X Window System

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Outline

- X Window System
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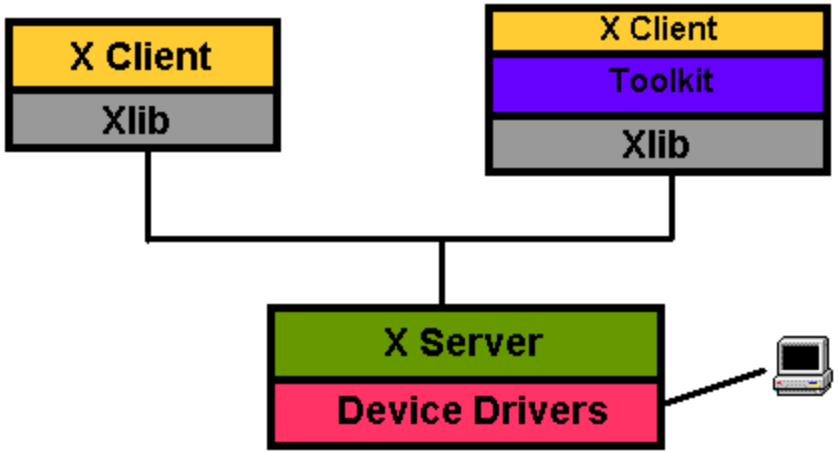
  - Architecture
  - X11 Implementation
  - The Window Manager
- Steps of exercise
  - Install and Configuring X11
  - Install Window Manager

X Window System (1)

- Introduction
  - X can be called "X"、"X11"、"X Window", using to provides a graphical user interface (GUI).
  - X was designed from the beginning to be network-centric, and adopts a "client-server" model.
- History
  - 1984: The X Window system was developed as part of Project Athena at MIT.
  - 1987: X Version 11 is released. X is now controlled and maintained by the Open Group.
  - 2005/12: X11R7.0
  - 2009/10: X11R7.5
  - 2010/11: X11R7.6
  - 2012/6/6: X11R7.7

X Window System (2)

- Architecture:
  - A client-server architecture
    - The X client request display service
    - The X server provide display service
    - Communicate with X Protocol



X Window System (3)

- Client-Server Design
  - Client
    - An application written using X libraries (e.g. Xlib)
    - Request service (like create window)
    - Receive events from X server (like mouse input)
  - Server
    - Runs locally and accepts multiple X clients
    - Manage the keyboard, mouse and display device
    - Create, draw and destroy graphic objects on screen

X Window System (4)

- X Protocol
  - The X Protocol is also divided into device dependent and device independent layers.
  - Advantages of X protocol
    - The X server is highly portable (various OS, Language)
    - The X Clients also have high portability
    - Local and network based computing look and feel the same

X11 Implementation

- Open-source implementations of X Window System

  - XFree86 project
    - Since 1992, dormant in Dec, 2011
    - Latest Version: 4.8.0 Dec 15, 2008

  - Xorg foundation
    - Since 2004, forked from XFree86 4.4 RC2
    - X11 official flavor
    - Latest Version: 7.7 June 6, 2012

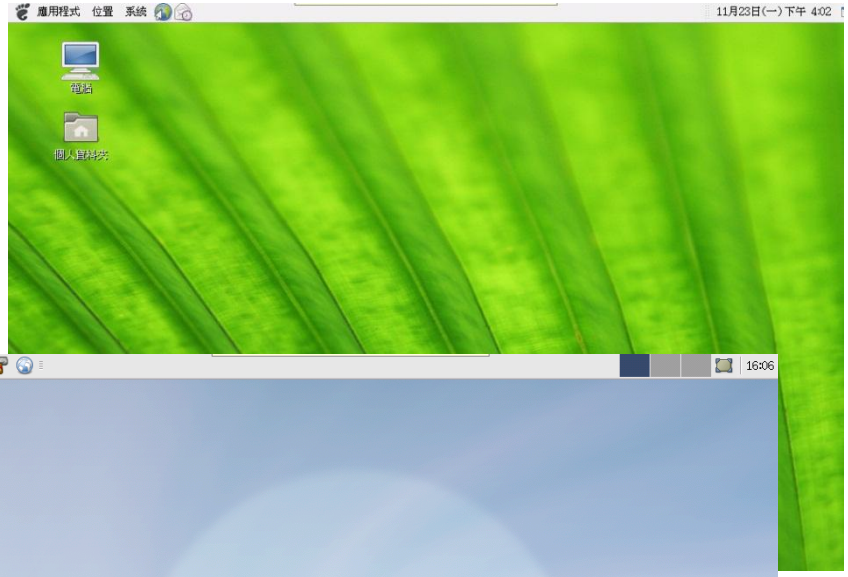
The Window Manager (1)

