xv6©-rev10

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Name Layer I

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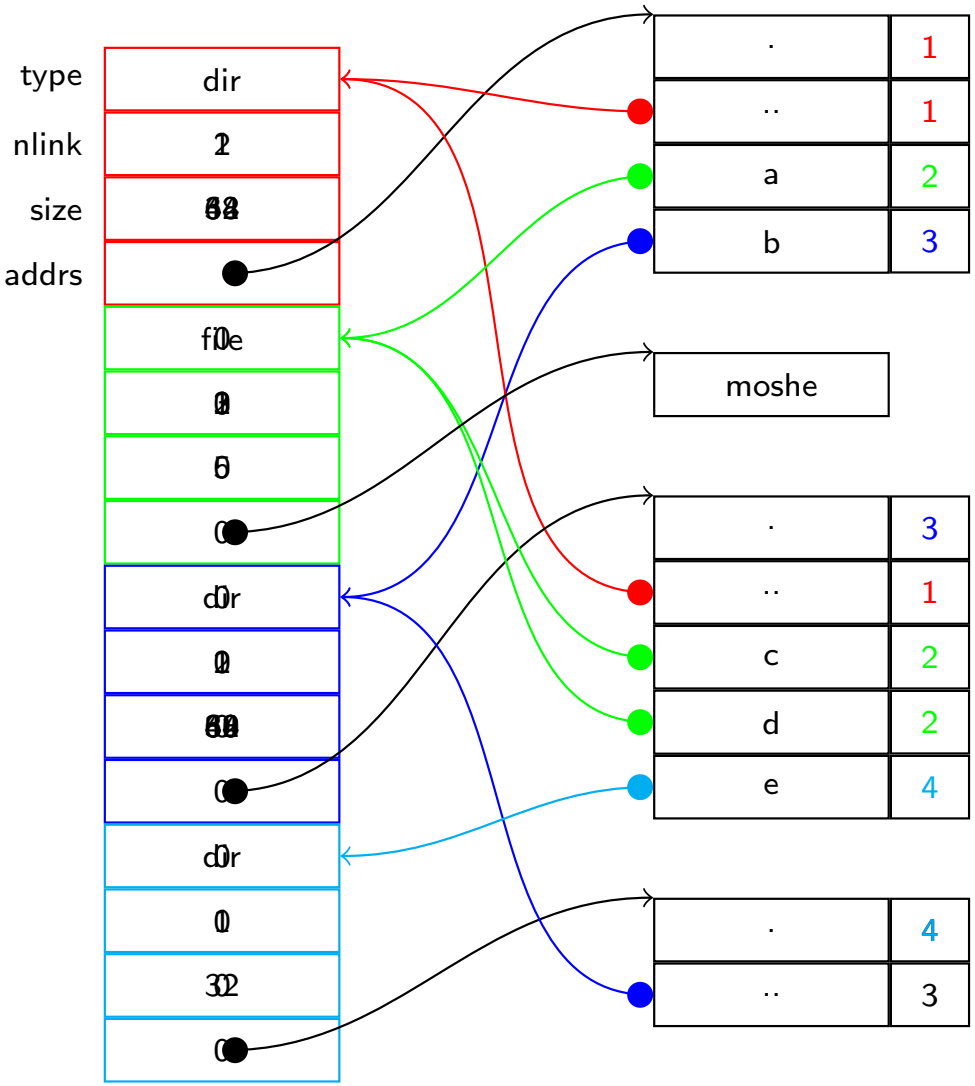
dinodes and directories on disk



System calls using the name layer

- sys_open.
- sys_mkdir.
- sys_link.
- sys_unlink.

open(char *path, int mode)

- omode flags:

```
3950 #define O_RDONLY 0x000
     #define O_WRONLY 0x001
     #define O_RDWR 0x002
     #define O_CREATE 0x200
```

- If `O_CREATE` set then we need to create file.
- If `O_CREATE` is clear we need to open existing file.
- Folders can be opened only for readonly access.

