Multi-Platform Thin Clients for the IT Centre

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Mike Parin, IS Officer @ Jesus College
John Ireland, IT Manager @ Jesus College

(Not) Loving IT

Looks unfriendly: lots of boxes

Noisy & smelly

Workstations get busy: limited resource

No space for books and papers

Lots of computers = lots of failures

Takes ages to update software

Too critical for experimentation

Expensive to provide, and no remote access

The Vision

'To offer an IT suite that:

- is pleasant to work in,

- abundantly satisfies members' needs,

- promotes awareness and use of IT.'

Key Features

- Reduced administration
- Enriched desktop computing for students
  - eg. wider choice of software
- Remote access to IT suite services
  - Access to costly software from personal computers
- A more robust workstation service
  - Ease of development, replacement, repair
- Environmentally conscientious
  - Low power requirements
  - Low heat generation
  - Low noise output

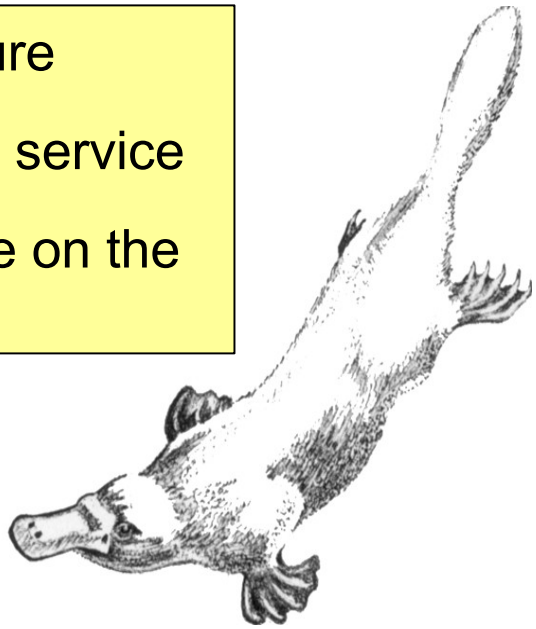
Platypus Workstations

'A streamlined mixture of several beasts'

