FreeBSD

Korea FreeBSD Users Group – http://www.kr.FreeBSD.org/

Chapter 17 : Vinum

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: 2004   8   7

: 2005   3   8

: 1.0

FreeBSD Documentation Project   FreeBSD Handbook   2004   8

7   . FreeBSD Handbook   ,

, CVS Repository

.

,   .

.   KFUG(Korea FreeBSD Users Group)

,   KFUG

.

"FreeBSD Handbook"   "FreeBSD Documentation Project"   ,   "   FreeBSD

"   "   (Young-oak Lee)"   .

KFUG   ,   .

.

17   Vinum

17.1

:

-

- .

- .

Vinum   .

17.2   .

Vinum   .
.

.

.   10
.

.

17.3

.

FTP   HTTP
100Mbit/s   .

70 MB/S

10kB : 3.5 ms

15,000rpm

(Rotational Latency:) 2 ms . 70MB/s

150μs

1MB/s

" ":

concatenation

17-1

17-1

KFUG

Disk 1

| 0 |
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |

Disk 2

| 6 |
| 7 |
| 8 |
| 9 |

Disk 3

| 10 |
| 11 |

Disk 4

| 12 |
| 13 |
| 14 |
| 15 |
| 16 |
| 17 |

[17-1.bmp]

.   256   256
.
.   (*Striping*)   RAID-0   .
.
I/O
.   17-2   .

17-2.

Disk 1	Disk 2	Disk 3	Disk 4
0	1	2	3
4	5	6	7
8	9	10	11
12	13	14	15
16	17	18	19
20	21	22	23

[17-2.bmp]

17.4

              :

(mirroring)   . RAID   RAID   1

RAID-1   .

               :

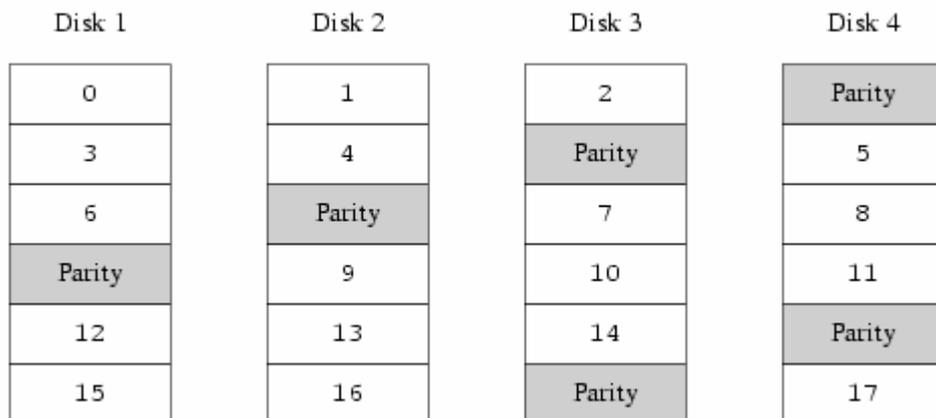-   .

-         ;   .
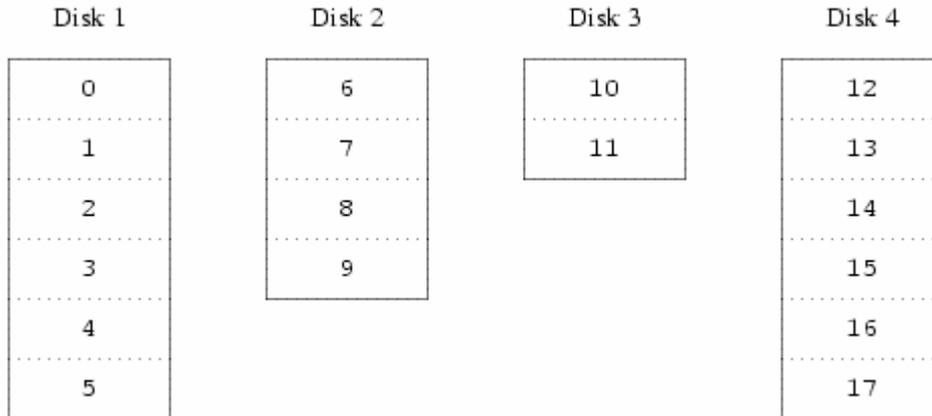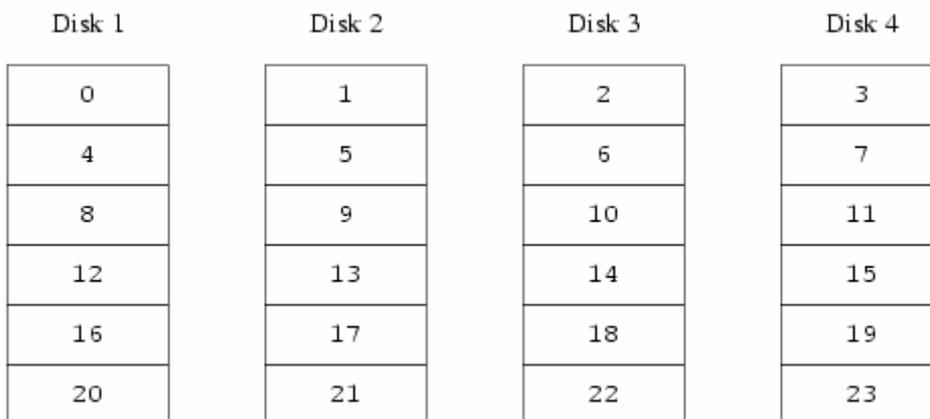
        RAID   2, 3, 4   5   (parity) .   RAID-5

