷 :

- 璞園建築團隊 IT 主管
- 遊戲基地(gamebase)資深系統工程師
- 資策會創研所資深工程師
- 台大生機所 90 級
- 交大機械系 89 級
    - 曾擔任 CCCA 及交大機械系網管

台灣最大社群網站

PIXNET 創立於2003年，2006年成立「優像數位媒體科技股份有限公司」，並於2007年加入城邦媒體控股集團。我們是一間以社群為核心的科技公司，旗下主要服務包含：痞客邦、PIXgoods、PIXmarketing、PIXinsight，透過創新的數據應用、多樣化社群服務，實現「Guide to SMART Life」企業核心價值。2018年，PIXNET 推出「全新痞客邦」加速興趣同好彼此凝聚及交流，並持續與產業各界結盟，踏實建構「社群共榮圈」願景。

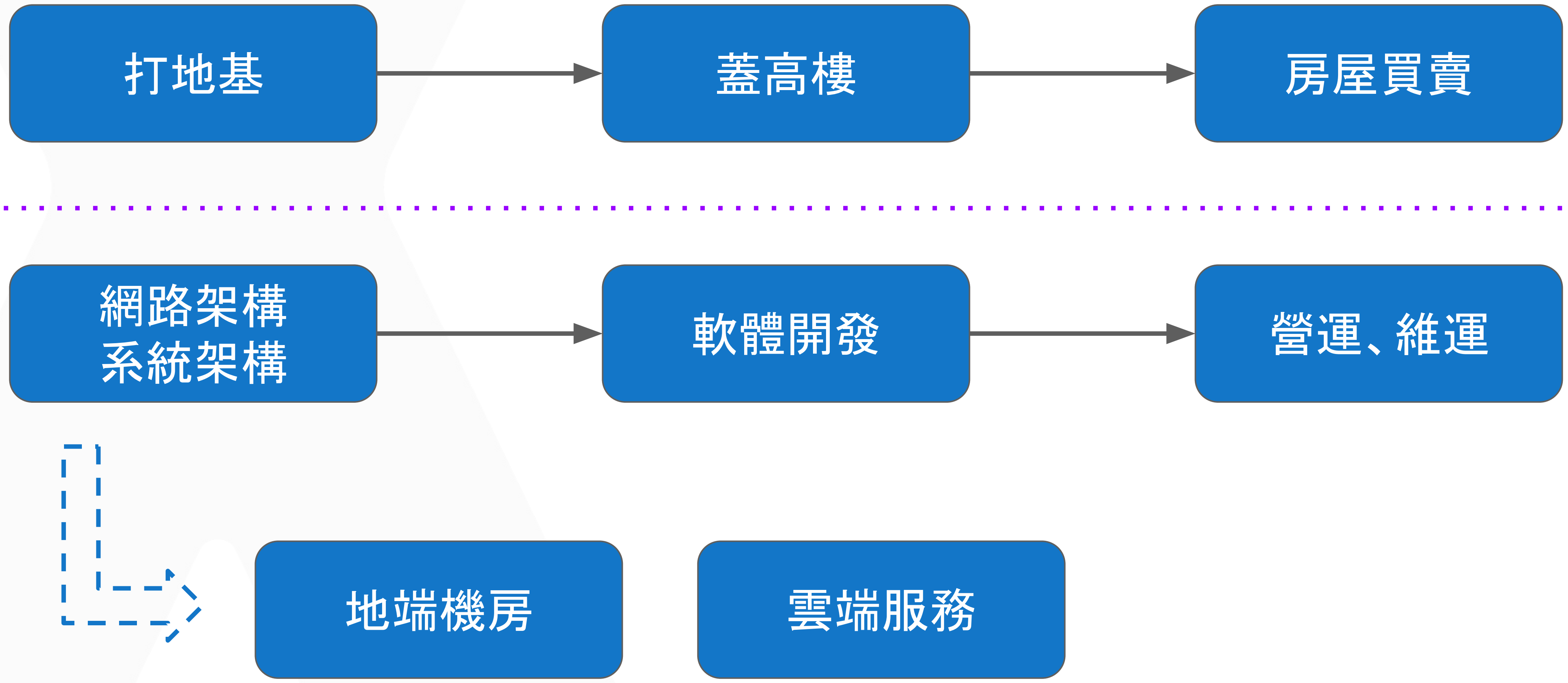


痞客邦 PIXmarketing PIXgoods PIXinsight www.pixinsight.com.tw

啟蒙

CCCA
國立交通大學
校園網路策進會
Campus Computer
Communication Association
Since 1992 May

系統管理能幹嘛？



打地基

蓋高樓

房屋買賣

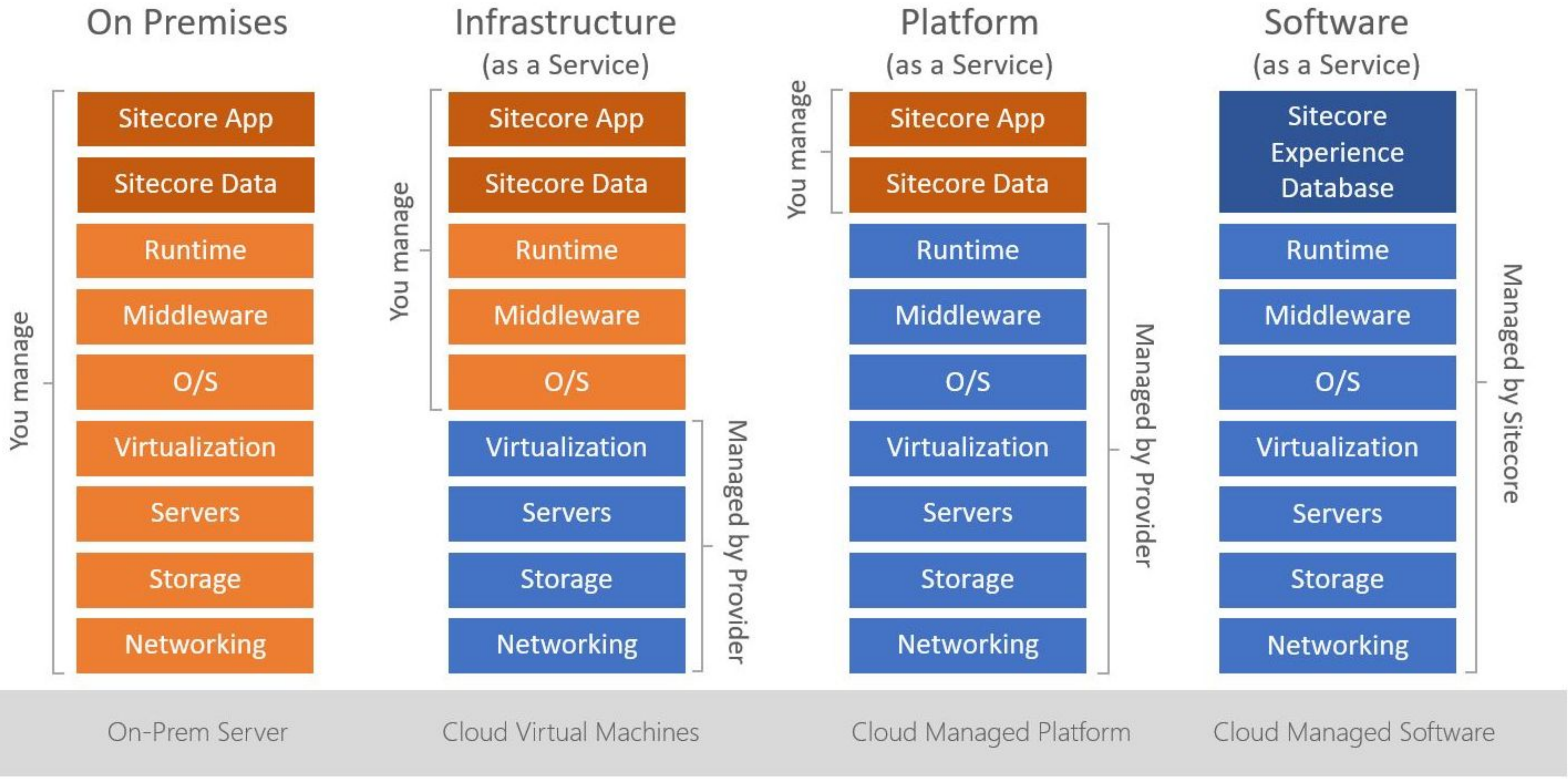
網路架構
系統架構

軟體開發

營運、維運

地端機房

雲端服務



On Premises

You manage

- Sitecore App
- Sitecore Data
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

On-Prem Server

Infrastructure (as a Service)

You manage

- Sitecore App
- Sitecore Data
- Runtime
- Middleware
- O/S

Managed by Provider

- Virtualization
- Servers
- Storage
- Networking

Cloud Virtual Machines

Platform (as a Service)

You manage

- Sitecore App
- Sitecore Data

Managed by Provider

- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

Cloud Managed Platform

Software (as a Service)

Managed by Sitecore

- Sitecore Experience Database
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

Cloud Managed Software

火力展示

地端機房

- 中華電信
- 台灣大哥大
- FAR EASTONE 遠傳
- FreeBSD
- debian GNU/Linux
- vmware®
- Microsoft® Windows xp
- CISCO
- JUNIPer NETWORKS

雲端服務

- Google Cloud Platform
- amazon web services
- linode
- verizon Digital Media Services
- amazon cloudfront
- Akamai

PIXNET 用到的服務軟體

envoy

SQUID

BIND 9

git

POSTFIX

splunk®>

APACHE
HTTP SERVER PROJECT

NGINX

fly light.
LIGHTTPD

RED HAT®
ANSIBLE®

cobbler

docker®

kubernetes

Jenkins

elasticsearch

Solr

PERCONA

PERCONA
XtraDB Cluster

PostgreSQL

fluentd

fluentbit

php

node JS®

python™

GOLANG

OpenZFS

HashiCorp
Consul

MRTG
MULTI ROUTER TRAFFIC GRAPHER

MUNIN

smoke ping

Prometheus

HashiCorp
Vault

SA / NA 基礎建設的根本

來談談一些維運的應用

PIXNET SRE 的工作

值班

- 維運
- 穩定
- 救火

支援

- 協助 RD
- 建置環境

開發

- 自動化
- 新技術

ZFS + Percona (MySQL)

說說一些 ZFS 的補充

What is ZFS?

- ZFS is a combined file system and logical volume manager designed by Sun Microsystems.
- The ZFS file system is a file system that fundamentally changes the way file systems are administered, with features and benefits not found in other file systems available today. ZFS is robust, scalable, and easy to administer.

- Software Raid - recommand HBA card
- 128 bit filesystem
- no fsck - scrub / resilvering
- RAID-Z / mirror
- Snapshots

Platform

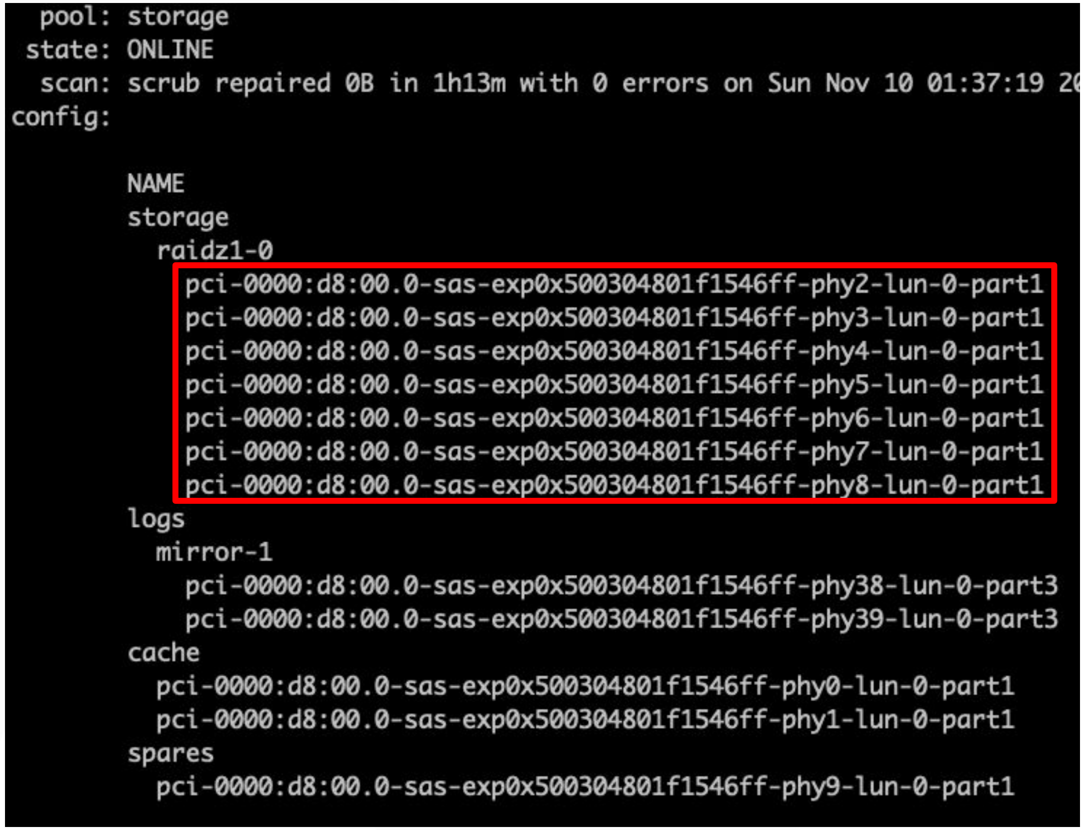
- Solaris / OpenSolaris
- macOS / FreeBSD
- FreeNAS / NAS4free / pfsense

https://en.wikipedia.org/wiki/ZFS
https://zfsonlinux.org/
http://wiki.lustre.org/ZFS_OSD_Hardware_Considerations
https://docs.oracle.com/cd/E26505_01/html/E37384/zfsover-2.html#scrolltoc