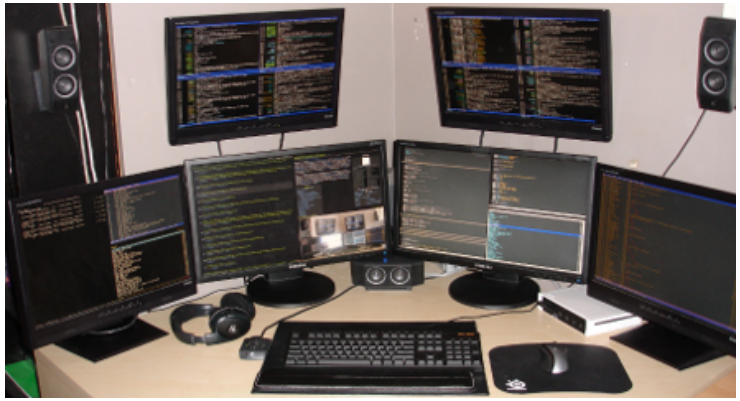
- Window Manager
  - A special kind of "X Client" provides certain look-and-feel window in front of you.
    - Background, desktop, theme
    - Virtual desktop
    - Window attributes and operations size
      - resize, minimize, maximize
      - position: overlap, move

  - Interactions between X server and X client will be redirected to a window manager.

The Window Manager (2)

- Some Popular Window Managers
  - Gnome
  - KDE
  - awesome
  - LXDE
  - LXQt
  - Xfce
  - Afterstep
  - etc..





Steps of exercise

- Install X11
- Configuring X11
- Install Window Manager
- Configuring Window Manager

Install X11

- We use Xorg as our X Server
  - To build and install Xorg from the ports
    - Login as root
    - /usr/ports/x11/xorg
    - # portmaster x11/xorg (7.5.2) or # pkg install xorg
  - To build Xorg in its entirety, be sure to have at least 4 GB of free space available.
    - /usr/ports/*/*/work/*
    - /usr/local/*

Configuring X11 (1)

- Pre-step – know your hardware
  - Monitor specifications
    - Horizon Synchronization frequency
      - Ex: 31 ~ 81 KHz
    - Vertical Synchronization frequency
      - Ex: 56 ~ 76 KHz
  - Video adaptor chipset
    - Ex: ATI Radeon 4670EAH
    - Ex: nVIDIA GeFource 9800GT
    - Ex: ATI Mobility RADEON 7500 (16M) (IBMT30)
    - Ex: vboxvideo
  - Video Adapter Memory
    - Ex:128MB

Configuring X11 (2)

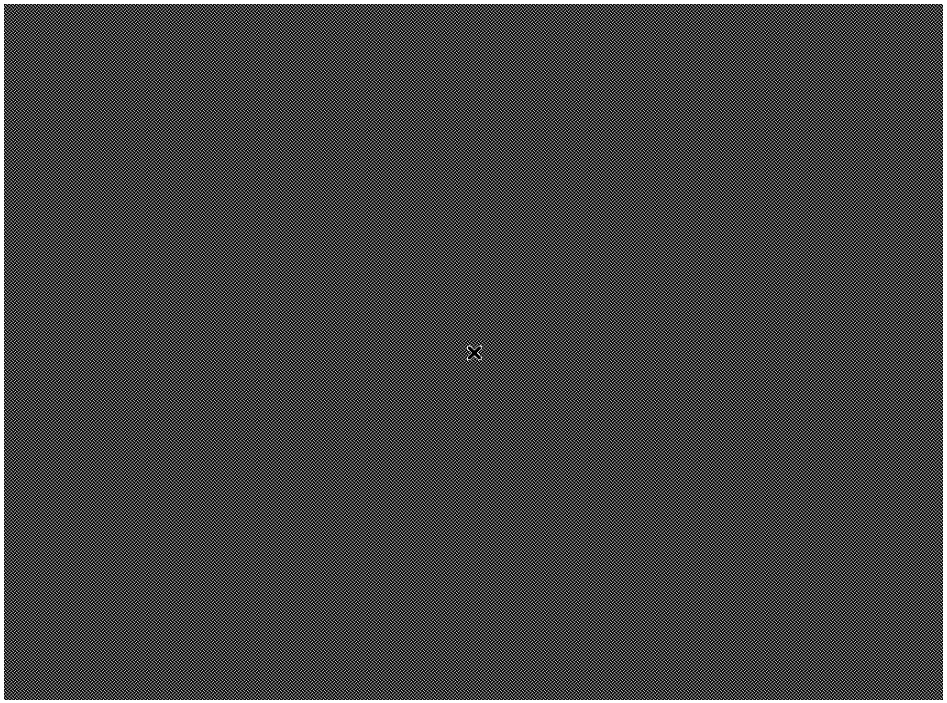
- Starting with version 7.4
  - Xorg can use HAL (Hardware Abstraction Layer) to autodetect keyboards and mice.
    - Install the following ports
      - sysutils/hal
      - devel/dbus
    - And adding the following lines into /etc/rc.conf
      - hald_enable="YES"
      - dbus_enable="YES"