   . Vinum

                .   RAID-5

        Vinum   RAID-5   (plex)   (plex)

. RAID-5

       .   .

17-3. RAID-5

[17-3.bmp]

RAID-5 .

25% .
:

RAID-4 RAID-5 (spare disk)
:

.

17.5 Vinum

Vinum 4 :

- (volume) .

.
.

- (plexes) .

.

.

- Vinum

: . Vinum

( )

.

● Vinum *( )* . Vinum

.

.

Vinum .

17.5.1

Vinum

. .

17.5.2

Vinum

. 1 8 .

(

) ( )

.

.

17.5.3

Vinum concatenation striping .

● *(concatenated plex)* .

- (*striped plex*)   .

.

17.5.4   ?

FreeBSD 5.2.1   Vinum   :

- ●   :

.

. CPU

CPU   .

.

- ●   (RAID-0)   :
  (256KB)

.   :

Vinum   .   Vinum

:

.

17-1   .

17-1. Vinum

			?	?	
Concatenated	1	Yes	No		
Striped	2	No	Yes		

17.6

Vinum   .

vinum(8)

. Vinum

(Vinum   )   .

Vinum   .
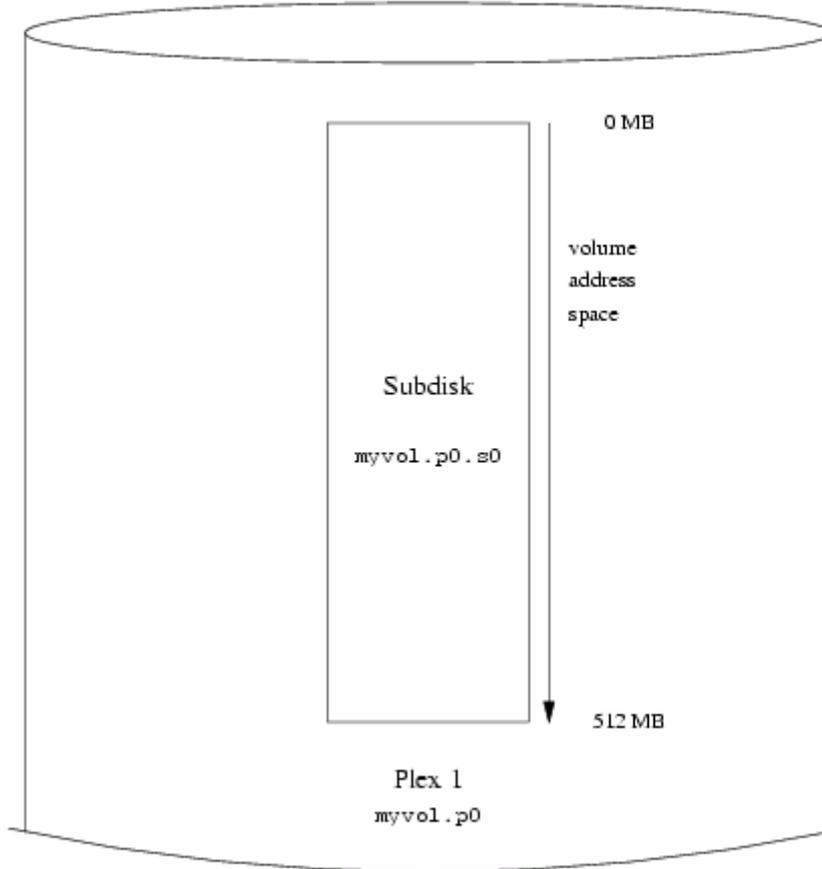
17.6.1

Vinum   .