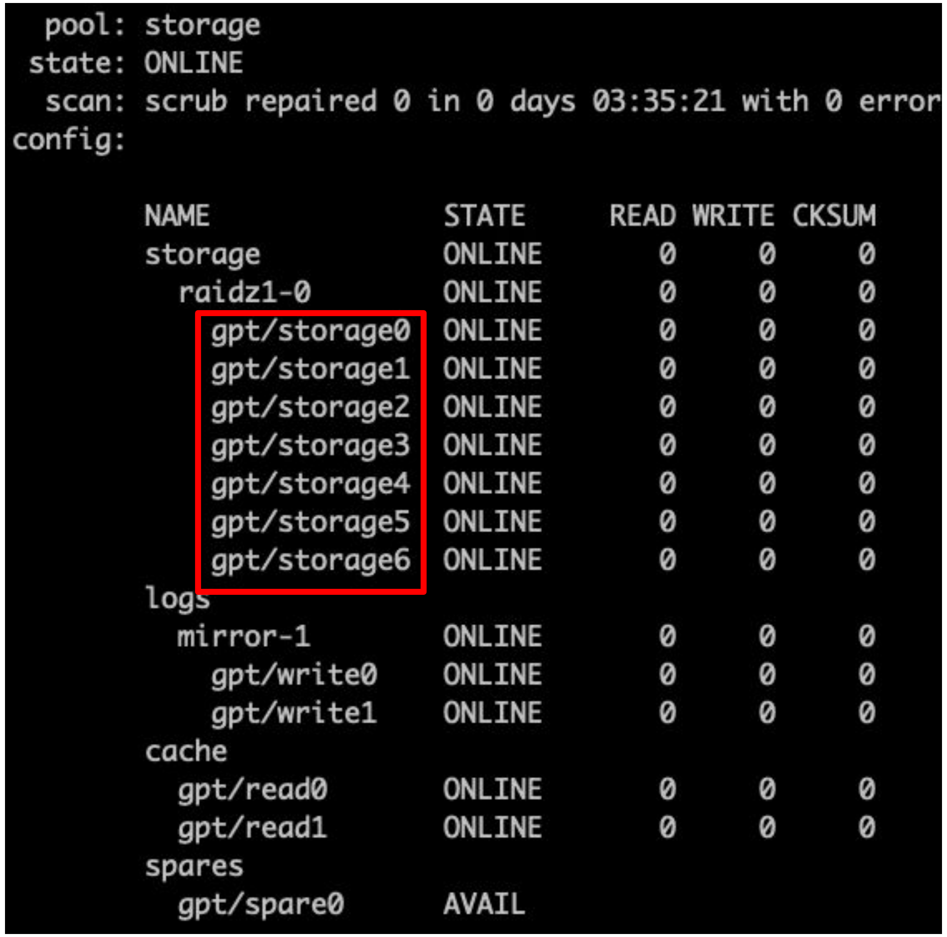
課堂外的補充

忽略硬碟排列順序

FreeBSD: ZFS + GEOM
Debian: ZFS + disk path / label



```
  pool: storage
 state: ONLINE
  scan: scrub repaired 0B in 1h13m with 0 errors on Sun Nov 10 01:37:19 2
config:

        NAME
        storage
          raidz1-0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy2-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy3-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy4-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy5-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy6-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy7-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy8-lun-0-part1
        logs
          mirror-1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy38-lun-0-part3
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy39-lun-0-part3
        cache
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy0-lun-0-part1
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy1-lun-0-part1
        spares
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy9-lun-0-part1
```



```
  pool: storage
 state: ONLINE
  scan: scrub repaired 0 in 0 days 03:35:21 with 0 error
config:

        NAME                STATE     READ WRITE CKSUM
        storage             ONLINE       0     0     0
          raidz1-0          ONLINE       0     0     0
            gpt/storage0    ONLINE       0     0     0
            gpt/storage1    ONLINE       0     0     0
            gpt/storage2    ONLINE       0     0     0
            gpt/storage3    ONLINE       0     0     0
            gpt/storage4    ONLINE       0     0     0
            gpt/storage5    ONLINE       0     0     0
            gpt/storage6    ONLINE       0     0     0
        logs
          mirror-1          ONLINE       0     0     0
            gpt/write0      ONLINE       0     0     0
            gpt/write1      ONLINE       0     0     0
        cache
          gpt/read0         ONLINE       0     0     0
          gpt/read1         ONLINE       0     0     0
        spares
          gpt/spare0        AVAIL
```

課堂外的補充

PIXNET

Root on ZFS 很好用
但需要和儲存資料分離

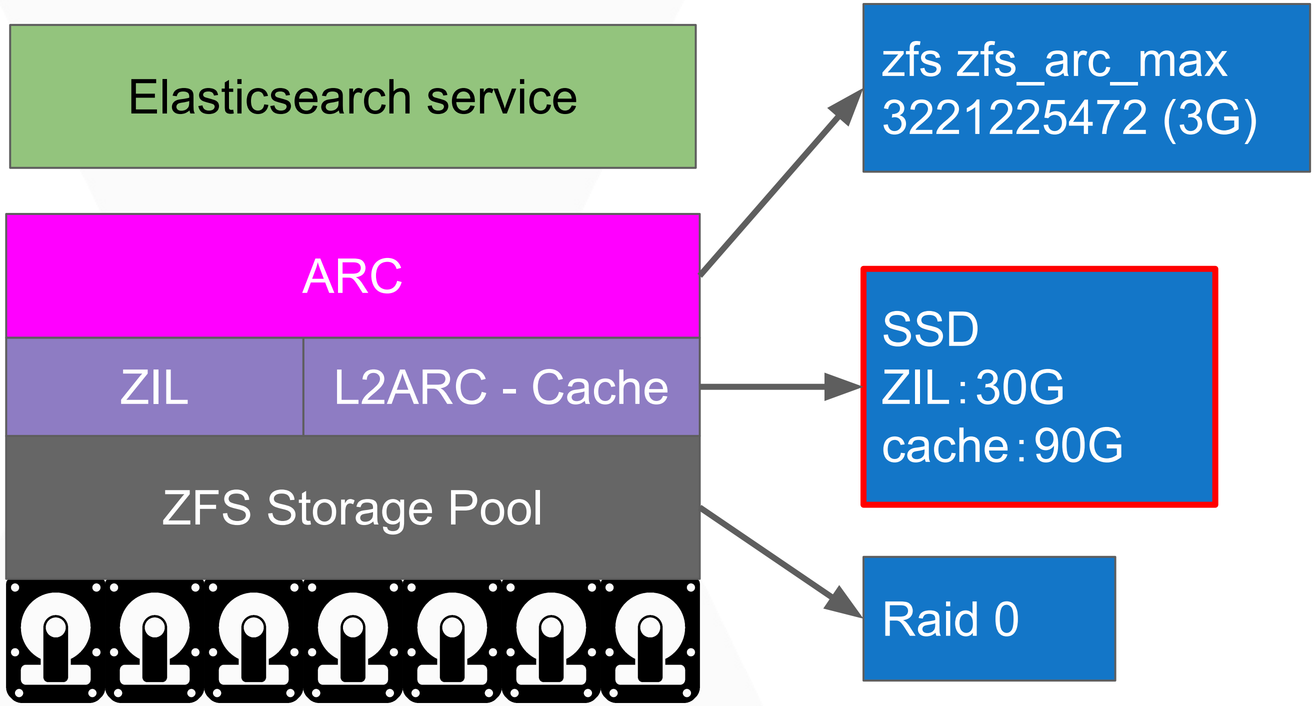
提升 IOPS
移用 SSD 當 ZIL & Cache

故事

- 曾在過年時發生 Storage (ZFS) 因故無法登入使用
- 年初三回公司處理，重開機再也找不到 root partition
- 各種方法都救不回來 root partition
- 最後用額外的硬碟當 OS 後 import ZFS 救回

降低機器負擔 (Percona 為例)
讀寫分離、讀寫比例分配

Elasticsearch 系統規劃



zfs zfs_arc_max
3221225472 (3G)

SSD
ZIL：30G
cache：90G

Raid 0

記憶體規劃
系統預留：500M ~ 1000M
Elasticsearch JVM：總記憶體 35% ~ 50%
ZFS ARC：總記體 35% ~ 50%

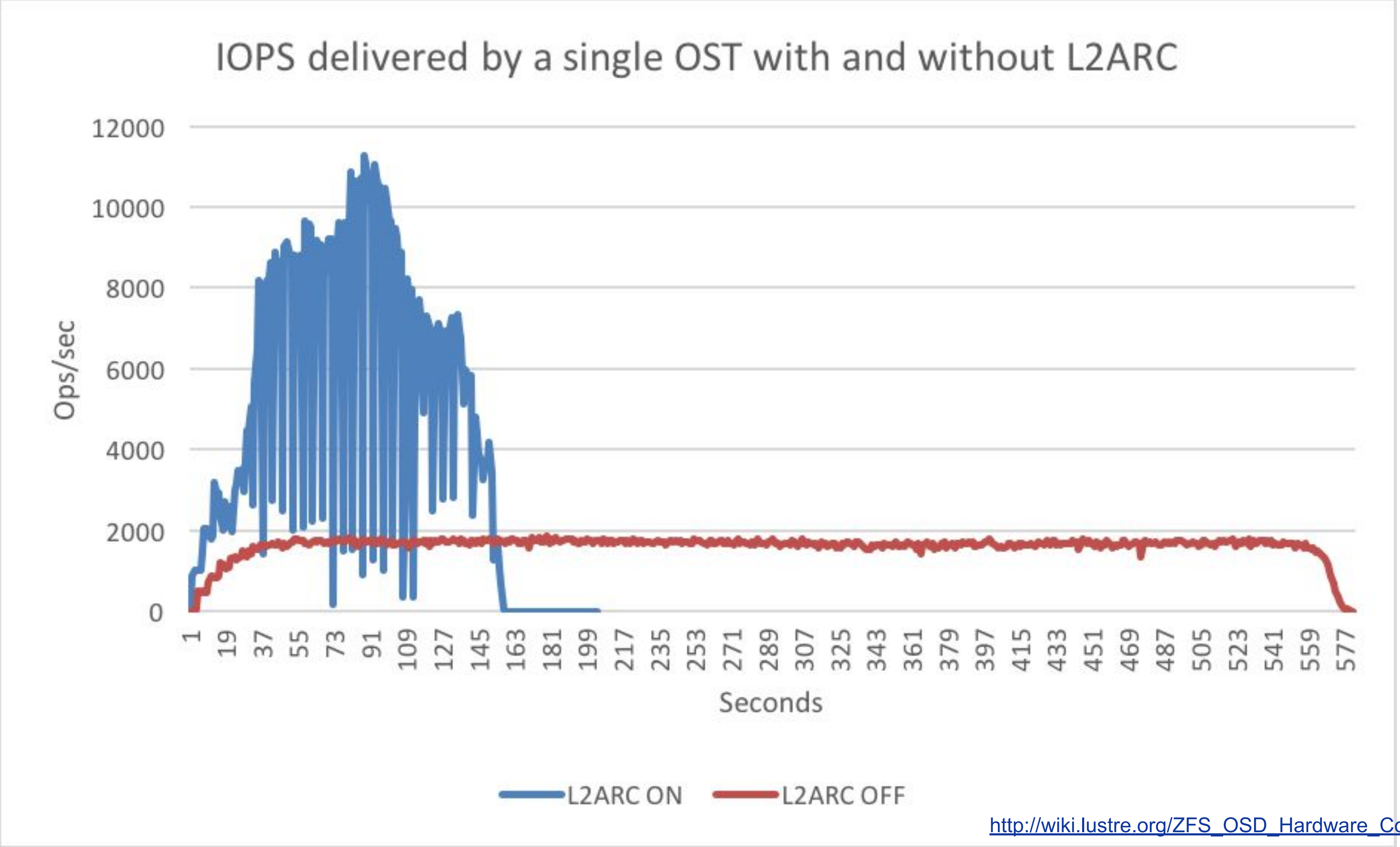
15G 記憶體分配方式

```
/etc/elasticsearch/jvm.options
-Xms5632m
-Xmx5632m

/etc/modprobe.d/zfs.conf
options zfs zfs_arc_max=3221225472 # 3G
```