Configuring X11 (3)

- Steps of X11 configuration
  - As of version 7.3, Xorg often work without any configuration file.
    - # startx
  - X11 configuration
    - Generate an X11 configuration skeleton file
      - # Xorg -configure
        - The file will be put in /root/xorg.conf.new
    - Test the existing configuration
      - # Xorg -config /root/xorg.conf.new -retro
        - If a black and grey grid and an X mouse cursor appear, the configuration was successful

Configuring X11 (4)

- Tune Configuration file
  - Edit /root/xorg.conf.new
    - Section Monitor
    - Section Screen
    - Section InputDevice



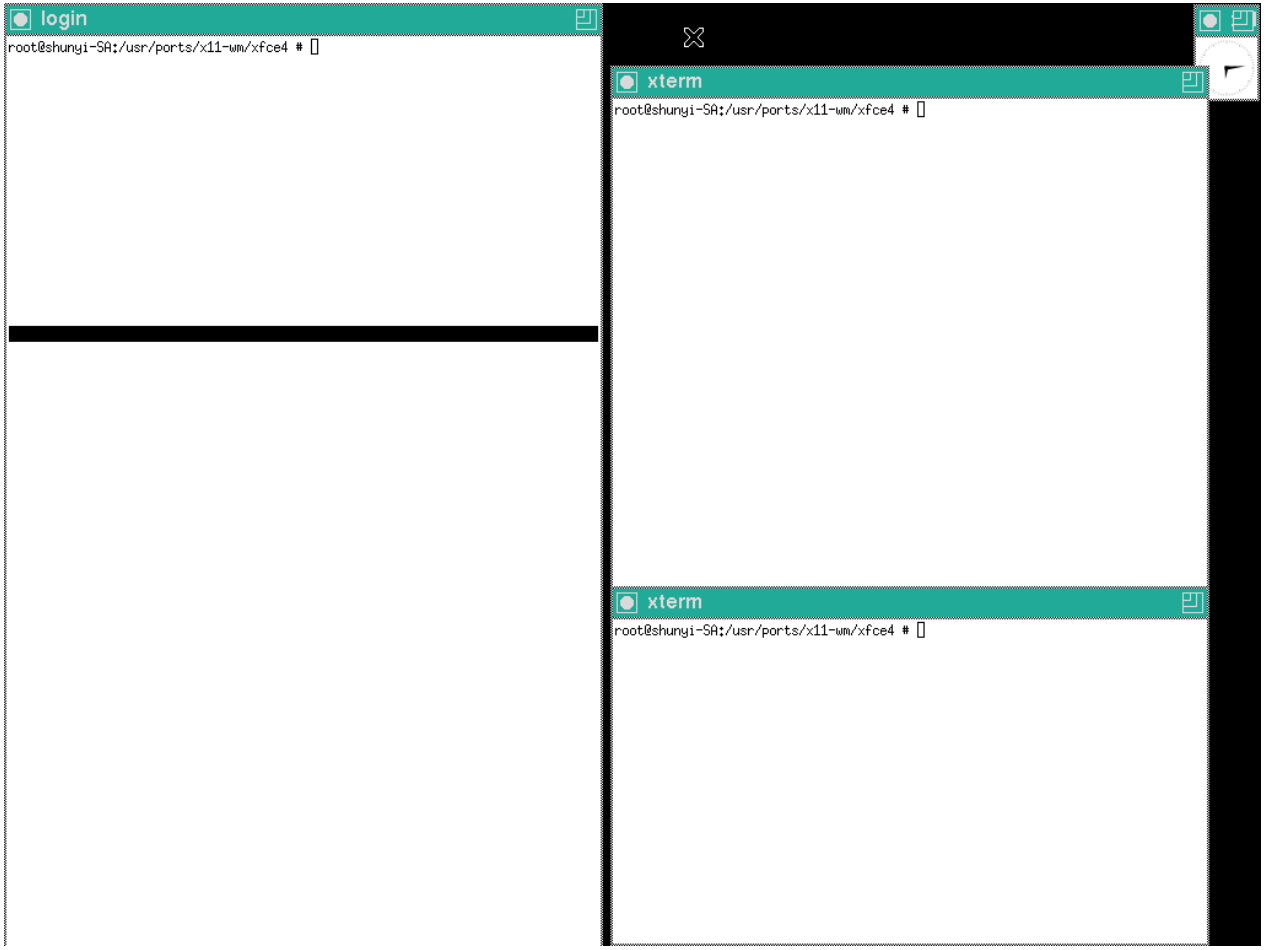
```
Section "Screen"
    Identifier "Screen0"
    Device "Card0"
    Monitor "Monitor0"
    DefaultDepth 24
    SubSection "Display"
        Viewport 0 0
        Depth 24
        Modes "1280x1024" "1024x768"
    EndSubSection
EndSection
```

```
Section "InputDevice"
    Identifier "Mouse0"
    Driver "mouse"
    Option "Protocol" "auto"
    Option "Device" "/dev/sysmouse"
    Option "ZAxisMapping" "4 5"
EndSection
```

```
Section "Monitor"
    Identifier "Monitor0"
    VendorName "Monitor Vendor"
    ModelName "Monitor Model“
    HorizSync 31.0 - 81.0
    VertRefresh 56.0 - 76.0
EndSection
```