:

```
drive a device /dev/da3h
    volume myvol
      plex org concat
        sd length 512m drive a
```

4   Vinum   :

- *drive*   (*drive*)   .
                    a   .
                                                    .

- *volume*   .   *myvol*   .

- *plex*   .
    concat   .   :   *.px*
                              x   .   *myvol.p0*
                    .

- *sd*   .

.   :

.sx   *.x*

.   Vinum   *myvol.p0.s0*   .

vinum(8)   :

```
# vinum - > create config1
      Configuration summary
      Drives:         1 (4 configured)
      Volumes:        1 (4 configured)
      Plexes:         1 (8 configured)
      Subdisks:       1 (16 configured)


   D a                      State: up         Device /dev/da3h         Avail:
2061/2573 MB (80%)


   V myvol                  State: up         Plexes:       1 Size:        512 MB


   P myvol.p0               C State: up       Subdisks:     1 Size:        512 MB


   S myvol.p0.s0            State: up         P0:       0   B Size:        512 MB
```

---

vinum(8)   17- 4

.

17- 4.   Vinum

[17-4.bmp]

17.6.2 :

```
drive b device /dev/da4h
    volume mirror
        plex org concat
            sd length 512m drive a
        plex org concat
            sd length 512m drive b
```

Vinum   *a*

.   :

```
Drives:           2 (4 configured)
    Volumes:       2 (4 configured)
    Plexes:        3 (8 configured)
    Subdisks:      3 (16 configured)


    D a                    State: up        Device /dev/da3h       Avail: 1549/2573 MB (60%)
    D b                    State: up        Device /dev/da4h       Avail: 2061/2573 MB (80%)


    V myvol                State: up        Plexes:       1 Size:         512 MB
    V mirror               State: up        Plexes:       2 Size:        512 MB


    P myvol.p0             C State: up        Subdisks:     1 Size:        512 MB
    P mirror.p0            C State: up        Subdisks:     1 Size:        512 MB
    P mirror.p1            C State: initializing    Subdisks:      1 Size:         512 MB


    S myvol.p0.s0          State: up        PO:        O  B Size:         512 MB
    S mirror.p0.s0         State: up        PO:        O  B Size:        512 MB
    S mirror.p1.s0         State: empty     PO:        O  B Size:        512 MB
```

17-5   .

17-5   Vinum
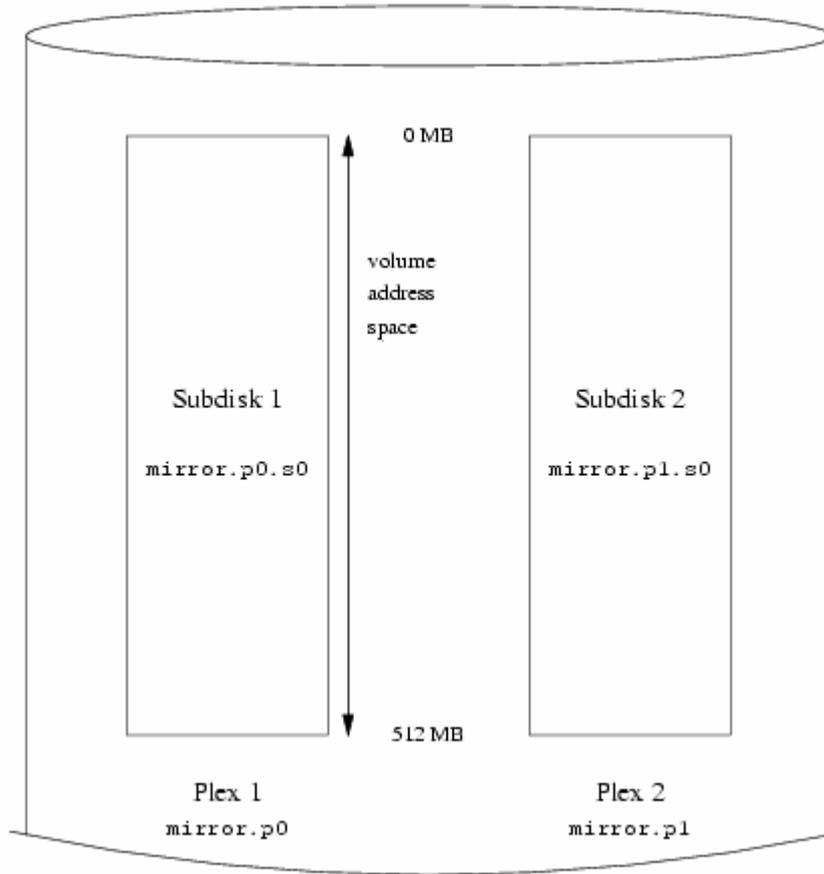
[17-5.bmp]

