THIN CLIENTS

Terms

Fat Client: A full PC of any size which includes RAM, hard drive, CD drive, running a full operating system and having applications local.

Thin Client: A miniature computer composed mainly of RAM which may run a slimmed down operating system but relies on connection to a server for its operating system experience and applications.

Terminal Server: Centralized server computer that holds the operating system and applications for use by the thin clients.

Terminal Server Cluster: As one Terminal Server can support few full-working clients, it is recommended to have many in a load balanced cluster. This allows client connections to be shared amongst many servers, relieving the stress on any one server.

SoftGrid Application Virtualization: A method of allowing software to be streamed from a server to a local computer. The software is completely self-contained and can be set to be upgraded, expire, etc without affecting the underlying operating system.

Thin Client Architecture

Thin client architecture takes the client/server relationship of UNIX terminals of the 80s and combines it with the graphical interface of Windows. The user workstations can be fat clients (normal PCs) and take advantage of centralized software packages, however using thin clients (tiny computers working entirely on RAM instead of hard disks) to connect to the servers reduces maintenance of the various components of a fat client (CD/DVD drives, hard disks, etc). The server cluster provides the operating system interface and the applications to the client, consolidating all software updates to the servers rather than the clients.

The idea is to reduce maintenance by having the clients be unchangeable with minimal moving parts, and the operating system and software upgrade and maintenance be completely centralized.

LAWR is requesting a breakdown of costs for purchasing and maintenance of a fat client vs thin client solution for staff and possibly the labs. The areas most likely to be affected:

- Initial client buy-in
- Client maintenance
- Initial infrastructure buy-in
- Infrastructure maintenance

Initial Client Buy-in

Fat Client: Currently on a 4 year rotation of staff computers, each station is estimated at $1000 (including new monitor). With approximately 20 staff users, that's an estimated $5000 per year, every year. Once staff all have decent monitors (17”-19” flat panel displays), the price will drop to $750 per
computer, with a yearly buy-in of $3750.

**Thin Client:** Thin clients conceivably have a 6-10 year lifespan. Cost of thin clients are estimated at $700 with monitor, $500 without. The initial cost to replace staff computers with thin clients would likely be rolling, with replacements coming over a four year span. Each year for the first four years, the cost would be $3000. Once flat panels are in place, upgrades will come again in two years, switching or upgrading one quarter of the clients at a cost of $2000 per year for four years.

In the initial 10 year period (assuming one half of staff currently have flat panels):
- Fat Client Cost: $40,000
- Thin Client Cost: $14,000
Cost savings of Thin Clients over 10 year period: $36,000 or 65% savings

Initial 20 year period:
- Fat Client Cost: $77500
- Thin Client Cost: $22000
Cost saving of Thin Clients over 20 year period: $55,300 or 71% savings

**Client Maintenance**

**Fat Client:** Staff computers are fairly low maintenance as their software is standardized and users don't have administrative rights. With drive imaging, building new computers is much faster. Hardware maintenance is standard, meaning the computers rarely need parts and the warranties make replacements quick and cost-free. The two most time-consuming maintenance aspects are moving email on new workstations as that is the one thing stored locally, and rolling out software updates for non-Microsoft packages (Adobe, for example). Staff generally have standard software and much of it updates itself so time is minimal. Estimated time per new workstation: 4 hours. Estimated time per workstation per year: 4 hours.

**Thin Client:** Once the entire Thin Client architecture is in place, setup of thin clients is minimal. A slight configuration change on the desktop, drop the client in place on the user's desktop, and they are ready to go. Email will be stored on a server, profile (desktop, my documents, etc) on a server, etc. Estimated time per workstation per year: 1 hour.

Initial 10 year period:
- Fat Client Maintenance Cost: $15,000
- Thin Client Maintenance Cost: $4000
Cost savings of Thin clients: $11,000 or 74%

**Initial Infrastructure Buy-in**

**Fat Client:** In place, no cost.

**Thin Client:** Substantial. To support 20 simultaneous thin clients on a scalable, manageable terminal server setup, you need several items in place: Terminal Servers, Licensing Server, Load Balancing, E-
Mail Server, SpamServer, SoftGrid Server, FileServer. The servers cannot be combined due to their nature making hardware costs alone substantial. The creation of this infrastructure would take months of planning, learning, and testing. The concepts are straightforward, implementation is not.