Thin client architecture

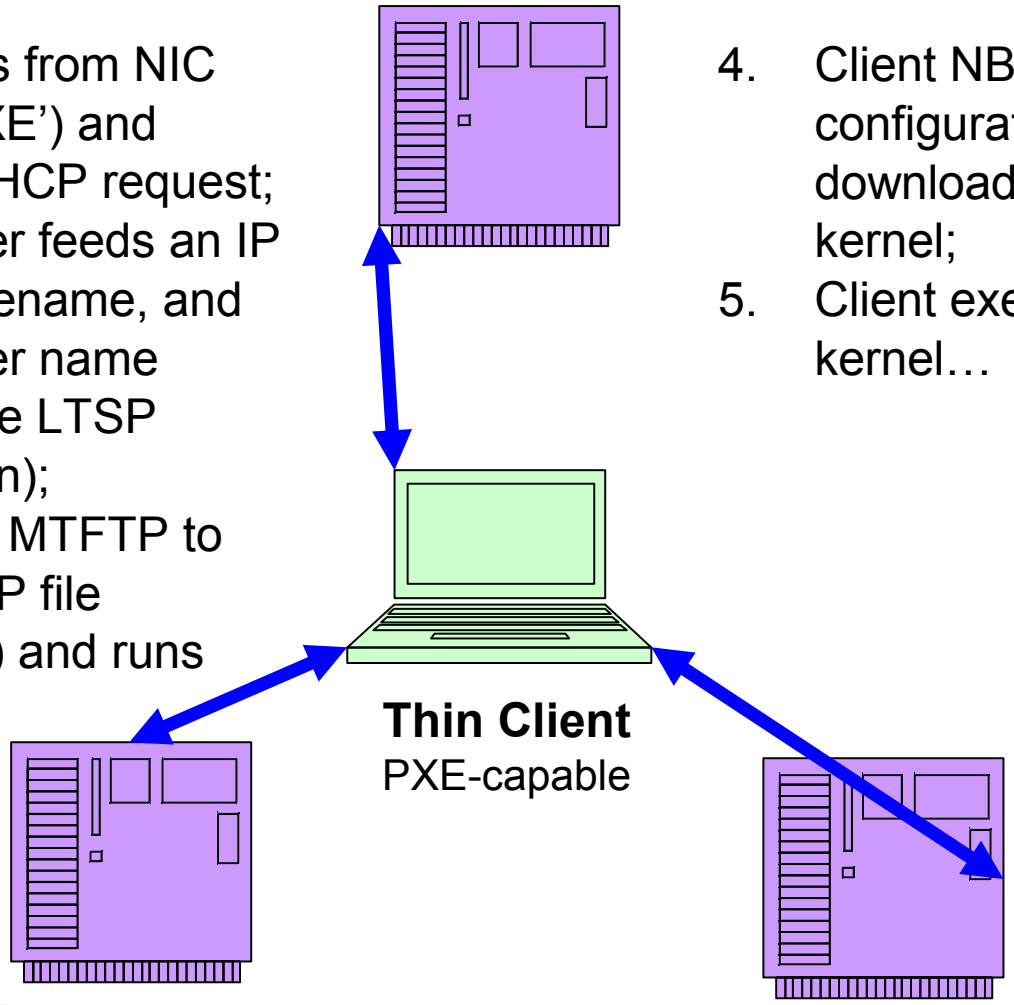
Linux & Windows desktop service

Accessible from anywhere on the college network



Scheme Overview

1. Client boots from NIC PROM (‘PXE’) and makes a DHCP request;
2. LTSP server feeds an IP address, filename, and TFTP server name (typically the LTSP server again);
3. Client uses MTFTP to acquire NBP file (pxelinux.0) and runs this;
4. Client NBP fetches some configuration and then downloads the real kernel;
5. Client executes real kernel…



Linux Terminal Server

- PXE boot via network card PROM
- DHCP (ISC DHCP3)
- TFTP (Peter Anvin's 'HPA' TFTPD)
- NFS (Linux 2.6.8 kernel, v3)
- LTSP (Version 4.2)

Linux X Windows Server

- Linux X Windows Server (Debian w/ GNOME 2.6)

Windows Terminal Server

- Windows Terminal Server (MS Server 2003)

LTS Installation and Configuration

- Base Debian (sarge) installation, including DHCP, TFTP, NFS tools, portmapper;
- Install LTSP administration tool
  - Admin tool installs all additional LTSP components such as NBP and boot kernel
- Configure LTSP, DHCP, TFTP and NFS

LTSP Setup

Download the ltsp-utils package (ltsp-utils_0.25_all.deb) from http://www.ltsp.org/

```
$ dpkg -i ./ltsp-utils_0.25_all.deb
$ /usr/sbin/ltspadmin
```

LTSPAdmin is used to:

- Install/update all the LTSP files
  - NBP and kernel (/tftpboot/…)
  - NFS root filesystem (/opt/ltsp/)
- Configure DHCP, NFS and TFTP services.

LTSP file updates are fire-and-forget: very easy!
Service configuration is sometimes better done manually.

DHCP Configuration

```
subnet 192.168.1.0 netmask 255.255.255.0 {
  option routers              192.168.1.254;
  option domain-name          “localdomain”;
  option domain-name-servers 192.168.1.254;
  get-lease-hostnames         true;
  range 192.168.1.1 192.168.1.199;

  group {
    next-server 192.168.1.1;
    filename "/lts/2.6.16.1-ltsp-2/pxelinux.0";
    option root-path "192.168.1.1:/opt/ltsp/i386";
    #use-host-decl-names on;

    host client1 { hardware ethernet 00:40:63:D3:B8:86; }
    host client2 { hardware ethernet 00:40:63:D3:B8:87; }
  }
}
```

TFTPD Setup

You may need to enable it by editing /etc/default/tftp-hpa:

```
RUN_DAEMON=“yes”
OPTIONS=“-l –s /tftpboot”
```

Easy!

NFS Setup

The packages you might need are portmap, nfs-common and nfs-kernel-server.

The LTSPAdmin tool will configure /etc/exports for you, but it should look like:

```
/opt/ltsp 192.168.1.0/255.255.255.0(ro,no_root_squash,sync)
/var/opt/ltsp/swapfiles
        192.168.1.0/255.255.255.0(rw,no_root_squash,async)
```

Remember to run `exportfs -a`

Network Setup

Common practice is to lock down network services with hosts.allow and iptables. We need to open up the installed services…