sys_open logic

- If `creating` is attempted then:
  - Delegate to the `create` function in the inode layer.
  - (Thus, either creating a file, or opening an existing file).
  - Note `create` an `ilock`'ed `inode` pointer.
- If `opening` is attempted then:
  - Delegate to the `namei` function in the inode layer.
  - (Thus opening an existing file).
  - If the file is directory make sure readonly access is in effect.
- Build a `FD_INODE` `file` structure pointing to the found/created inode.
- Hide the `file` pointer in the `ofile` vector.

sys_open, invoking lower layer

```
6401  int sys_open(void) {
      char *path;
      int omode;
      struct inode *ip;
      if (argstr(0, &path) < 0 || argint(1, &omode) < 0) retur
       begin_op();
      if (omode & O_CREATE) {
        if ((ip = create(path, T_FILE, 0, 0)) == 0) {
           end_op(); return -1;
        }
       } else {
        if ((ip = namei(path)) == 0) { end_op(); return -1;}
        ilock(ip);
        if (ip->type == T_DIR && omode != O_RDONLY) {
         iunlockput(ip);
         end_op();
         return -1;
        }
      }
```

sys_open, housekeeping

```
6432    if ((f=filealloc()) == 0 || (fd=fdalloc(f)) < 0) {
         if (f)
           fileclose(f);
         iunlockput(ip);
         end_op()
         return -1;
        }
        iunlock(ip);
        end_op();

        f->type = FD_INODE;
        f->ip = ip;
        f->off = 0;
        f->readable = !(omode & O_WRONLY);
        f->writable = (omode & O_WRONLY)||(omode & O_RDWR);
        return fd;
        }
```

sys_mkdir

```
6451  int sys_mkdir(void) {
       char *path;
       struct inode *ip;

       begin_op();
       if (argstr(0, &path) < 0 ||
           (ip = create(path, T_DIR, 0, 0)) == 0) {
        end_op();
        return    1;
       }
       iunlockput(ip);
       end_op();
       return 0;
      }
```

sys_link (1)

```
6202  sys_link(void) {
       char name[DIRSIZ], *new, *old;
       struct inode *dp, *ip;

       if (argstr(0, &old) < 0 || argstr(1, &new) < 0)
        return -1;
       begin_op()
       if ((ip = namei(old)) == 0) {
        end_op();
        return -1;
       }
       ilock(ip);
       if (ip->type == T_DIR) {
        iunlockput(ip);
        end_op();
        return -1;
       }
```

sys_link (2)

```
6223    ip->nlink++;
        iupdate(ip);
        iunlock(ip);

        if((dp = nameiparent(new, name)) == 0)
          goto bad;
        ilock(dp);
        if(dp->dev != ip->dev || dirlink(dp, name, ip->inur
          iunlockput(dp);
          goto bad;
        }
        iunlockput(dp);
        iput(ip);

        end_op();
        return 0;
```

sys_link (3)

```
6241  bad:
        ilock(ip);
        ip->nlink       ;
        iupdate(ip);
        iunlockput(ip);
        end_op();
        return -1;
      }
```

sys_unlink

```
6301  int sys_unlink(void) {
       struct inode *ip, *dp;
       struct dirent de;
       char name[DIRSIZ], *path;
       uint off;

       if(argstr(0, &path) < 0)
        return -1;
       begin_op();
       if((dp = nameiparent(path, name)) == 0) {
        end_op();
        return -1;
       }
       ilock(dp);
       if(namecmp(name, ".")==0 || namecmp(name, "..")==0)
        goto bad;
```

sys_unlink (2)

```
6323    if((ip = dirlookup(dp, name, &off)) == 0)
         goto bad;
        ilock(ip);

        if(ip->nlink < 1)
         panic("unlink: nlink < 1");
        if(ip->type == T_DIR && !isdirempty(ip)){
         iunlockput(ip);
         goto bad;
        }

        memset(&de, 0, sizeof(de));
        if(writei(dp, (char*)&de, off, sizeof(de)) != sizeo
         panic("unlink: writei");
```

sys_unlink (3)

```
6337    if(ip->type == T_DIR) {
          dp->nlink--;
          iupdate(dp);
        }
        iunlockput(dp);

        ip->nlink--;
        iupdate(ip);
        iunlockput(ip);

        end_op();

        return 0;
```

sys_unlink (4)

```
6350  bad:
        iunlockput(dp);
        end_op();
        return -1;
      }
```