512MB   .
.

17.6.3

:   .
:
.   4
:

```
drive c device /dev/da5h

    drive d device /dev/da6h

    volume stripe

    plex org striped 512k

        sd length 128m drive a

        sd length 128m drive b

        sd length 128m drive c

        sd length 128m drive d
```
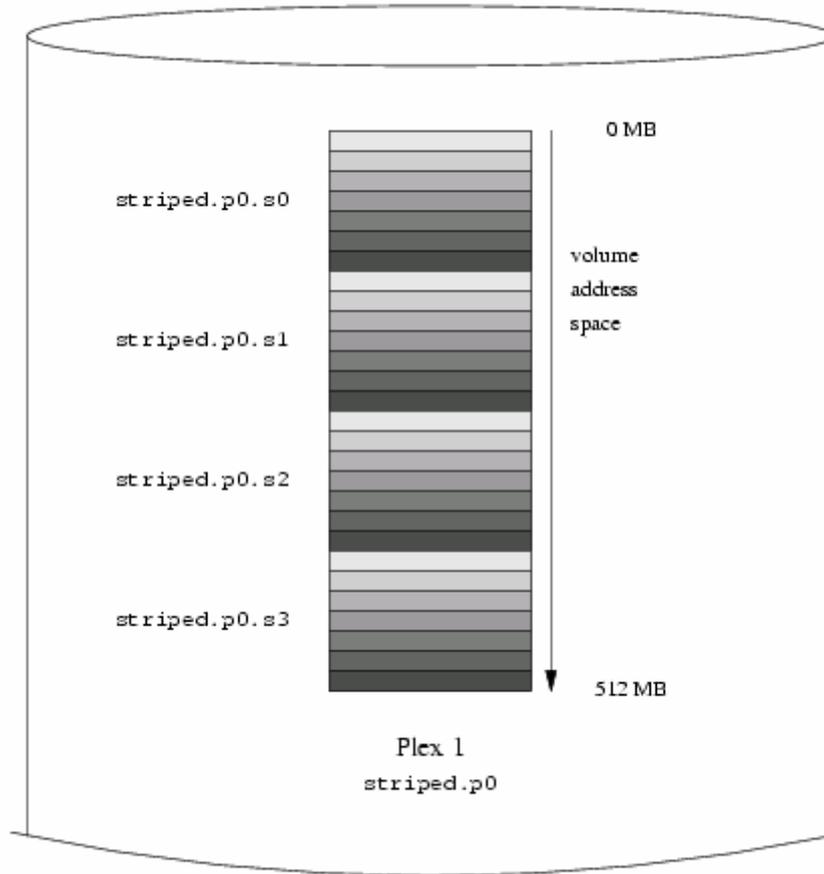
Vinum   .