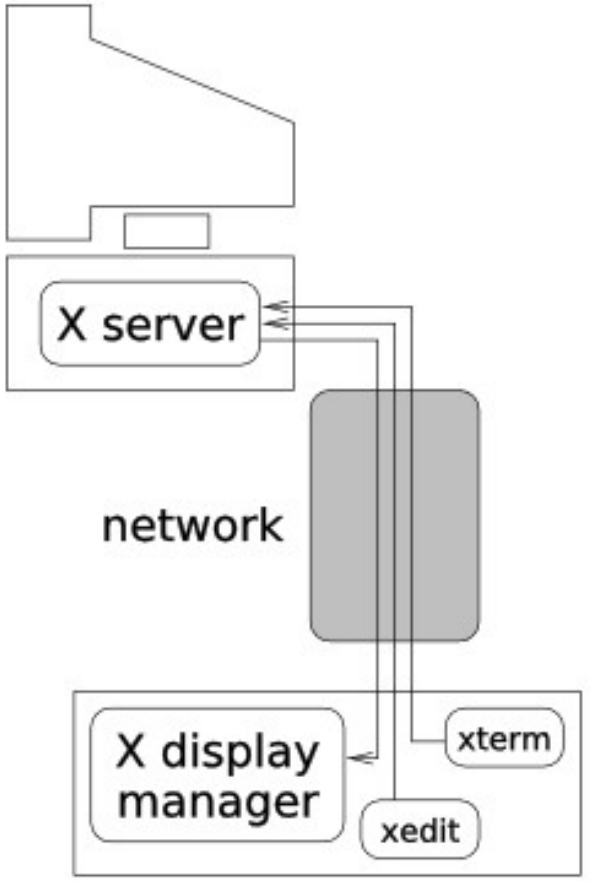
TCP wrappers - hosts.allow:

```
in.tftpd:   192.168.1.
portmap:    192.168.1.
rpc.mountd: 192.168.1.
```

IPTables:

```
iptables –A INPUT –s 192.168.1.0/24 –p udp –j ACCEPT
iptables –A INPUT –s 192.168.1.0/24 –p tcp --syn –j ACCEPT
```

On the server hosting your X applications:



- Display manager such as GDM listening on UDP port 177;
- Configure firewall to allow this traffic through;
- For XFree86 fix up keyboard:

```
cd /etc/X11/xkb/rules
ln -s xfree86 xorg
ln -s xfree86.lst xorg.lst
```

Windows Terminal Server Configuration

- Microsoft Windows Server 2003, and add the ‘Terminal Server’ role.
- Configure as if you were setting up a regular workstation.
- In the Terminal Services Configuration MMC you will need to add permissions to the RDP connection to allow users to connect.

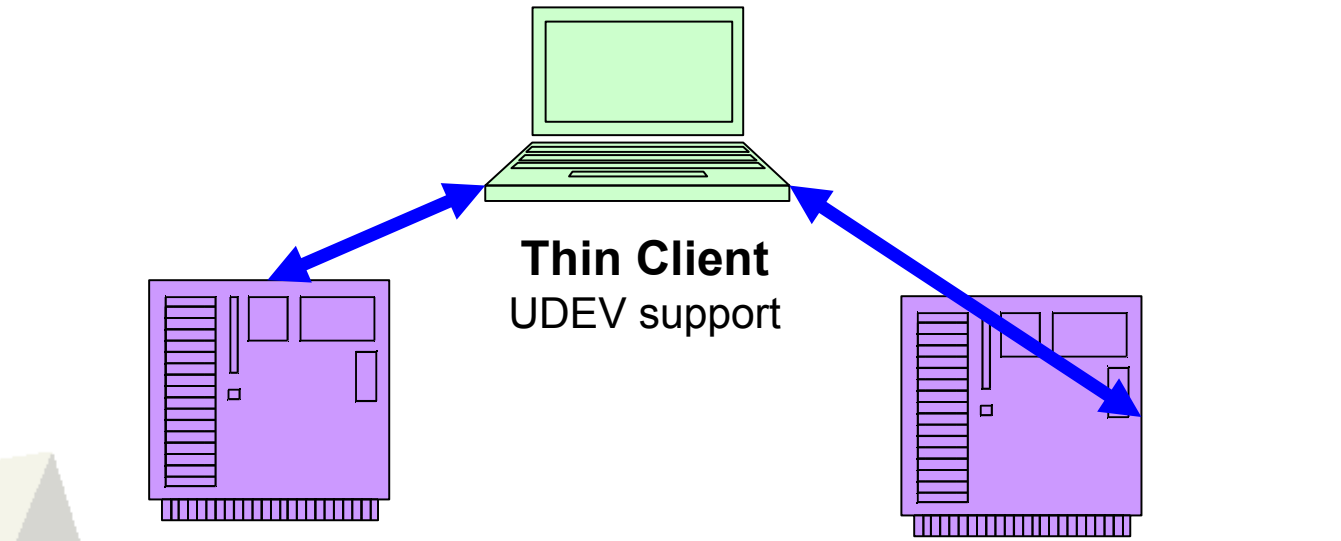
LTS Client Configuration

Within the NFS shared root partition in /opt/ltsp is the file /opt/ltsp/i386/etc/lts.conf:

```
[Default]
  XSERVER          = auto
  SERVER           = xserver.localdomain
  DNS_SERVER       = 192.168.1.254
  X_MOUSE_DEVICE   = "/dev/psaux"
  X_MOUSE_PROTOCOL = "ImPS/2"
  XkbLayout        = "gb"
  XkbModule        = "pc105"
  XkbRules         = "xorg"
  USE_XFS          = N
  SOUND            = Y
  SOUND_DAEMON     = "rdp"
  LOCAL_STORAGE    = Y
  SCREEN_01        = "rdesktop -a 16 -f -x l -d WORKGROUP
                  -r sound:local -r disk:USB=/tmp/drives/usb
                  -r disk:CDROM=/dev/hdc winserver.localdomain”
  SCREEN_02        = startx
```

Local Device Mapping

Local devices (CDROM, USB, …) appear on your desktop – even though your session is running on a remote server.