L2ARC

- 若有獨立 (SSD) Cache 則稱為 SLOG (Separate ZFS Intent Log, SLOG)
- 若沒有獨立 Cache 則由所有 (virtual devices, vdevs) 分擔 ZIL 功能

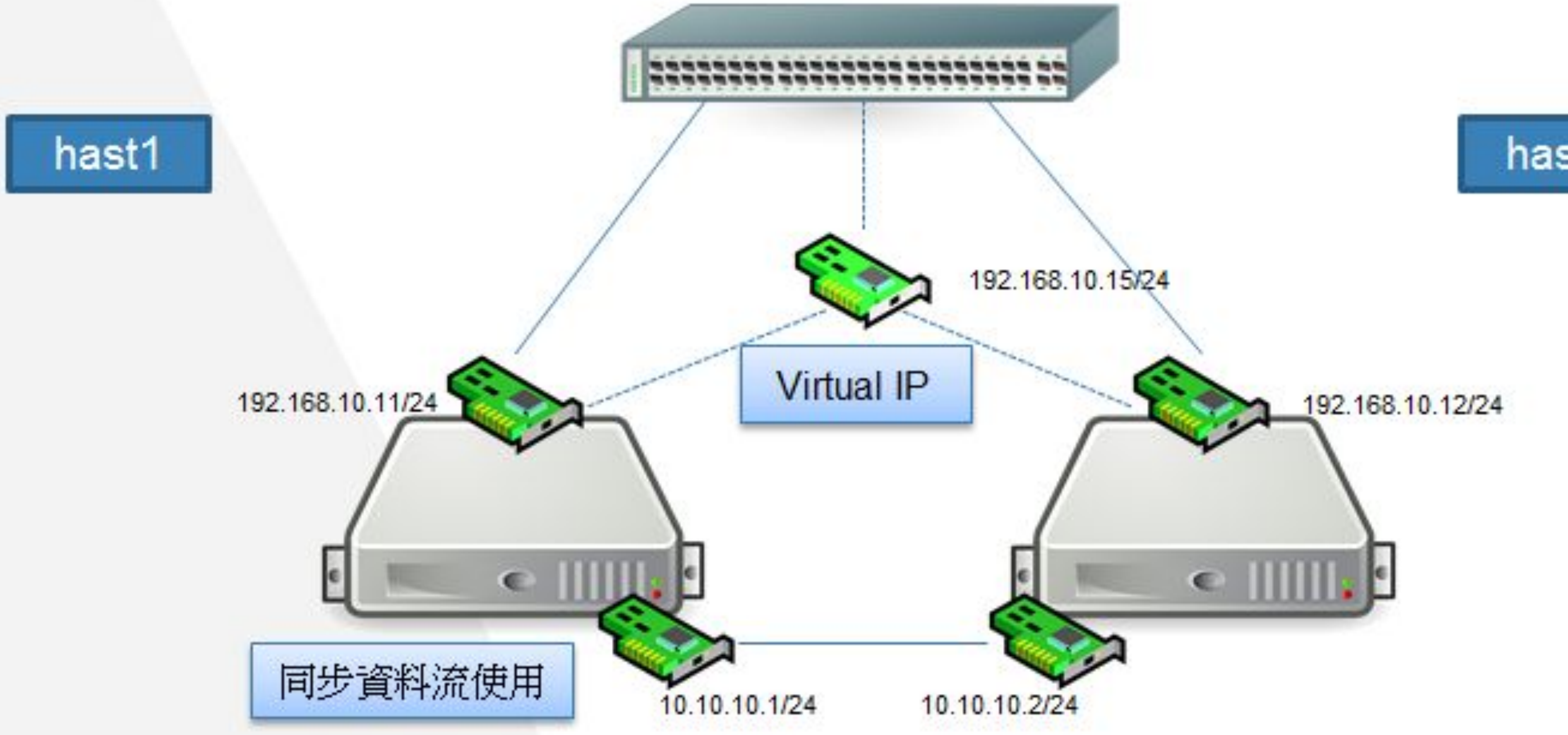
Compare L2ARC on and L2ARC off



http://wiki.lustre.org/ZFS_OSD_Hardware_Considerations

課堂外的補充

FreeBSD + HAST + CARP + ZFS = 超好用

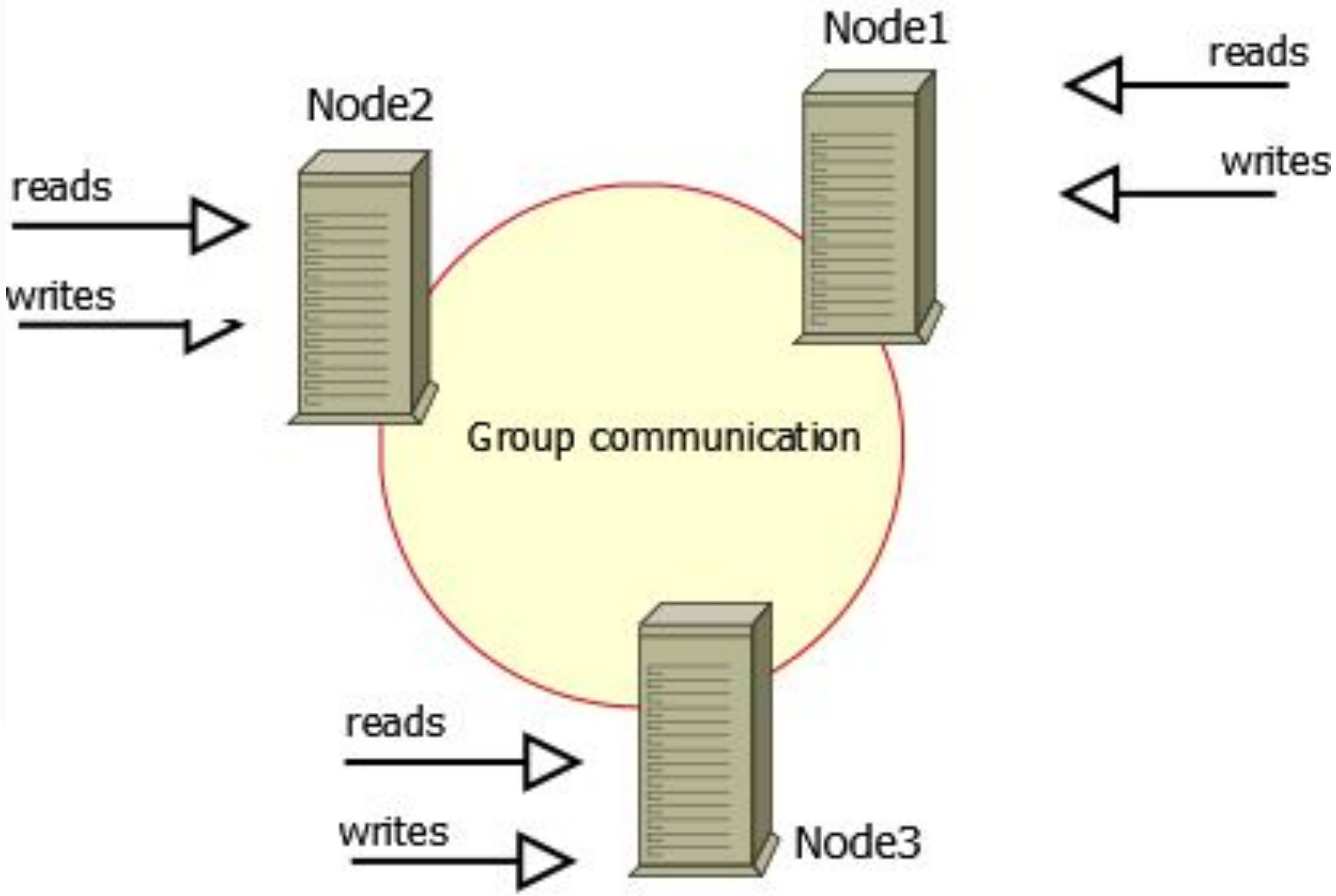


Storage 規格
SATA or SAS x24
HBA Card

- VMWare GuestOS 在 ZFS Failover 時可不中斷服務
- ZFS Failover 時間約 78s

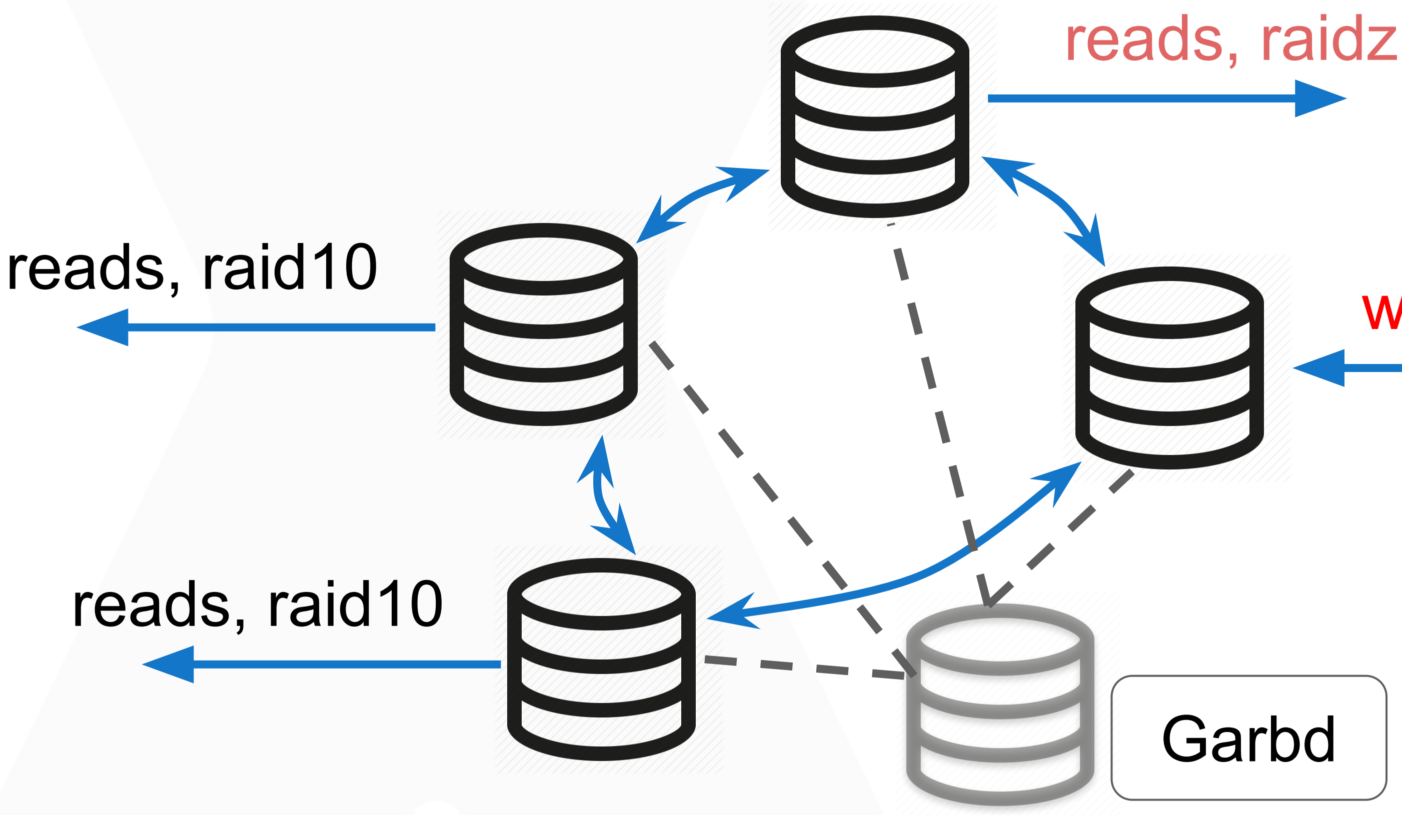
回來談談 Percona (MySQL)