                                        :

```
Drives:          4 (4 configured)

    Volumes:        3 (4 configured)

    Plexes:        4 (8 configured)

    Subdisks:        7 (16 configured)


    D a                State: up        Device /dev/da3h        Avail: 1421/2573 MB (55%)

    D b                State: up        Device /dev/da4h        Avail: 1933/2573 MB (75%)

    D c                State: up        Device /dev/da5h        Avail: 2445/2573 MB (95%)

    D d                State: up        Device /dev/da6h        Avail: 2445/2573 MB (95%)


    V myvol            State: up        Plexes:        1 Size:        512 MB

    V mirror            State: up        Plexes:        2 Size:        512 MB

    V striped            State: up        Plexes:        1 Size:        512 MB


    P myvol.p0            C State: up        Subdisks:        1 Size:        512 MB

    P mirror.p0            C State: up        Subdisks:        1 Size:        512 MB

    P mirror.p1            C State: initializing        Subdisks:        1 Size:        512 MB

    P striped.p1            State: up        Subdisks:        1 Size:        512 MB


    S myvol.p0.s0            State: up        PO:        0  B Size:        512 MB

    S mirror.p0.s0            State: up        PO:        0  B Size:        512 MB

    S mirror.p1.s0            State: empty        PO:        0  B Size:        512 MB

    S striped.p0.s0            State: up        PO:        0  B Size:        128 MB

    S striped.p0.s1            State: up        PO:        512 kB Size:        128 MB
```

```
S striped.p0.s2        State: up      PO:     1024 kB Size:        128 MB
S striped.p0.s3        State: up      PO:     1536 kB Size:        128 MB
```

17-6   .

17-6.   Vinum

striped.p0.s0

striped.p0.s1

striped.p0.s2

striped.p0.s3

0 MB

volume
address
space

512 MB

Plex 1
striped.p0

[17-6.bmp]

:

.

17.6.4

.   :

```
volume raid10
      plex org striped 512k
         sd length 102480k drive a
         sd length 102480k drive b
         sd length 102480k drive c
         sd length 102480k drive d
         sd length 102480k drive e
      plex org striped 512k
         sd length 102480k drive c
         sd length 102480k drive d
         sd length 102480k drive e
         sd length 102480k drive a
         sd length 102480k drive b
```
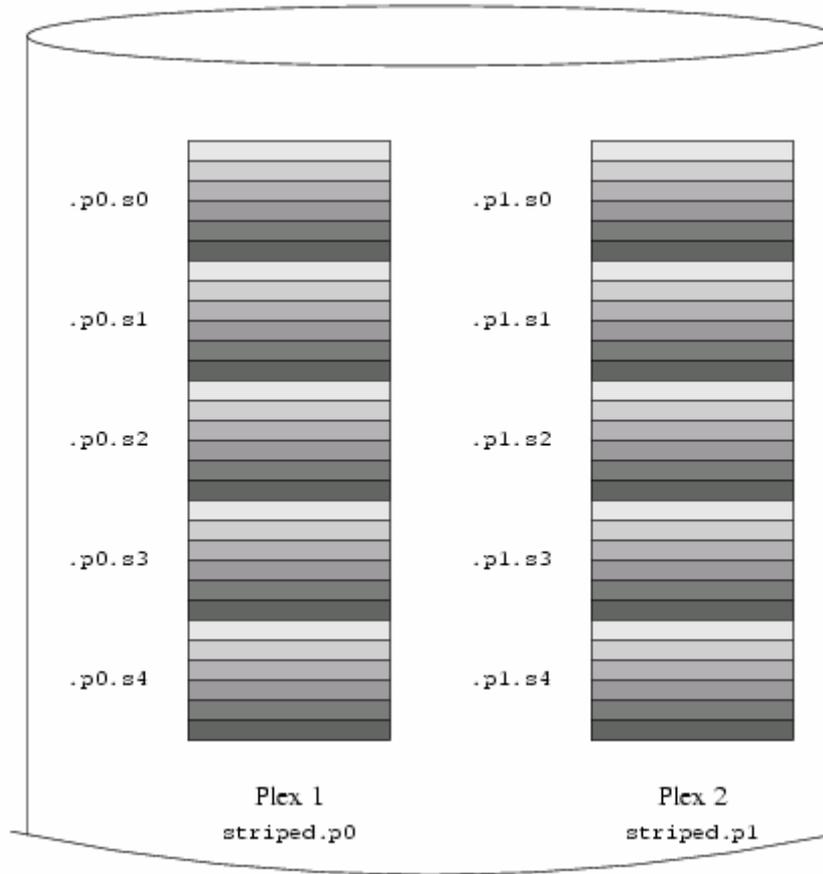
(offset)   :
                .

         17- 7   .

         17- 7.   Vinum

.p0.s0 .p1.s0

.p0.s1 .p1.s1

.p0.s2 .p1.s2

.p0.s3 .p1.s3

.p0.s4 .p1.s4

Plex 1 Plex 2
striped.p0 striped.p1

[17-7.bmp]

17.7

Vinum

:

VERITAS

.

.

(_) .

64 32 .

