

## IP services (overview)

## Linux Terminal Server Project

- started in 1999
  - thin clients on GNU/Linux
- take out cdrom, floppy, harddrive
- most applications and all file store held on servers

Layer	Protocols										
Process Application	NN TP	HT TP	PO P3	RC MDS	X rpc xdr	NFS	D NS	TF TP	SN NP	N TP	DH CP
Transport	TCP						UDP				
Internet	[ICMP, ARP, RARP]						IP [EGP, BGP, IGMP]				
Network	802.3		802.11		SLIP			PPP			

## Linux Terminal Server Project

## Concept

- clients are built from low power silent computers with typical specification
  - 1 GB RAM
  - 1 GHz processor
  - maybe use a raspberry pi, onboard fast Ethernet, (onboard graphics)
  - 27inch screen, keyboard, mouse
  - roughly £270.00
- this is almost certainly an over specified machine and built with premium components
  - obviously another technique is to use old machines and remove the hard disk
- ease of configuration
  - one file `/opt/ltsp/i386/etc/lts.conf` which describes all client configurations
- includes, graphics, various kernel modules, mouse type, mouse buttons, server, ramdisk size, nfs server, extra config files if really necessary, sound

## Resources

- by default everything a user runs, executes on the server
  - ideal in today's environment
  - multi core 64 bit server (Opteron Quad/Dual Core) with multiple processors
  - huge hard drive on server
  - protect server against physical attacks and networked attacks
- users sit at thin client and effectively log into server using say, KDM
  - someone unacquainted with LTSP will think they are logging in normally

## Resources

- by default all applications run on the server
- Linux is very good at disk caching and code sharing
  - so good that the LTSP project estimates you need
  - 250MB ram for the first user and only 50MB ram for subsequent users
- so how many users can you support with 1GB ram?
  - what about mcgreg with its 64GB ram?
  - mcgreg is a 20 processor machine, (theoretically it could support 1276 users!)

## Resources

- LTSP is used at a call center and the server is one high end Dell machine
  - it serves 170 members of staff who are typically running OpenOffice and FireFox
- ideal also for exhibitions which want to provide Internet access
  - configure the networking on the server and plug in 100 thin clients..

## LTSP client initialisation

- the client is diskless, so it boots using either
  - network interface card boot ROM
    - the preferred method
  - floppy disk
  - CDROM
- all methods
  - first it runs the DHCP protocol to obtain the IP, netmask, gateway, tftp server addresses
  - second using TFTP/UDP/IP it downloads pxelinux.0
  - third it runs pxelinux.0 which downloads the linux kernel from the tftp server
  - fourth it runs the kernel and uses NFS to download the root filesystem

## LTSP client initialisation

- note it uses pxelinux.0 as the linux kernel is too large to fit into base memory
- it configures itself from the root filesystem and starts an X server which connects to an XDM server which provides a graphical login screen
- the XDM server is where the application programs are run
  - normally this should be a powerful machine
  - ie multiprocessor quad core Opteron

## Example /etc/lts.conf file

- this file is located at:  
/opt/ltsp/i386/etc/lts.conf on the NFS server

## Example /etc/lts.conf file

```
[Default]
SERVER          = 192.168.0.6
XSERVER        = auto
X_MOUSE_PROTOCOL = "IMPS/2"
X_MOUSE_DEVICE  = "/dev/psaux"
X_MOUSE_RESOLUTION = 400
X_MOUSE_BUTTONS = 5
X_ZAxisMapping  = "4 5"
USE_XFS         = N
SCREEN_01       = startx
SCREEN_02       = shell
X_COLOR_DEPTH   = 24
SOUND           = Y
LOCAL_DEVICE_01 = /dev/hdc:cdrom
HOTPLUG         = Y
```

## Background reading and listening

- please take a look at [ltsp](http://sourceforge.net/apps/mediawiki/ltsp/index.php?title=Ltsp_Documentation) ([http://sourceforge.net/apps/mediawiki/ltsp/index.php?title=Ltsp\\_Documentation](http://sourceforge.net/apps/mediawiki/ltsp/index.php?title=Ltsp_Documentation)) and try listening to [linux-terminal-09-2005.ogg](http://floppe.com/glam.ac.uk/ogg/linux-terminal-09-2005.ogg) (<http://floppe.com/glam.ac.uk/ogg/linux-terminal-09-2005.ogg>)
- this ogg file is an edited version of a VoIP conference (the original had a huge non ltsp intro - waiting for someone to turn up..)

## Film of LTSP client booting

- apologies for camera shake..
- [boot](http://floppsie.comp.glam.ac.uk/miniitx/6.mpg) (http://floppsie.comp.glam.ac.uk/miniitx/6.mpg)
- [login](http://floppsie.comp.glam.ac.uk/miniitx/7.mpg) (http://floppsie.comp.glam.ac.uk/miniitx/7.mpg)

## Use of LTSP

- LTSP allows full X windows, so for example the KDE, GNOME desktop
- applications by default run on server
  - can run applications on client
- typically client side programs include
  - dvd player (mplayer, xine)
  - VoIP applications (kphone)

## Use of LTSP

- small text editors (vi)
- OpenOffice runs exceptionally well on the server
  - first instance takes 3 seconds to start
  - subsequent instances have an almost instant start up time
- firefox also behaves in this way - check out the movie

## Use of LTSP

- over 50% of users are educational establishments
  - greater 100,000 users
- popular use is to keep a Windows 2003 server on the network
  - and provide users with kdesktop
  - users have access to both GNU/Linux and Windows
- use 30 boot floppy disks to convert a Windows lab into a GNU/Linux lab
  - provides schools, Universities with low risk experimentation with GNU/Linux

## Use of LTSP

- LTSP is available in the Ubuntu distribution ([Breezy Badger](http://www.ubuntu.com/download)) (<http://www.ubuntu.com/download>)
  - and Debian (Etch/Sarge)
  - LTSP is being placed into Fedora and should lead to Redhat
- IBM is using LTSP
  - internally committed to replacing Windows with GNU/Linux
- sites are using LTSP with 140..170 clients per server

## LTSP overseas

- Mark Shuttleworth in South Africa has organised 80,000 LTSP clients in schools
- South Korea 1 Million LTSP clients
- Brazil
  - Telecentos project: 6000 Cyber cafés which have 20 terminals each
  - 120,000 thin clients
- massive financial saving