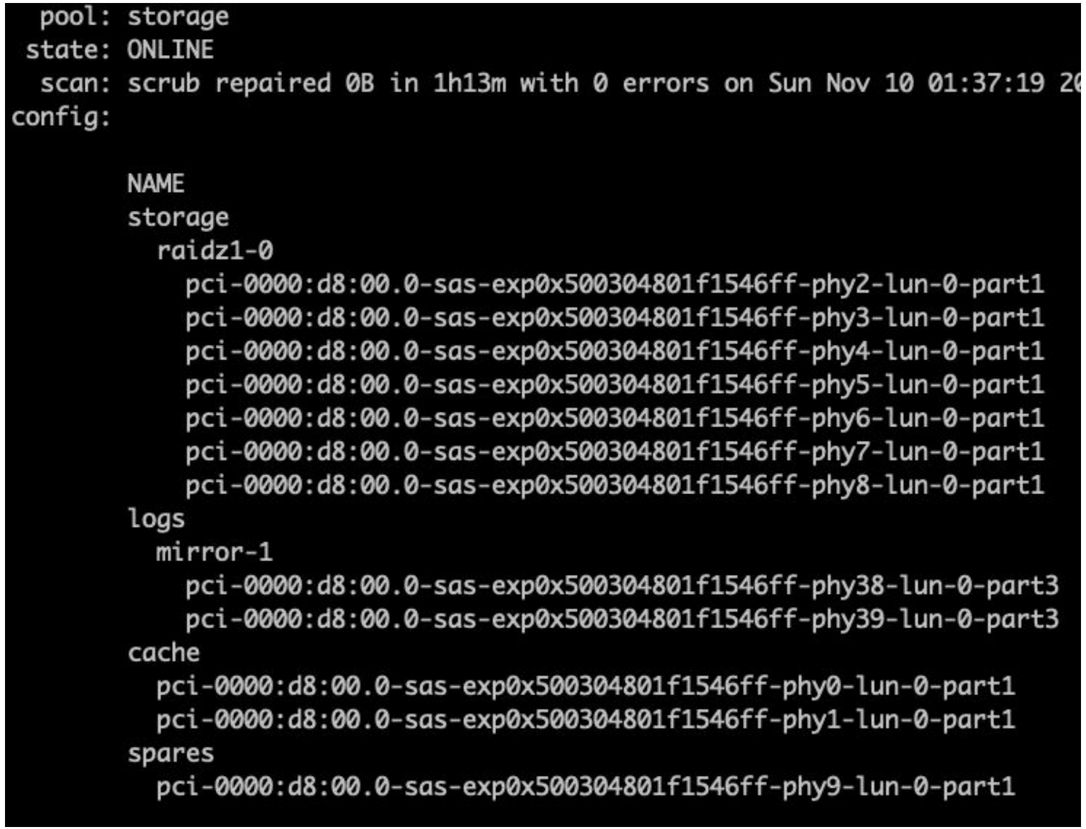
About Percona XtraDB Cluster, PXC



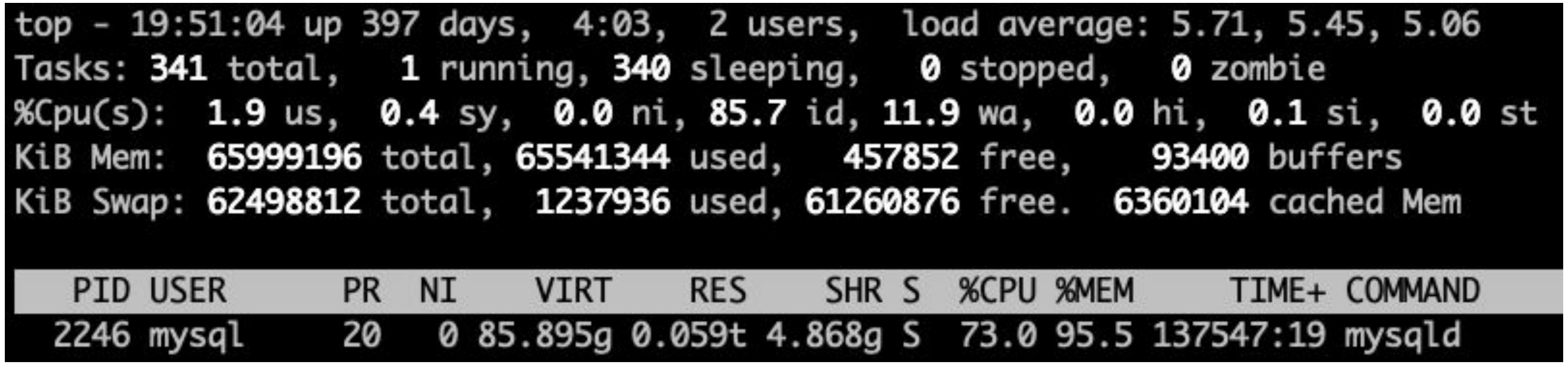
https://www.percona.com/doc/percona-xtradb-cluster/LATEST/intro.html

PIXC on PIXNET

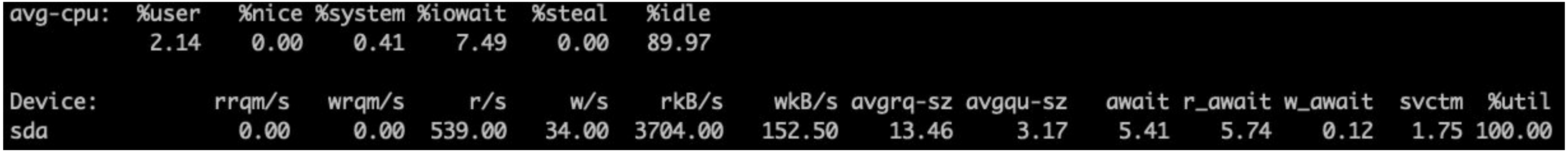




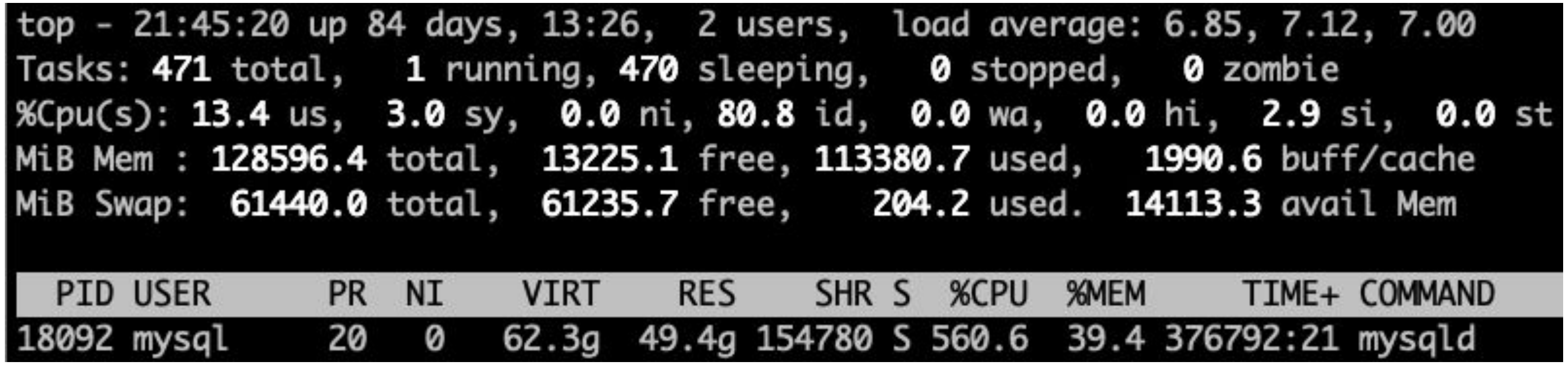
```
  pool: storage
 state: ONLINE
  scan: scrub repaired 0B in 1h13m with 0 errors on Sun Nov 10 01:37:19 20
config:

        NAME
        storage
          raidz1-0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy2-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy3-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy4-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy5-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy6-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy7-lun-0-part1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy8-lun-0-part1
        logs
          mirror-1
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy38-lun-0-part3
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy39-lun-0-part3
        cache
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy0-lun-0-part1
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy1-lun-0-part1
        spares
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy9-lun-0-part1
```



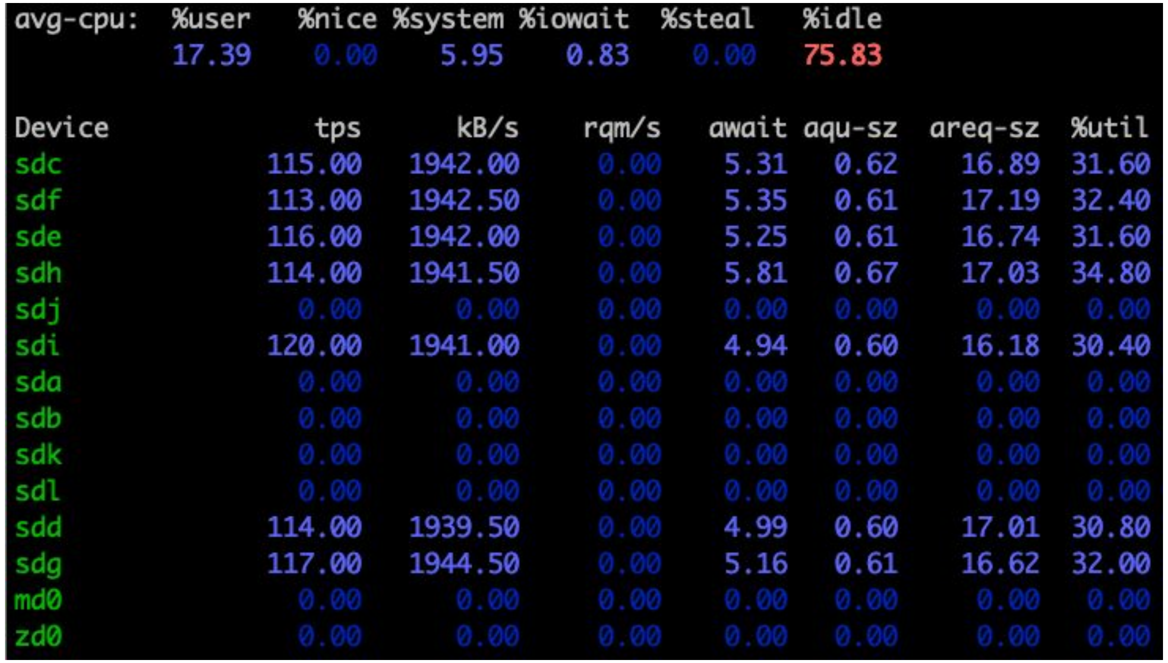
```
top - 19:51:04 up 397 days,  4:03,  2 users,  load average: 5.71, 5.45, 5.06
Tasks: 341 total,   1 running, 340 sleeping,   0 stopped,   0 zombie
%Cpu(s):  1.9 us,  0.4 sy,  0.0 ni, 85.7 id, 11.9 wa,  0.0 hi,  0.1 si,  0.0 st
KiB Mem:  65999196 total, 65541344 used,   457852 free,    93400 buffers
KiB Swap: 62498812 total,  1237936 used, 61260876 free.  6360104 cached Mem

   PID USER      PR  NI    VIRT    RES    SHR S  %CPU %MEM     TIME+ COMMAND
  2246 mysql     20   0 85.895g 0.059t 4.868g S  73.0 95.5 137547:19 mysqld
```