Vinum /dev/vinum .
Vinum :

● vinum(8) Vinum /dev/vinum/control /dev/vinum/controld .

● Vinum .

BSD

r . /dev/vinum/myvol, /dev/vinum/mirror, /dev/vinum/striped, /dev/vinum/raid5 /dev/vinum/raid10 . /dev/vinum/rmyvol, /dev/vinum/rmrror, /dev/vinum/rstriped, /dev/vinum/rraid5 /dev/vinum/rraid10 . : *r* *rr*

/dev/vinum/rr :

r *rr* ? Vinum

:   .

● /dev/vinum/volume .

.

● /dev/vinum/volume .

.

● /dev/vinum/plex, /dev/vinum/sd /dev/vinum/rsd

.

:

```
drive drive1 device /dev/sd1h
    drive drive2 device /dev/sd2h
    drive drive3 device /dev/sd3h
    drive drive4 device /dev/sd4h
    volume s64 setupstate
       plex org striped 64k
          sd length 100m drive drive1
          sd length 100m drive drive2
```

```
        sd length 100m drive drive3
        sd length 100m drive drive4
```

vinum(8)   /dev/vinum   :

```
brwx------   1 root   wheel    25, 0x40000001 Apr 13 16:46 Control
    brwx------   1 root   wheel    25, 0x40000002 Apr 13 16:46 control
    brwx------   1 root   wheel    25, 0x40000000 Apr 13 16:46 controld
    drwxr-xr-x   2 root   wheel        512 Apr 13 16:46 drive
    drwxr-xr-x   2 root   wheel        512 Apr 13 16:46 plex
    crwxr-xr--   1 root   wheel    91,    2 Apr 13 16:46 rs64
    drwxr-xr-x   2 root   wheel        512 Apr 13 16:46 rsd
    drwxr-xr-x   2 root   wheel        512 Apr 13 16:46 rvol
    brwxr-xr--   1 root   wheel    25,    2 Apr 13 16:46 s64
    drwxr-xr-x   2 root   wheel        512 Apr 13 16:46 sd
    drwxr-xr-x   3 root   wheel        512 Apr 13 16:46 vol


    /dev/vinum/drive:
    total 0
    lrwxr-xr-x   1 root   wheel   9 Apr 13 16:46 drive1 -> /dev/sd1h
    lrwxr-xr-x   1 root   wheel   9 Apr 13 16:46 drive2 -> /dev/sd2h
    lrwxr-xr-x   1 root   wheel   9 Apr 13 16:46 drive3 -> /dev/sd3h
    lrwxr-xr-x   1 root   wheel   9 Apr 13 16:46 drive4 -> /dev/sd4h


    /dev/vinum/plex:
    total 0
    brwxr-xr--   1 root   wheel    25, 0x10000002 Apr 13 16:46 s64.p0


    /dev/vinum/rsd:
    total 0
```

```
crwxr-xr--  1 root   wheel    91, 0x20000002 Apr 13 16:46 s64.p0.s0
crwxr-xr--  1 root   wheel    91, 0x20100002 Apr 13 16:46 s64.p0.s1
crwxr-xr--  1 root   wheel    91, 0x20200002 Apr 13 16:46 s64.p0.s2
crwxr-xr--  1 root   wheel    91, 0x20300002 Apr 13 16:46 s64.p0.s3


/dev/vinum/rvol:
total 0
crwxr-xr--  1 root   wheel    91,    2 Apr 13 16:46 s64


/dev/vinum/sd:
total 0
brwxr-xr--  1 root   wheel    25, 0x20000002 Apr 13 16:46 s64.p0.s0
brwxr-xr--  1 root   wheel    25, 0x20100002 Apr 13 16:46 s64.p0.s1
brwxr-xr--  1 root   wheel    25, 0x20200002 Apr 13 16:46 s64.p0.s2
brwxr-xr--  1 root   wheel    25, 0x20300002 Apr 13 16:46 s64.p0.s3


/dev/vinum/vol:
total 1
brwxr-xr--  1 root   wheel    25,    2 Apr 13 16:46 s64
drwxr-xr-x  3 root   wheel       512 Apr 13 16:46 s64.plex


/dev/vinum/vol/s64.plex:
total 1
brwxr-xr--  1 root   wheel    25, 0x10000002 Apr 13 16:46 s64.p0
drwxr-xr-x  2 root   wheel       512 Apr 13 16:46 s64.p0.sd


/dev/vinum/vol/s64.plex/s64.p0.sd:
total 0
brwxr-xr--  1 root   wheel    25, 0x20000002 Apr 13 16:46 s64.p0.s0
brwxr-xr--  1 root   wheel    25, 0x20100002 Apr 13 16:46 s64.p0.s1
brwxr-xr--  1 root   wheel    25, 0x20200002 Apr 13 16:46 s64.p0.s2
brwxr-xr--  1 root   wheel    25, 0x20300002 Apr 13 16:46 s64.p0.s3
```

Vinum

.   .

