Less is More

Re-inventing the desktop

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Introduction

- The *real* cost of deploying personal computers in a networked environment
- The network terminal alternative
- How schools, governments, and businesses large and small can capitalize on this paradigm shift
The Personal Computer Model

- All programs, data, and processing in one box.

- Each box is autonomous
  - updates, backups, repairs
  - must be maintained individually

- Every PC is a cheap server
I can get a PC for less than $500USD

- The purchase price of PCs has decreased dramatically – but has the cost?

- Each PC is identical at only one point in time – when the hard drive is imaged.

- Since each PC stores its own copy of its operating system, programs, and in many cases user data, there is a nonzero cost to maintain its operation before its end of life.

- And, the hardware required to store and run these programs locally has a short lifespan
The Network Terminal Model

- All programs, data, and processing are on a server
- Each box is anonymous
  - provides input/output only
  - no maintenance required
- Sometimes a terminal is just a terminal...
So there's no hard drive. So what?

- No hard drive = no locally stored OS, programs, or data
  - Terminal OS and configuration remains on the server
  - All user data is on the server: backup the server and all user data is backed up
  - Most applications run on the server: update software on the server and the network is updated, programs utilize the powerful server processing power and run faster
- A $250USD terminal has a total cost not much higher...
- No moving parts = high reliability, low power
From Terminal to PC...

- The shift from “Mainframe” to “PC” was driven by:
  - The inability for the hardware at the time to push graphic media across the network
  - A more immediate need for local processing power than for sharing files between computers
  - Ultimately, an increasing market for home computers
Why haven't we shifted back?

- The overwhelming market dominance of PCs in the workplace

- Two decades of education and development devoted to a “Personal Computer” OS

- We've been waiting for a server-grade multi-user “mainframe” operating system that could present a user-friendly desktop and applications that run well in that environment
Enter Linux and LTSP

- Linux – Developing since 1991, an open source multi-user OS, suitable for systems from server to desktop
- LTSP – The Linux Terminal Server Project – Developing since 1999, an open source project that enables a Linux server to boot terminals and provide them their OS and configuration
Does **LTSP limit me to Linux apps?**

- Not at all, in fact with the right infrastructure it could expand the number of apps available
- LTSP runs on a Linux server and boots the terminals, but it can connect the terminals to *any* terminal server or mainframe
  - Windows applications can be pushed through Windows Terminal Services or Citrix
  - Unix applications can be pushed through X
  - IBM 3270 and other terminal emulation connections can be made as well
Do I need to buy special terminals?

- A terminal is very dumb, thus the hardware requirements are minimal
- All of the following can be used:
  - **Dedicated network terminal**: typically no moving parts, silent, low power, small form factor
  - **Some “thin clients”**: Varies by manufacturer and difficult to refurbish
  - **PC (as old as 486)**: 16 MB RAM, CPU > 66MHz recommended – not as reliable, energy efficient, or small
- No vendor lock-in
Small networks

- File storage, authentication, terminal booting, and application serving in a single server
- Easy to manage, update, backup, and maintain
Distributed Networks

- Centralized authentication, file storage, application servers
- Boot servers can be centralized or placed wherever routers would be placed
- Servers can be on-site or off-site, depending upon performance/maintenance needs
Who's making the shift to terminals?

• Hundreds of elementary schools, high schools, and universities around the world
• IBM (internal deployments)
• Exxon Mobil
• Libraries
• Government agencies
• Cyber Cafes – Telecentros (Brazil)
• Small businesses such as property managers, publishers, brokers...
• You?
Is there commercial support?

- Yes, and it's growing.

- **Symbio Technologies** was formed in February, 2002 to contribute to LTSP and to develop commercial tools, hardware, and support to expedite its widespread adoption.

- The number of vendors producing terminals specifically for use with LTSP has grown by over 300% in the last 3 years.
Conclusion

• The convergence of Linux, high quality and high bandwidth network hardware, and low-cost commodity desktop hardware enables us to revisit practical and efficient network architectures

• The result is a simpler, more manageable, high quality network architecture within reach of organizations large and small, rich and poor
More Info

- www.TheSymbiont.com
- www.LTSP.org
- IRC (#ltsp on irc.freenode.net)
- www.K12LTSP.org
- www.SkoleLinux.org
- Probably, a 1979 Unix Admin Guide...
Questions?