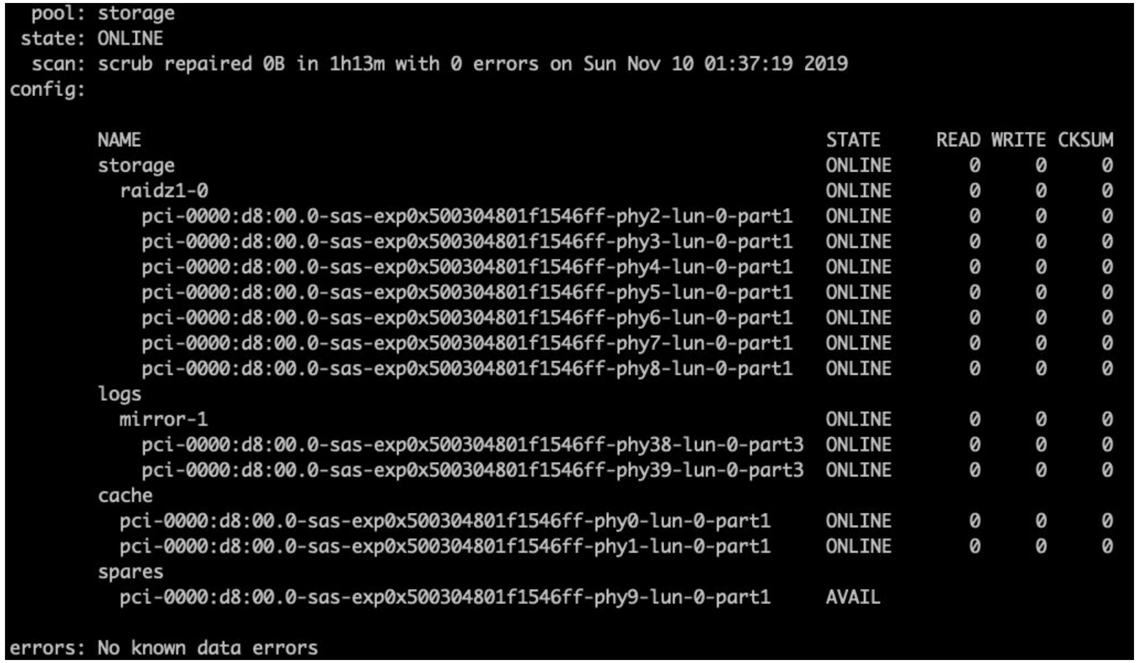
```
avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           2.14    0.00    0.41    7.49    0.00   89.97

Device:         rrqm/s   wrqm/s     r/s     w/s    rkB/s    wkB/s avgrq-sz avgqu-sz   await r_await w_await  svctm  %util
sda               0.00     0.00  539.00   34.00  3704.00   152.50    13.46     3.17    5.41    5.74    0.12   1.75 100.00
```



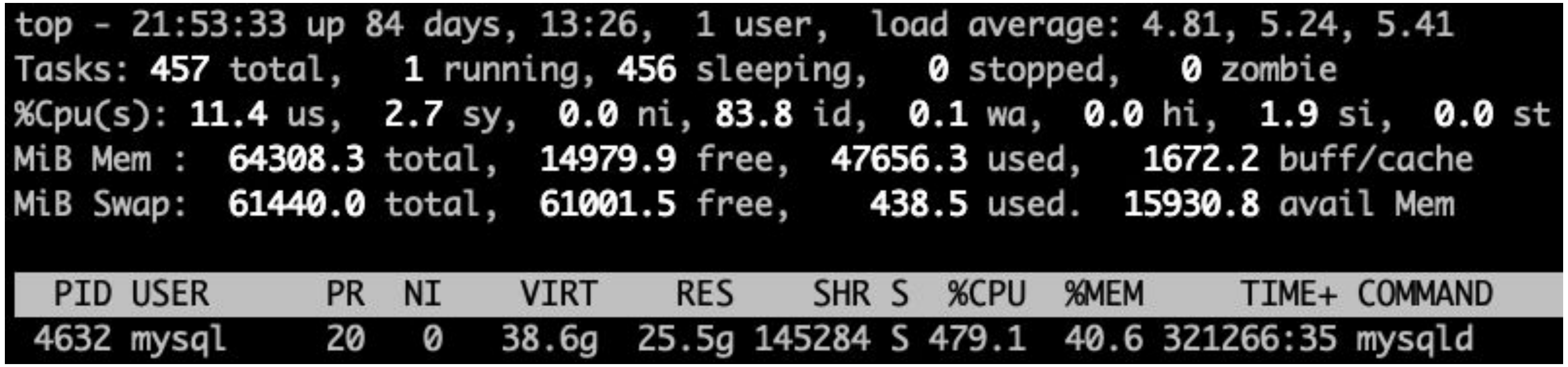
```
top - 21:45:20 up 84 days, 13:26,  2 users,  load average: 6.85, 7.12, 7.00
Tasks: 471 total,   1 running, 470 sleeping,   0 stopped,   0 zombie
%Cpu(s): 13.4 us,  3.0 sy,  0.0 ni, 80.8 id,  0.0 wa,  0.0 hi,  2.9 si,  0.0 st
MiB Mem : 128596.4 total,  13225.1 free, 113380.7 used,   1990.6 buff/cache
MiB Swap:  61440.0 total,  61235.7 free,    204.2 used.  14113.3 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
18092 mysql     20   0   62.3g  49.4g 154780 S 560.6  39.4 376792:21 mysqld
```



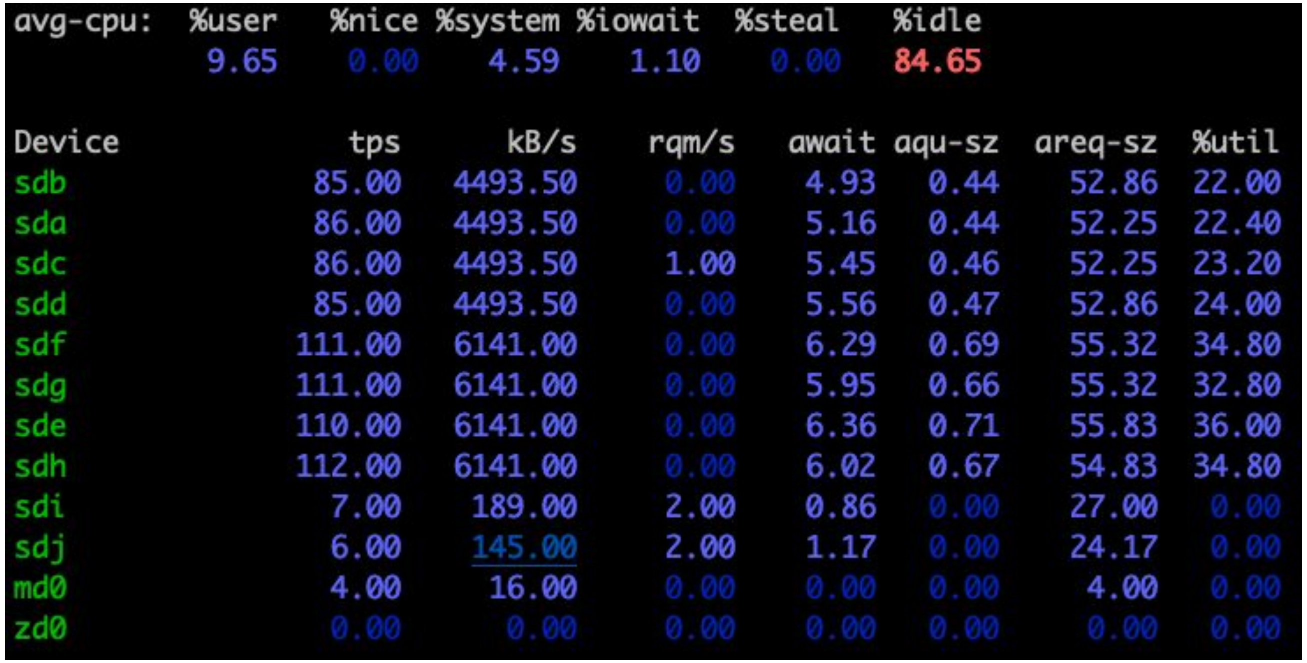
```
avg-cpu:  %user   %nice %system %iowait  %steal   %idle
          17.39    0.00    5.95    0.83    0.00   75.83

Device            tps    kB/s    rqm/s   await aqu-sz  areq-sz  %util
sdc            115.00  1942.00    0.00    5.31   0.62    16.89  31.60
sdf            113.00  1942.50    0.00    5.35   0.61    17.19  32.40
sde            116.00  1942.00    0.00    5.25   0.61    16.74  31.60
sdh            114.00  1941.50    0.00    5.81   0.67    17.03  34.80
sdj              0.00     0.00    0.00    0.00   0.00     0.00   0.00
sdi            120.00  1941.00    0.00    4.94   0.60    16.18  30.40
sda              0.00     0.00    0.00    0.00   0.00     0.00   0.00
sdb              0.00     0.00    0.00    0.00   0.00     0.00   0.00
sdk              0.00     0.00    0.00    0.00   0.00     0.00   0.00
sdl              0.00     0.00    0.00    0.00   0.00     0.00   0.00
sdd            114.00  1939.50    0.00    4.99   0.60    17.01  30.80
sdg            117.00  1944.50    0.00    5.16   0.61    16.62  32.00
md0              0.00     0.00    0.00    0.00   0.00     0.00   0.00
zd0              0.00     0.00    0.00    0.00   0.00     0.00   0.00
```



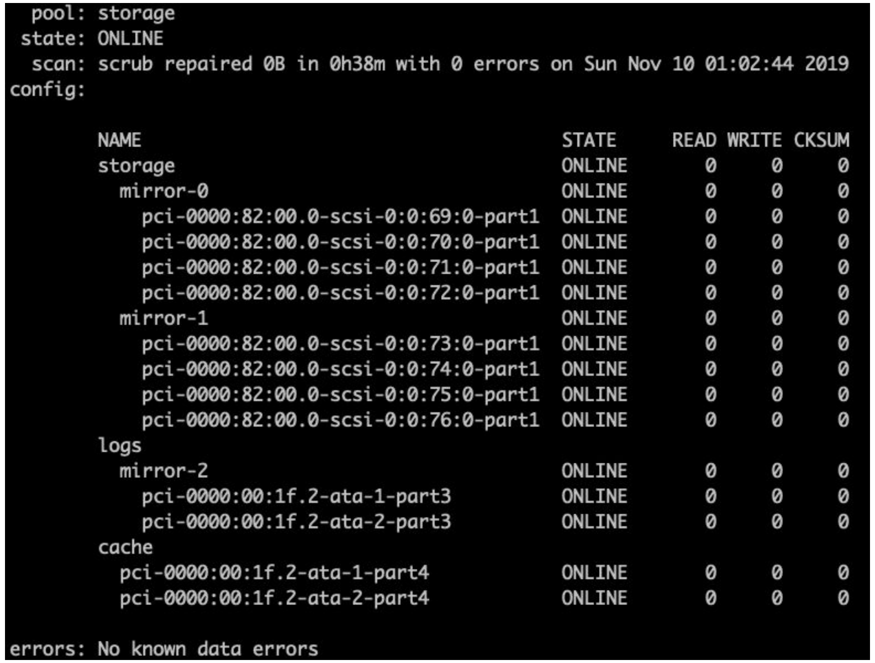
```
  pool: storage
 state: ONLINE
  scan: scrub repaired 0B in 1h13m with 0 errors on Sun Nov 10 01:37:19 2019
config:

        NAME                                                   STATE     READ WRITE CKSUM
        storage                                                ONLINE       0     0     0
          raidz1-0                                             ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy2-lun-0-part1   ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy3-lun-0-part1   ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy4-lun-0-part1   ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy5-lun-0-part1   ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy6-lun-0-part1   ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy7-lun-0-part1   ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy8-lun-0-part1   ONLINE       0     0     0
        logs
          mirror-1                                             ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy38-lun-0-part3  ONLINE       0     0     0
            pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy39-lun-0-part3  ONLINE       0     0     0
        cache
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy0-lun-0-part1     ONLINE       0     0     0
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy1-lun-0-part1     ONLINE       0     0     0
        spares
          pci-0000:d8:00.0-sas-exp0x500304801f1546ff-phy9-lun-0-part1     AVAIL

errors: No known data errors
```



```
top - 21:53:33 up 84 days, 13:26,  1 user,  load average: 4.81, 5.24, 5.41
Tasks: 457 total,   1 running, 456 sleeping,   0 stopped,   0 zombie
%Cpu(s): 11.4 us,  2.7 sy,  0.0 ni, 83.8 id,  0.1 wa,  0.0 hi,  1.9 si,  0.0 st
MiB Mem :  64308.3 total,  14979.9 free,  47656.3 used,   1672.2 buff/cache
MiB Swap:  61440.0 total,  61001.5 free,    438.5 used.  15930.8 avail Mem

  PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
 4632 mysql     20   0   38.6g  25.5g 145284 S 479.1  40.6 321266:35 mysqld
```



```
avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           9.65    0.00    4.59    1.10    0.00   84.65

Device            tps    kB/s    rqm/s   await aqu-sz  areq-sz  %util
sdb             85.00  4493.50    0.00    4.93   0.44    52.86  22.00
sda             86.00  4493.50    0.00    5.16   0.44    52.25  22.40
sdc             86.00  4493.50    1.00    5.45   0.46    52.25  23.20
sdd             85.00  4493.50    0.00    5.56   0.47    52.86  24.00
sdf            111.00  6141.00    0.00    6.29   0.69    55.32  34.80
sdg            111.00  6141.00    0.00    5.95   0.66    55.32  32.80
sde            110.00  6141.00    0.00    6.36   0.71    55.83  36.00
sdh            112.00  6141.00    0.00    6.02   0.67    54.83  34.80
sdi              7.00   189.00    2.00    0.86   0.00    27.00   0.00
sdj              6.00   145.00    2.00    1.17   0.00    24.17   0.00
md0              4.00    16.00    0.00    0.00   0.00     4.00   0.00
zd0              0.00     0.00    0.00    0.00   0.00     0.00   0.00
```



```
  pool: storage
 state: ONLINE
  scan: scrub repaired 0B in 0h38m with 0 errors on Sun Nov 10 01:02:44 2019
config:

        NAME                                    STATE     READ WRITE CKSUM
        storage                                 ONLINE       0     0     0
          mirror-0                              ONLINE       0     0     0
            pci-0000:82:00.0-scsi-0:0:69:0-part1  ONLINE       0     0     0
            pci-0000:82:00.0-scsi-0:0:70:0-part1  ONLINE       0     0     0
            pci-0000:82:00.0-scsi-0:0:71:0-part1  ONLINE       0     0     0
            pci-0000:82:00.0-scsi-0:0:72:0-part1  ONLINE       0     0     0
          mirror-1                              ONLINE       0     0     0
            pci-0000:82:00.0-scsi-0:0:73:0-part1  ONLINE       0     0     0
            pci-0000:82:00.0-scsi-0:0:74:0-part1  ONLINE       0     0     0
            pci-0000:82:00.0-scsi-0:0:75:0-part1  ONLINE       0     0     0
            pci-0000:82:00.0-scsi-0:0:76:0-part1  ONLINE       0     0     0
        logs
          mirror-2                              ONLINE       0     0     0
            pci-0000:00:1f.2-ata-1-part3        ONLINE       0     0     0
            pci-0000:00:1f.2-ata-2-part3        ONLINE       0     0     0
        cache
          pci-0000:00:1f.2-ata-1-part4          ONLINE       0     0     0
          pci-0000:00:1f.2-ata-2-part4          ONLINE       0     0     0

errors: No known data errors
```