32   .

17.7.1

Vinum

Vinum

newfs(8)   .   /dev/ad0a   /dev/da2h

.   (0) IDE   (ad)   (a)   (2)

SCSI   (da)   (h)   .   Vinum

/dev/vinum/concat   .

newfs(8)   .

:

```
# newfs /dev/vinum/concat
newfs: /dev/vinum/concat: can't figure out file system partition
```

> **Note:**   FreeBSD 5.0   :

newfs(8)   - v   :

```
# newfs - v /dev/vinum/concat
```

17.8 Vinum

GENERIC   Vinum   . Vinum

. Vinum   (kld).

Vinum   kldload(8)   : vinum(8)

.

17.8.1 Startup

Vinum   .

Vinum   .

:

```
volume myvol state up

volume bigraid state down

plex name myvol.p0 state up org concat vol myvol

plex name myvol.p1 state up org concat vol myvol

plex name myvol.p2 state init org striped 512b vol myvol

plex name bigraid.p0 state initializing org raid5 512b vol bigraid

sd name myvol.p0.s0 drive a plex myvol.p0 state up len 1048576b driveoffset 265b
plexoffset 0b

sd name myvol.p0.s1 drive b plex myvol.p0 state up len 1048576b driveoffset 265b
plexoffset 1048576b

sd name myvol.p1.s0 drive c plex myvol.p1 state up len 1048576b driveoffset 265b
plexoffset 0b

sd name myvol.p1.s1 drive d plex myvol.p1 state up len 1048576b driveoffset 265b
plexoffset 1048576b

sd name myvol.p2.s0 drive a plex myvol.p2 state init len 524288b driveoffset
1048841b plexoffset 0b

sd name myvol.p2.s1 drive b plex myvol.p2 state init len 524288b driveoffset
1048841b plexoffset 524288b

sd name myvol.p2.s2 drive c plex myvol.p2 state init len 524288b driveoffset
1048841b plexoffset 1048576b

sd name myvol.p2.s3 drive d plex myvol.p2 state init len 524288b driveoffset
1048841b plexoffset 1572864b

sd name bigraid.p0.s0 drive a plex bigraid.p0 state initializing len 4194304b driveoff
set 1573129b plexoffset 0b

sd name bigraid.p0.s1 drive b plex bigraid.p0 state initializing len 4194304b driveoff
set 1573129b plexoffset 4194304b

sd name bigraid.p0.s2 drive c plex bigraid.p0 state initializing len 4194304b driveoff
set 1573129b plexoffset 8388608b

sd name bigraid.p0.s3 drive d plex bigraid.p0 state initializing len 4194304b driveoff
set 1573129b plexoffset 12582912b

sd name bigraid.p0.s4 drive e plex bigraid.p0 state initializing len 4194304b driveoff
set 1573129b plexoffset 16777216b
```

,   (

)   . Vinum

: Vinum   .

ID   Vinum

.

17.8.1.1

Vinum   /etc/rc.conf

:

```
start_vinum="YES"        # set to YES to start vinum
```

/etc/rc.conf   .   Vinum kld

.

fsck(8)   Vinum   .

vinum start   Vinum   Vinum   Vinum

.

.   .

Vinum

.

.

17.9 Root   Vinum

Vinum   root   .

:

● root   Vinum

● Vinum   root

(: PC   BIOS)

.

"root   "   root   Vinum

.   "root"

.   .

17.9.1 root   Vinum

:

● Vinum   .   17.8.1.1

Vinum

start_vinum   .

Vinum   .

.   /boot/loader   (12.3.3   ) vinum

.   /boot/loader.conf

.

```
vinum_load="YES"
```

● root   Vinum

.   Vinum   (   ) **vinum**

start   Vinum

.

Note: FreeBSD 5.x   .

FreeBSD 4.x   17.9.5   .