Configuring X11 (5)

- Copy the configuration file to real place
  - % cp /root/xorg.conf.new /etc/X11/xorg.conf
- Start X
  - % startx



Install Window Manager (1)

- Here we use xfce4 as our WM
  - http://www.xfce.org
- Installation
  - x11-wm/xfce4
  - # portmaster x11-wm/xfce4 or # pkg install xfce4

Install Window Manager (2)

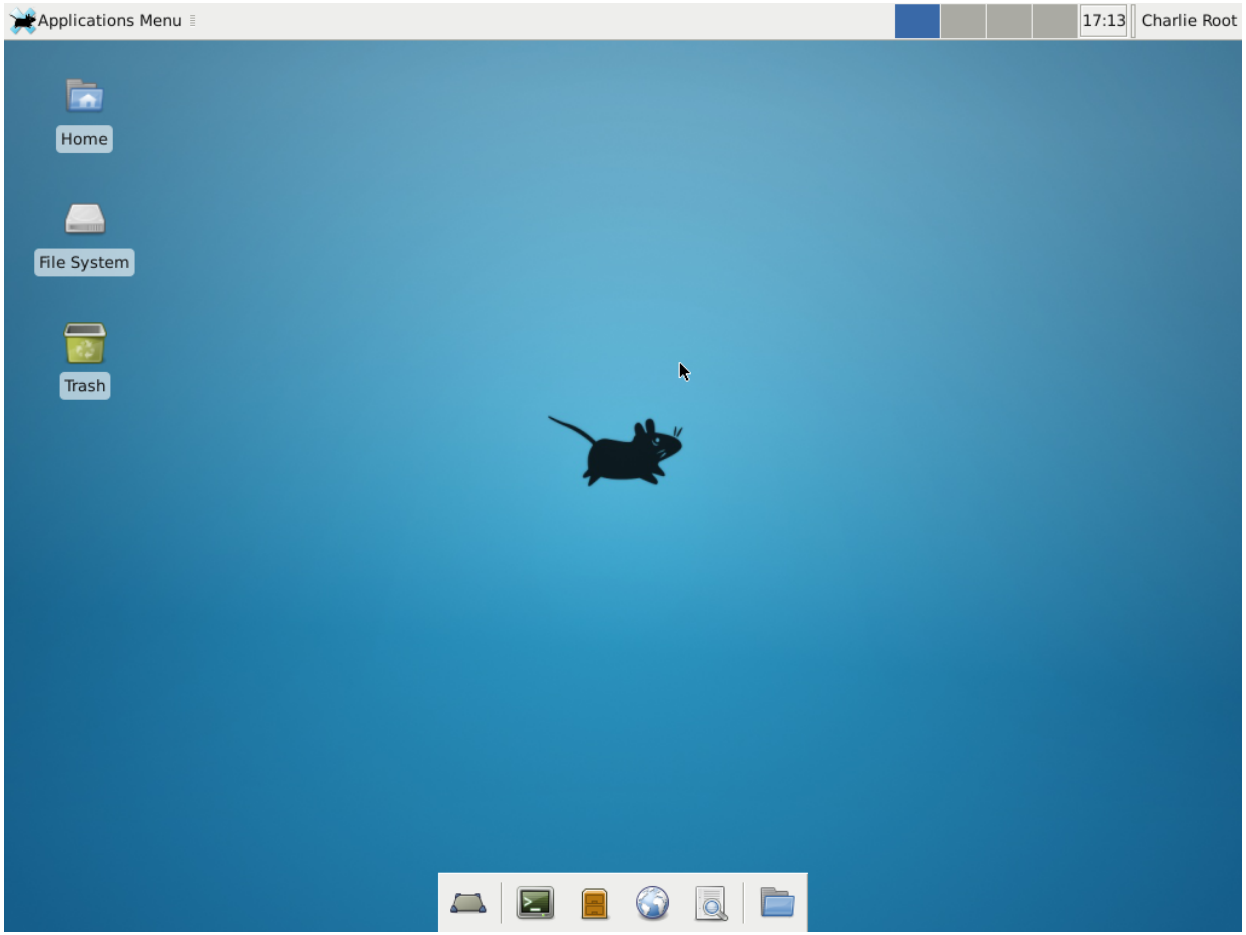
- Configuring X11 to use Xfce4
  - Edit "xinitrc"
    - File Location:
      - System Default: /usr/local/etc/X11/xinit/xinitrc
      - Personal: ~/.xinitrc
    - Format: just like a shell script!
      - exec /usr/local/bin/xfce4-session
    - echo "/usr/local/bin/startxfce4" > ~/.xinitrc

```
if [ -d /usr/local/etc/X11/xinit/xinitrc.d ] ; then
        for f in /usr/local/etc/X11/xinit/xinitrc.d/?*.sh ; do
                [ -x "$f" ] && . "$f"
        done
        unset f
fi

twm &
xclock -geometry 50x50-1+1 &
xterm -geometry 80x50+494+51 &
xterm -geometry 80x20+494-0 &
exec xterm -geometry 80x66+0+0 -name login
```