Local Device Mapping Setup

UDEV support is already built into LTSP.
Add FUSE to your X Windows server:

```
$ aptitude install kernel-image-2.6.8-3-386 \
kernel-headers-2.6.8-3-386
$ aptitude install fuse-source fuse-utils libfuse2
$ aptitude install module-assistant
$ m-a a-i fuse
$ modprobe fuse
$ echo "fuse" >> /etc/modules
$ aptitude install libx11-protocol-perl
```

Download the lbus daemon to your LTSP server and install it (download from http://ltsp.mirrors.tds.net/pub/ltsp/utils/ltsp-server-pkg-debian_0.1_i386.deb):

```
$ dpkg –i ltsp-server-pkg-debian_0.1_i386.deb
```

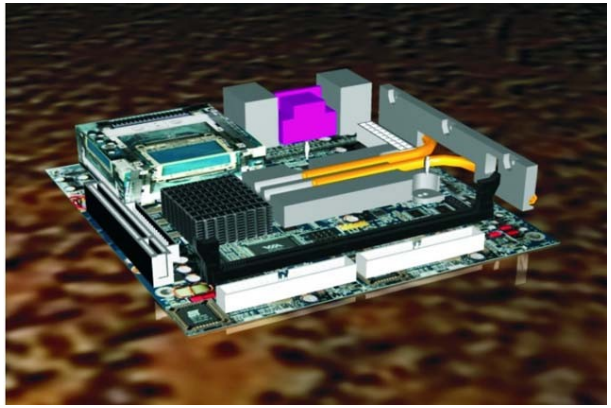
Finally, enable LOCAL_STORAGE=Y in /opt/lts/i386/etc/lts.conf.

Workstation Hardware

LCD flat panel: obvious choice

Mini-ITX system

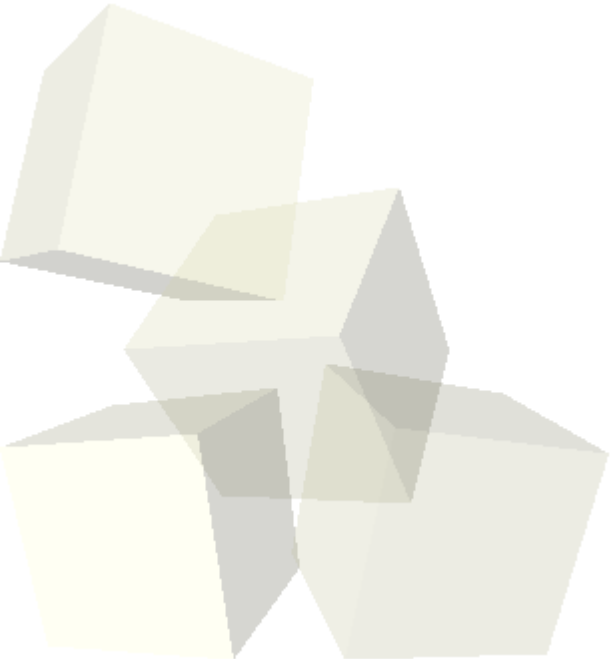
- ~ 1.6GHz
- Audio, USB on front panel
- Very small
- Fanless (silent, cool)



Current Limitations

- Local device mapping:
  - LTSP 4.1 okay for Windows, not for X
  - LTSP 4.2 okay for X, not for Windows
  - Developers are addressing this in 4.2 right this minute…
- Sessions are not encrypted
  - Can use secure tunnels, switched networks etc to help
- Failover configurations
  - DHCP, TFTP, X and even NFS can failover gracefully
  - Harder to resolve for Windows Terminal Server – clustering?
- No support for Mac OS X as yet
  - But you *could* simply provide an X Windows session

Demonstration



Further Information

LTSP is well documented:

http://www.ltsp.org/

LTSP support is available from the wiki, and IRC – the developers are very friendly!

Jesus College IT staff are also friendly – do feel free to contact us:

mike.parin@jesus.ox.ac.uk
john.ireland@jesus.ox.ac.uk

- End of Presentation -