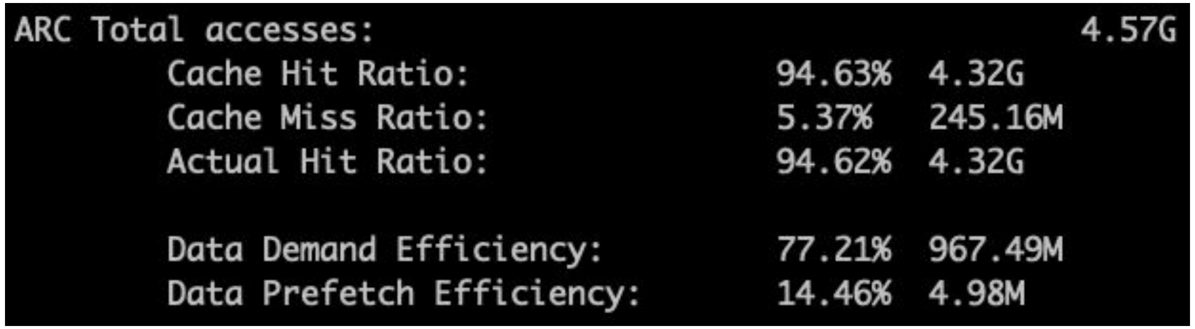
PXC 系統規劃

環境
CPU: 8 Cores 以上
RAM: 64G 以上
HDD: SAS 300G x8 (600G) 以上
SSD: 120G x 2

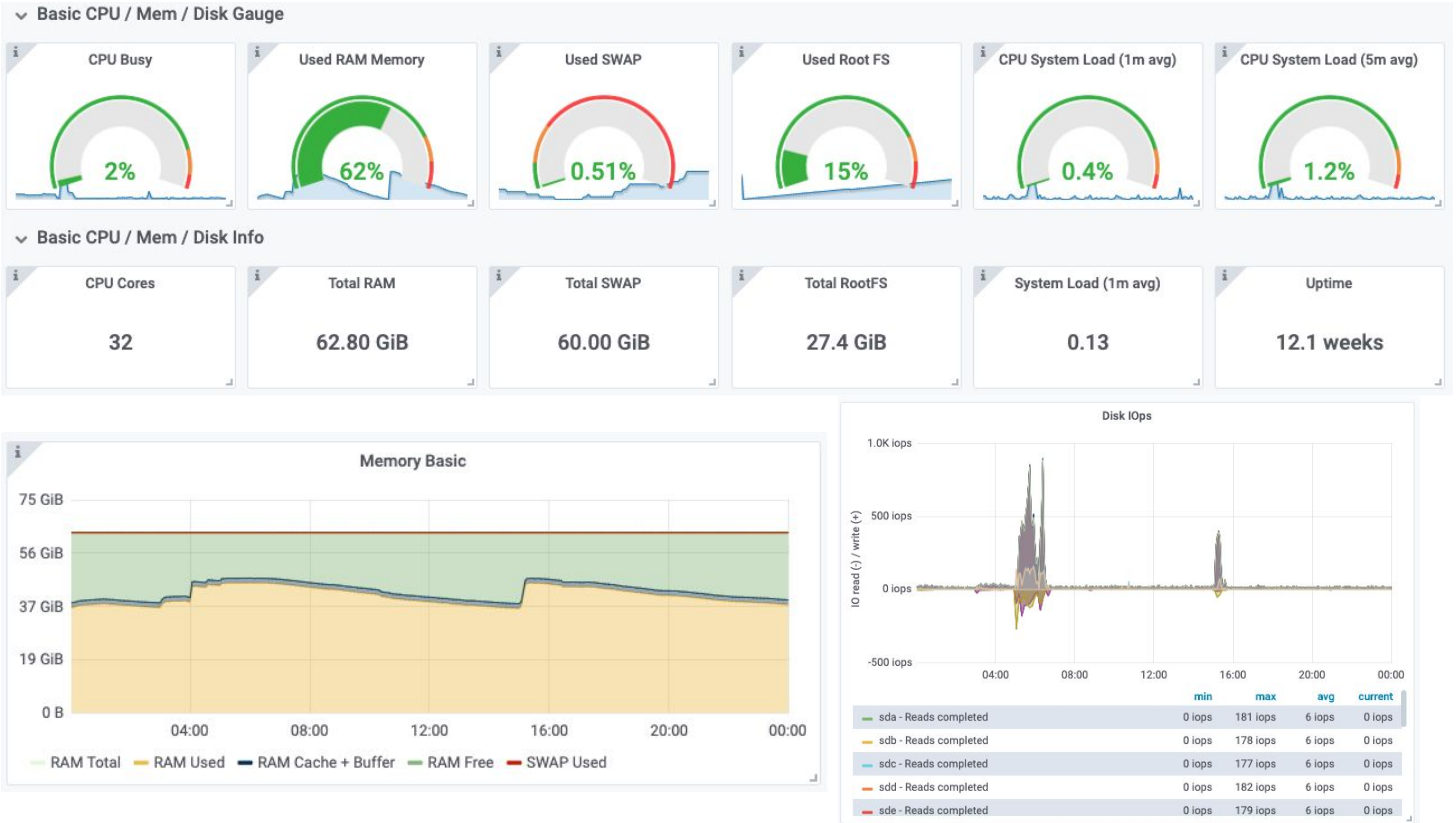
ZFS 參數
atime=off
checksum=fletcher4
setuid=off
exec=off
devices=off
sync=disabled for mysql datadir and binglog dir

ZIL: 30G (mirror)
cache: 90G stripe
ARC: 20G

Percona 參數
innodb_buffer_pool_size = 20G
innodb_thread_concurrency = 32: 以 CPU 數量而定, cat /proc/cpuinfo | grep proc | wc -l
innodb_read_io_threads = 28
innodb_write_io_threads = 4
: io theads 則依讀與寫的量比例分配



```
ARC Total accesses:                                    4.57G
        Cache Hit Ratio:                 94.63%  4.32G
        Cache Miss Ratio:                5.37%   245.16M
        Actual Hit Ratio:                94.62%  4.32G

        Data Demand Efficiency:          77.21%  967.49M
        Data Prefetch Efficiency:        14.46%  4.98M
```



Basic CPU / Mem / Disk Gauge

CPU Busy 2%

Used RAM Memory 62%

Used SWAP 0.51%

Used Root FS 15%

CPU System Load (1m avg) 0.4%

CPU System Load (5m avg) 1.2%

Basic CPU / Mem / Disk Info

CPU Cores 32

Total RAM 62.80 GiB

Total SWAP 60.00 GiB

Total RootFS 27.4 GiB

System Load (1m avg) 0.13

Uptime 12.1 weeks

Memory Basic

Disk IOps

	min	max	avg	current
sda - Reads completed	0 iops	181 iops	6 iops	0 iops
sdb - Reads completed	0 iops	178 iops	6 iops	0 iops
sdc - Reads completed	0 iops	177 iops	6 iops	0 iops
sdd - Reads completed	0 iops	182 iops	6 iops	0 iops
sde - Reads completed	0 iops	179 iops	6 iops	0 iops

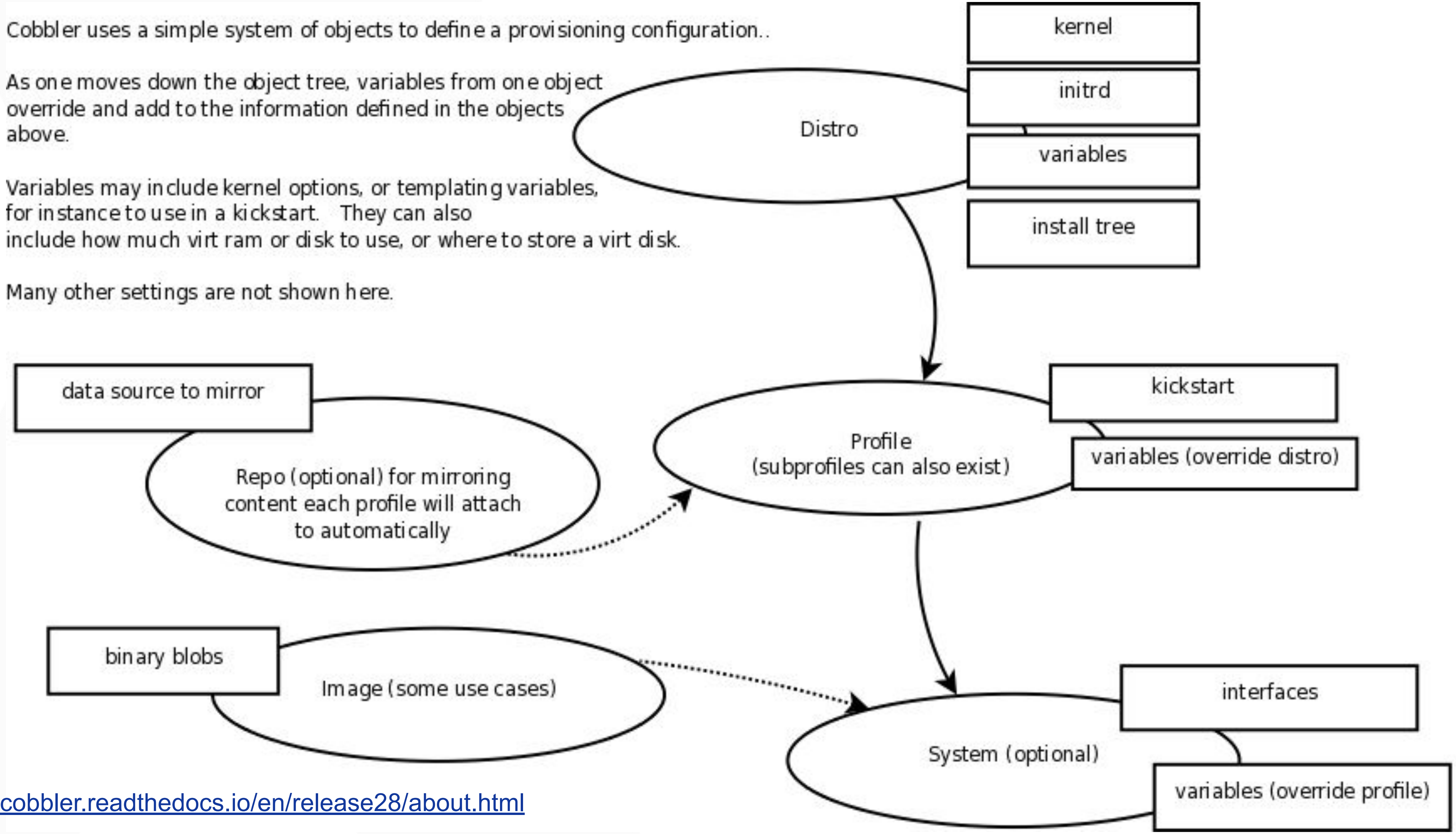
談談自動重灌

一切都因為懶

一直點很麻煩、條件好多點選

能不能一鍵裝到好？

Debian 自動重灌



Cobbler uses a simple system of objects to define a provisioning configuration..