Install Window Manager (3)

- Run your X Window
  - % startx



Appendix A: X Startup (1)

- xinit - X Window System initializer
  - xinit [[client] options] [-- [server] [display] options]
    - ➢ Files
      - – Default client script:
        - » ~/.xinitrc
        - » /usr/local/etc/X11/xinit/xinitrc

      (run xterm if .xinitrc does not exist)
      - – Default server script:
        - » ~/ .xserverrc
        - » /usr/local/etc/X11/xinit/xserverrc

      (run X if .xserverrc does not exist)
- startx:
  - script to initiate an X session

Appendix A: X Startup (2)

- Xdm - X Display Manager
  - Xdm provides services similar to those provided by init, getty and login on character terminals
    - x11/xdm
    - Other display manager
      - gdm, kdm
  - Files:
    - /etc/ttys

```
ttyv8 "/usr/local/bin/xdm -nodaemon" xterm on secure
```

    - Default script
      - ~/.xsession

Appendix B: Remote X client

- To launch an X client from a remote host for display on the local X server, you need to do following steps:
  - Start X Server with tcp connection support
    - % X
  - Permit for the remote host to display X clients on the local machine.
    - % xhost [+]remotehost
  - Set DISPLAY for remote X clients
    - % setenv DISPLAY server:display

Appendix C: X11 forwarding

- To forward X11 connection
  - Connection to X11 DISPLAY can be forward by ssh, any X11 programs started will go through the encrypted channel.
  - Server:
    - Enables X11 forwarding: ssh -X
    - Enables trusted X11 forwarding: ssh -Y (may be dangerous)
  - Client:
    - Execute any X clients you want
  - ※Note:
    - X11 forwarding can represent a security hazard.

Appendix D: VNC

- VNC (Virtual Network Computing)
  - a graphical desktop sharing system to remotely control another computer.
  - Use Remote Frame Buffer (RFB) protocol.
  - Start VNC Server (and input a connection password)
    - % vncserver
    - VNC startup script
      - ~/.vnc/xstartup (just like ~/.xinitrc)
  - Than you can connect to vnc server by a vnc client
  - Common VNC Client
    - RealVNC https://www.realvnc.com/
    - UltrlVNC http://www.uvnc.com/

References

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