

IP services (overview)



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

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

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) and try listening to [linux-terminal-09-2005.ogg](http://floppsie.comp.glam.ac.uk/ogg/linux-terminal-09-2005.ogg) (<http://floppsie.comp.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