As one moves down the object tree, variables from one object override and add to the information defined in the objects above.

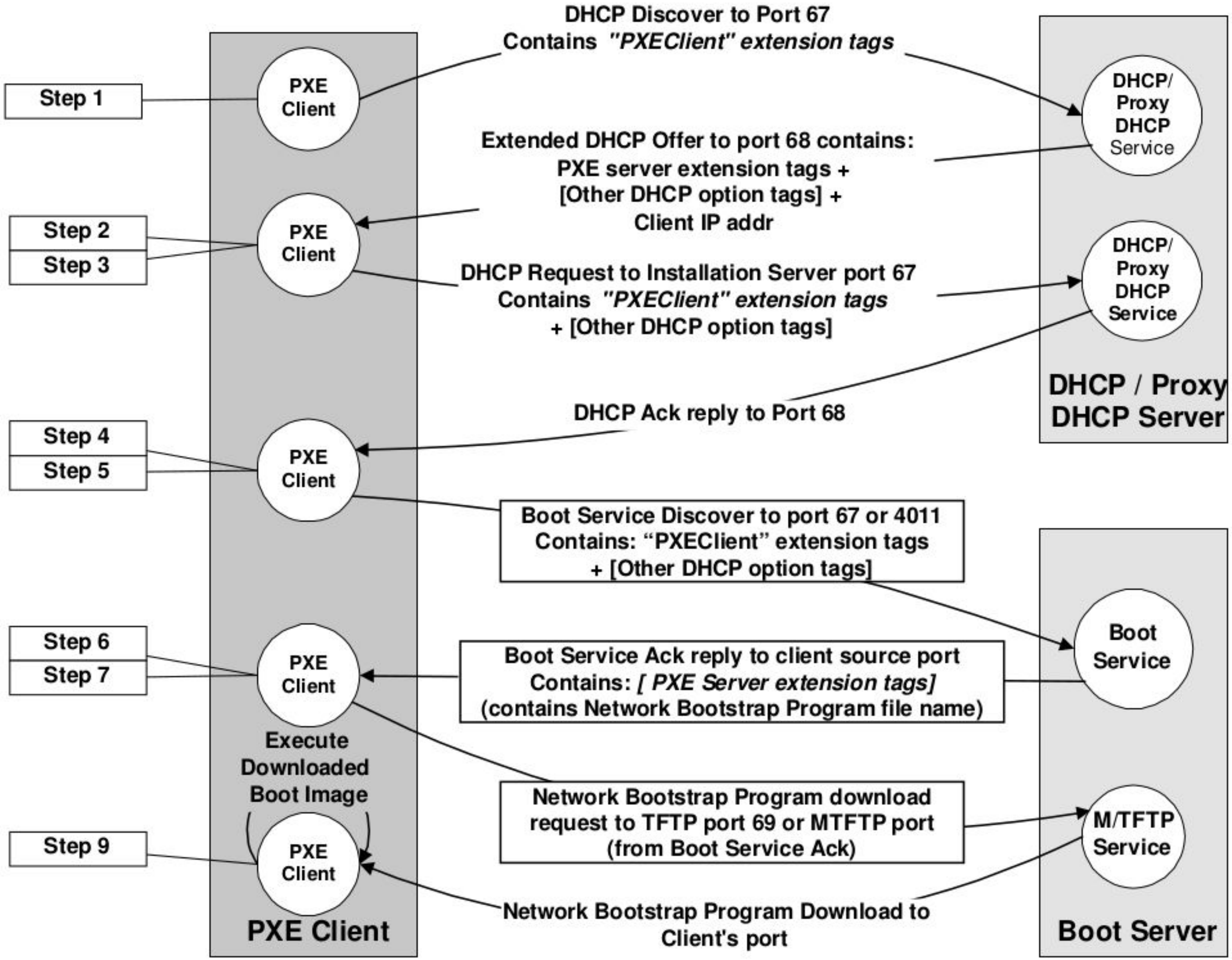
Variables may include kernel options, or templating variables, for instance to use in a kickstart. They can also include how much virt ram or disk to use, or where to store a virt disk.

Many other settings are not shown here.

Distro
kernel
initrd
variables
install tree
data source to mirror
Repo (optional) for mirroring content each profile will attach to automatically
Profile (subprofiles can also exist)
kickstart
variables (override distro)
binary blobs
Image (some use cases)
System (optional)
interfaces
variables (override profile)

https://cobbler.readthedocs.io/en/release28/about.html

Ansible 觸發 PXC Client reboot



DHCP Discover to Port 67
Contains *"PXEClient" extension tags*

Extended DHCP Offer to port 68 contains:
PXE server extension tags +
[Other DHCP option tags] +
Client IP addr

DHCP Request to Installation Server port 67
Contains *"PXEClient" extension tags*
+ [Other DHCP option tags]

DHCP Ack reply to Port 68

Boot Service Discover to port 67 or 4011
Contains: “PXEClient” extension tags
+ [Other DHCP option tags]

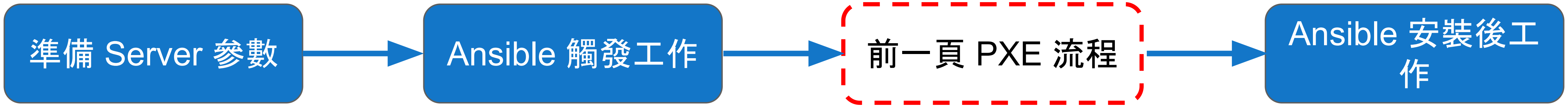
Boot Service Ack reply to client source port
Contains: *[PXE Server extension tags]*
(contains Network Bootstrap Program file name)

Network Bootstrap Program download
request to TFTP port 69 or MTFTP port
(from Boot Service Ack)

Network Bootstrap Program Download to
Client's port

Cobbler 透過 API 取得各 Server 之參數

Cobbler
+
kickstart



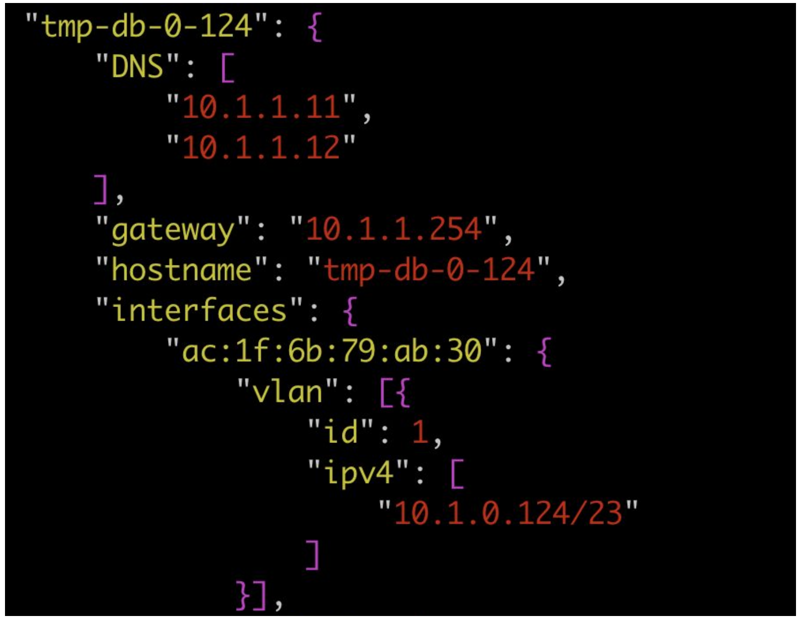
- Hostname
- IP, Gateway
- HDD 分割
- 設定 switch vlan

- reboot
- 修改 vlan
- cobbler 取得 server 參數

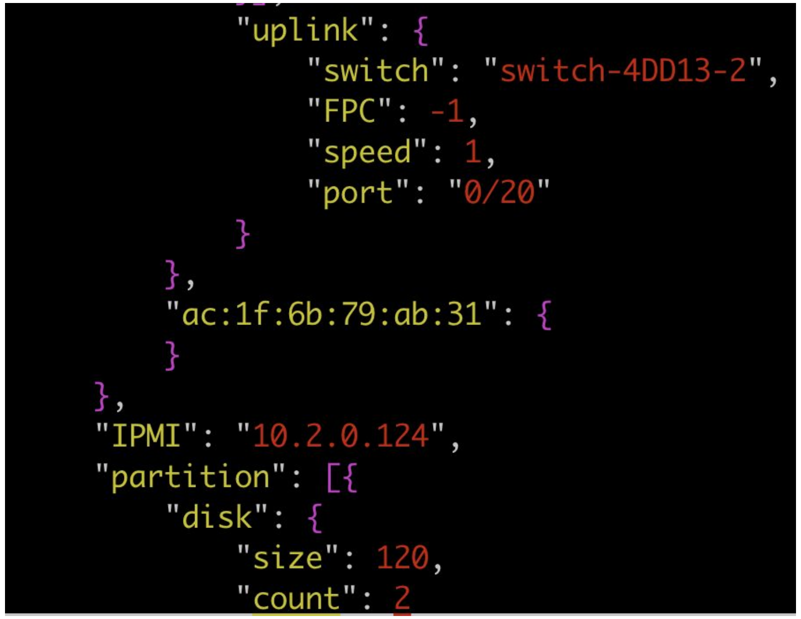
- 硬碟分割
- 安裝套件

(一般安裝 Debian 會做的事)