Vinum   Vinum

/boot/loader.conf   .

```
vinum.autostart="YES"
```

root   . /boot/loader   /etc/fstab
root   . root
                                                      ID   (major/minor   )
        .

17.9.2 Vinum   root

        FreeBSD   7.5KB   UFS
                Vinum   .   Vinum
                                                                                          .   root
                "a"
                        .

                                                        root   :

● root   RAID-5   .

● root   .

    root
        .   root
                                                        .
                                                "a"   (illusion)
. root   (faked) "a"
                                        .

                Vinum   .

                root   "a"
        :

root

.

```
# vinum l - rv root
```

Vinum   (bytes)   . disklable
512   .

root   .

```
# disklabel - e devname
```

devname   (da0   )
(ad0s1   ).

(Vinum root   ) "*a*"
(   )
.   (root
)   "Fixit"   (
)   .

Vinum   root
.   "*a*"   "*offset*"   .
"*size*"   . "*fstype*"   4.2BSD   .
"*fsize*", "*bsize*"   "*cpg*"

.

"*a*"   Vinum   . Vinum
"*vinum*"   disklabel
.

"*a*"   root   .

.

```
# fsck -n /dev/devnamea
```

Vinum root   ,   root
Vinum   root
.   /etc/fstab   /boot/loader.conf   .

Vinum   root

.

:

```
Mounting root from ufs:/dev/vinum/root
```

17.9.3 Vinum   root

Vinum root   **vinum l -rv root**   :

```
…
Subdisk root.p0.s0:
        Size:          125829120 bytes (120 MB)
        State: up
        Plex root.p0 at offset 0 (0  B)
        Drive disk0 (/dev/da0h) at offset 135680 (132 kB)

Subdisk root.p1.s0:
        Size:          125829120 bytes (120 MB)
        State: up
        Plex root.p1 at offset 0 (0  B)
        Drive disk1 (/dev/da1h) at offset 135680 (132 kB)
```

offset(/dev/da0h   )   *135680*   . disklabel   265
        512   .   root   245760
512-   .   /dev/da1h

.

:

```
…
8 partitions:
#          size     offset     fstype    [fsize bsize bps/cpg]
  a:     245760       281     4.2BSD      2048 16384    0   # (Cyl.    0*- 15*)
  c:   71771688         0     unused          0     0       # (Cyl.    0 - 4467*)
  h:   71771672        16     vinum                         # (Cyl.    0*- 4467*)
```

"*a*"   "*size*"   "*offset*"
       Vinum   "*h*"   (   )
              .   17.9.4.3   .
"*a*"   Vinum   "*h*"
       .

                   Vinum   Vinum
                   Vinum root   .

17.9.4

                                   .
                         .

17.9.4.1

                              10   space
                      .   (*vinum.autostrt*   ) show
       set   unset   .

                         Vinum   **load vinum**
              .

boot –as   .   -as   root

        (-a)   root

        (-s)   .

.

root   root

                        . /etc/fstab

ufs:/dev/vinum/root   .   Vinum root

                    ufs:da0d   . Vinum root

            "a"   root

                                        .

                                                    Vinum root

        .

17.9.4.2   .

/boot/loader   (

                                    -                              )   **space**

                                        .

        12.3.2   .   "*a*"   root

                                                    .

17.9.4.3   .

                Vinum   .   Vinum

    Vinum   4KB   .

        8KB   .   Vinum   0

                    Vinum   .

                    "Fixit"   12.3.2

disklabel - B   ,   Vinum

            Vinum   .   Vinum

Vinum   Vinum

. Vinum

4kb   Vinum   .

17.9.5 FreeBSD 4.x

FreeBSD 4.x   Vinum
      , root   ID   /dev/vinum/root
                                 .   .

Vinum   /boot/loader.conf
    :

vinum.drives="/dev/da0 /dev/da1"

                      Vinum   .
                              , Vinum   Vinum
                                                                              .

root   ID(major/minor   )
    /dev/ad0s1a   "   "
/dev/vinum/root   root   .   Vinum
      root   ID   .
                      vinum.root   root   .
              /boot/loader.conf   :

vinum.root="root"

                              root
                          .   root
        (*"vinum"*)   root
        ,   ID   .
          root   Vinum root   .

                KFUG   ,   .

boot-a   root   Vinum

. Vinum

root

,   ufs:da0d

.   ufs:vinum/root

.

("askroot"   /dev/   ).