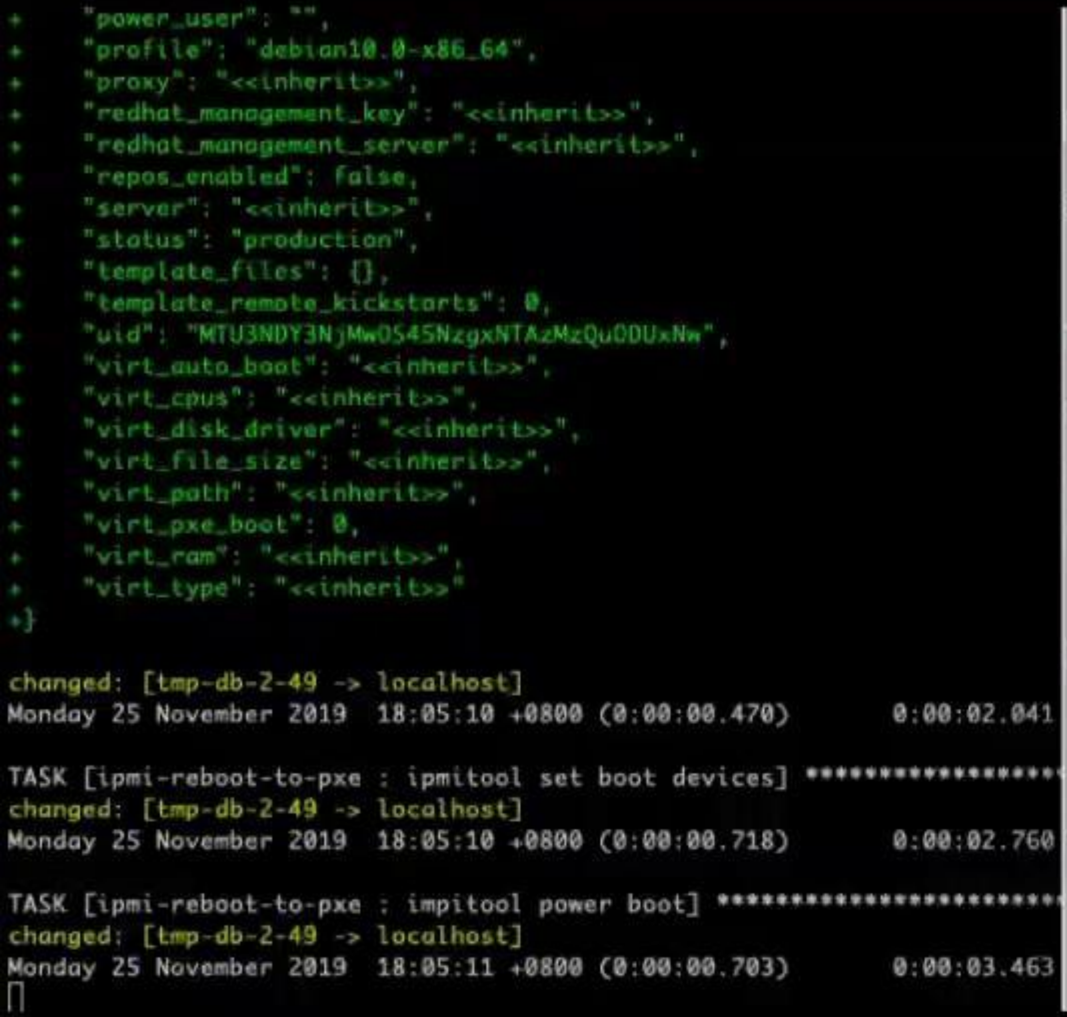
- 自定套件
- 權限設定
- NIS
- NFS
- 設定環境



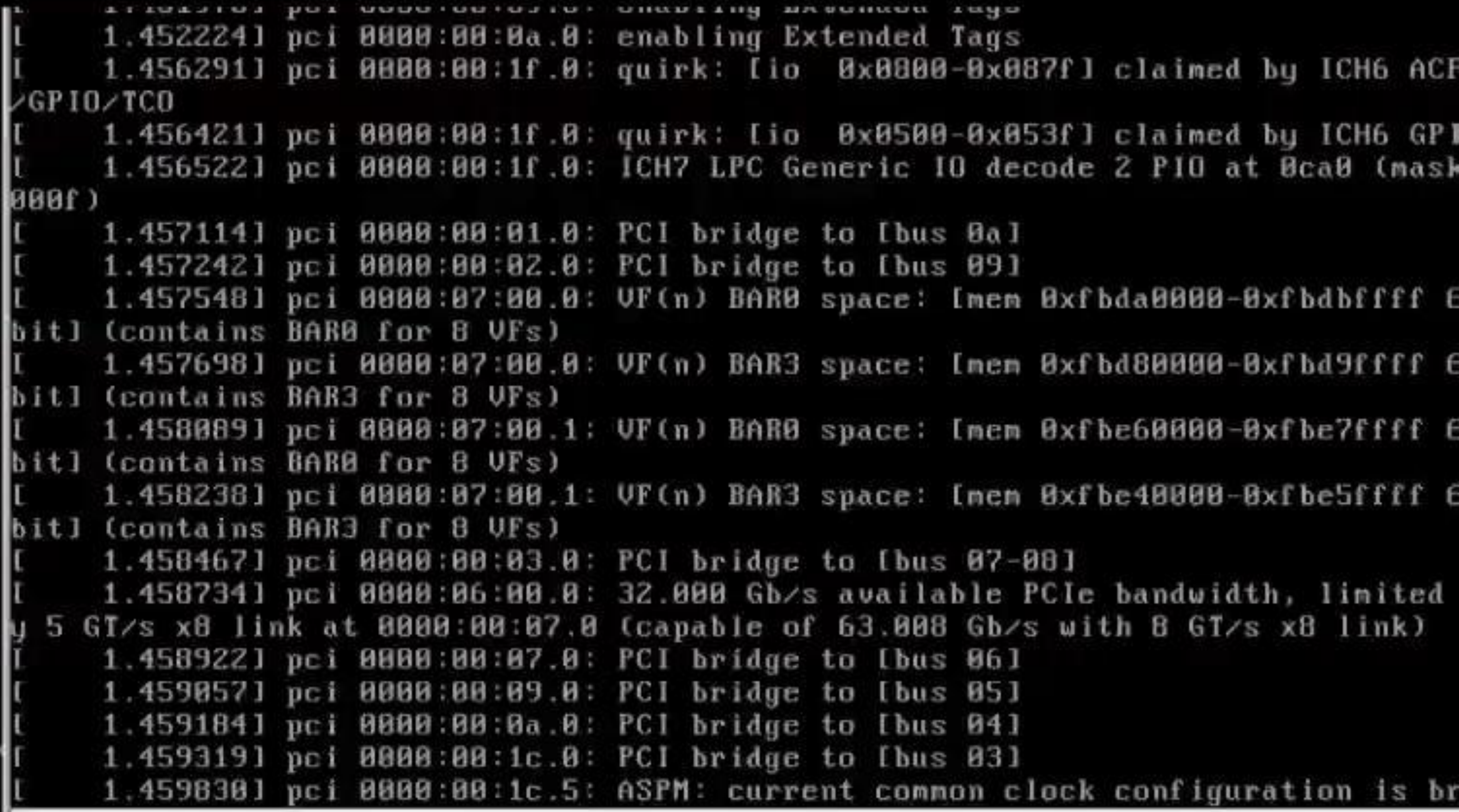
```
"tmp-db-0-124": {
    "DNS": [
        "10.1.1.11",
        "10.1.1.12"
    ],
    "gateway": "10.1.1.254",
    "hostname": "tmp-db-0-124",
    "interfaces": {
        "ac:1f:6b:79:ab:30": {
            "vlan": [{
                "id": 1,
                "ipv4": [
                    "10.1.0.124/23"
                ]
            }],
```



```
            "uplink": {
                "switch": "switch-4DD13-2",
                "FPC": -1,
                "speed": 1,
                "port": "0/20"
            }
        },
        "ac:1f:6b:79:ab:31": {
        }
    },
    "IPMI": "10.2.0.124",
    "partition": [{
        "disk": {
            "size": 120,
            "count": 2
```



```
+    "power_user": "",
+    "profile": "debian10.0-x86_64",
+    "proxy": "<<inherit>>",
+    "redhat_management_key": "<<inherit>>",
+    "redhat_management_server": "<<inherit>>",
+    "repos_enabled": false,
+    "server": "<<inherit>>",
+    "status": "production",
+    "template_files": {},
+    "template_remote_kickstarts": 0,
+    "uid": "MTU3NDY3NjMwOS45NzgxNTAzMzQuODUxNw",
+    "virt_auto_boot": "<<inherit>>",
+    "virt_cpus": "<<inherit>>",
+    "virt_disk_driver": "<<inherit>>",
+    "virt_file_size": "<<inherit>>",
+    "virt_path": "<<inherit>>",
+    "virt_pxe_boot": 0,
+    "virt_ram": "<<inherit>>",
+    "virt_type": "<<inherit>>"
+}

changed: [tmp-db-2-49 -> localhost]
Monday 25 November 2019  18:05:10 +0800 (0:00:00.470)       0:00:02.041

TASK [ipmi-reboot-to-pxe : ipmitool set boot devices] ******************
changed: [tmp-db-2-49 -> localhost]
Monday 25 November 2019  18:05:10 +0800 (0:00:00.718)       0:00:02.760

TASK [ipmi-reboot-to-pxe : impitool power boot] ************************
changed: [tmp-db-2-49 -> localhost]
Monday 25 November 2019  18:05:11 +0800 (0:00:00.703)       0:00:03.463
```



```
[    1.452224] pci 0000:00:0a.0: enabling Extended Tags
[    1.456291] pci 0000:00:1f.0: quirk: [io  0x0800-0x087f] claimed by ICH6 ACF
/GPIO/TCO
[    1.456421] pci 0000:00:1f.0: quirk: [io  0x0500-0x053f] claimed by ICH6 GPI
[    1.456522] pci 0000:00:1f.0: ICH7 LPC Generic IO decode 2 PIO at 0ca0 (mask
000f)
[    1.457114] pci 0000:00:01.0: PCI bridge to [bus 0a]
[    1.457242] pci 0000:00:02.0: PCI bridge to [bus 09]
[    1.457548] pci 0000:07:00.0: VF(n) BAR0 space: [mem 0xfbda0000-0xfbdbffff 6
bit] (contains BAR0 for 8 VFs)
[    1.457698] pci 0000:07:00.0: VF(n) BAR3 space: [mem 0xfbd80000-0xfbd9ffff 6
bit] (contains BAR3 for 8 VFs)
[    1.458089] pci 0000:07:00.1: VF(n) BAR0 space: [mem 0xfbe60000-0xfbe7ffff 6
bit] (contains BAR0 for 8 VFs)
[    1.458238] pci 0000:07:00.1: VF(n) BAR3 space: [mem 0xfbe40000-0xfbe5ffff 6
bit] (contains BAR3 for 8 VFs)
[    1.458467] pci 0000:00:03.0: PCI bridge to [bus 07-08]
[    1.458734] pci 0000:06:00.0: 32.000 Gb/s available PCIe bandwidth, limited
y 5 GT/s x8 link at 0000:00:07.0 (capable of 63.008 Gb/s with 8 GT/s x8 link)
[    1.458922] pci 0000:00:07.0: PCI bridge to [bus 06]
[    1.459057] pci 0000:00:09.0: PCI bridge to [bus 05]
[    1.459184] pci 0000:00:0a.0: PCI bridge to [bus 04]
[    1.459319] pci 0000:00:1c.0: PCI bridge to [bus 03]
[    1.459830] pci 0000:00:1c.5: ASPM: current common clock configuration is br
```

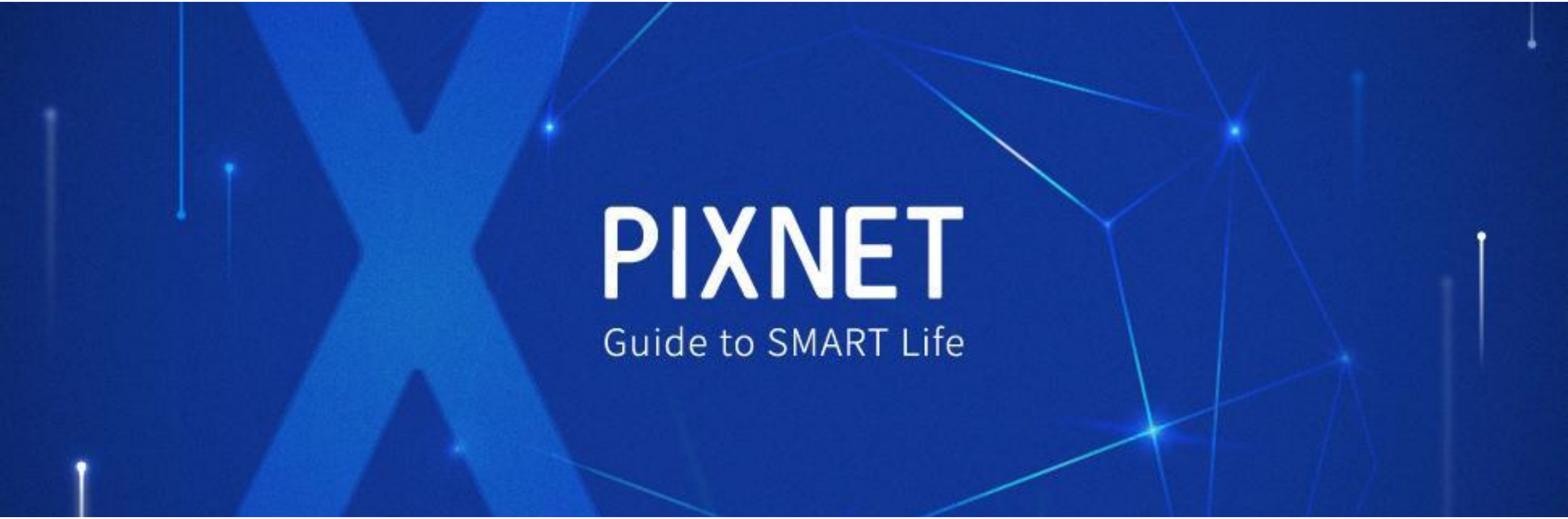
由 PXE 取得 kernel 開機

Q&A

THANK YOU

台灣最大社群網站

PIXNET 創立於2003年，2006年成立「優像數位媒體科技股份有限公司」，並於2007年加入城邦媒體控股集團。我們是一間以社群為核心的科技公司，旗下主要服務包含：痞客邦、PIXgoods、PIXmarketing、PIXinsight，透過創新的數據應用、多樣化社群服務，實現「Guide to SMART Life」企業核心價值。2018年，PIXNET 推出「全新痞客邦」加速興趣同好彼此凝聚及交流，並持續與產業各界結盟，踏實建構「社群共榮圈」願景。



痞客邦　PIXmarketing　PIXgoods　PIXinsight www.pixinsight.com.tw

連絡方式

Email: cytseng@pixnet.tw
cytseng@gmail.com

個人 Facebook

後續討論、找工作、找實習都歡迎來信詢問