- Fat Client Infrastructure Cost: $0
- Thin Client Infrastructure Cost:

**COSTS**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>Amt</th>
<th>Price Each</th>
<th>Price Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyse Thin Client</td>
<td>Client terminal which replaces normal PC</td>
<td>20</td>
<td>$500</td>
<td>$10000</td>
</tr>
<tr>
<td>Terminal Services Licensing Server</td>
<td>Server to handle the license management of the Terminal Services Cluster</td>
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<td>$800</td>
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<tr>
<td>Terminal Server</td>
<td>Servers to support the client terminal desktop and applications</td>
<td>4</td>
<td>$3000</td>
<td>$12000</td>
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<tr>
<td>Terminal Server Client Access License (CAL)</td>
<td>Licensing to connect to Terminal Server</td>
<td>20</td>
<td>$4</td>
<td>$80</td>
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<tr>
<td>SoftGrid Server</td>
<td>Allows virtualized applications to be loaded onto Terminal Servers to cut down load</td>
<td>1</td>
<td>$2000</td>
<td>$2000</td>
</tr>
<tr>
<td>User Server</td>
<td>Holds user profiles and documents which are loaded onto the Terminal Server session upon user login</td>
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<td>$2000</td>
<td>$2000</td>
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<tr>
<td>E-Mail Server</td>
<td>E-Mail cannot be stored in profile or on Terminal Server and UCD quotas are not large enough for IMAP. Department email server will allow for IMAP configurations, allowing all mail to be stored on the server, rather than partially on the client.</td>
<td>1</td>
<td>$4000</td>
<td>$4000</td>
</tr>
</tbody>
</table>

**TOTAL** $30,880

Servers would need to be replaced every 4-6 years depending on technology and software changes. The main terminal servers can be rolled out with a replacement each year for four years.

**Infrastructure Maintenance**

**Fat Client:** The areas where fat clients depend upon infrastructure overlap with the thin client solution: Z drive (file server), networking, authentication servers.
Thin Client: Aside from the overlap with fat client infrastructure, the thin client solution relies completely on multiple servers to be fully operational. The failure of any one of the five types of servers results in either work stoppage for all, or no email for all. Upgrade of software applications and operating systems falls to the server side which centralizes general upkeep. In the short term, where hardware warranties prevail, server issues should be minimal...after a the 3-5 year mark, failures become costly and, as everything in the solution is mission-critical, costly in both IT time and normal staff time. Overall, maintenance shouldn't be much different than fat client, it just has more impact when an issue arises.

Outside Opinions

Dean's Office

The Ag Dean's Office is looking into an infrastructure change to suit Terminal Clients. Their area has a slightly broader infrastructure than we do (they run an internal mail server) and makes this a little simpler. The person I spoke with hadn't gone overboard with research yet on the subject. Currently, they have a central terminal server to hold incoming Remote Desktop sessions, rather than having users log into their desktops separately. Because we don't have our own email server with near unlimited quotas, we could set a central terminal server up for remote users, but old emails stored locally on their machines would be inaccessible. For staff, that generally doesn't make it worthwhile.

Microsoft Says:

I was on a conference call with Microsoft terminal service experts. Despite questioning, they didn't offer a general estimate of what it would take to follow through on an all-staff terminal services solution. It was apparent that a full desktop emulation through terminal services for multiple users is not a common solution. They offered sidesteps that approach the results of the solution (lower maintenance), such as centralized virtualization of software (which is included in the Infrastructure quote above but can also be done separately). They were going to get back with me on ideas for us, but as yet have not.

LAWR IT OPINION

The cost savings are potentially great, though the combination of a completely centralized system and the unprecedented size makes it difficult to move forward in a sweeping motion. Here are some ideas:

Pilot Program

One thing we could try is a very small pilot program which wouldn't require much extra infrastructure to emulate. Give one of our standard software setup staff users a thin client and access to a terminal server with the appropriate software and customizations. See how it goes, see what the base issues are in terms of usability. If successful, we can do it again with a couple more users to see how robust the solution is with multiple people on one server.
Dean's Office

We could let them do some of the early implementation of a large-scale solution. In the end, we might even be able to piggy-back our staff on their system if they offer and/or can be convinced (security issues there, of course).

Possibilities

Advances in thin clients, terminal services, and networking are making this a greater possibility for cost savings. As test cases of this scale are rare, LAWR would end up being a guinea pig which I can't recommend given the cost. The pilot program seems like a good idea for implementing the technology and letting IT get familiar with the ins and outs, all for a low introductory cost.

NOTES (don't bother reading...for IT only)

PROS
- Operating System and Application updates are performed only on the servers – no need to install updates on clients.
- Almost no hardware maintenance for clients, keyboards, mice and monitors notwithstanding.
- Lifetime of desktop equipment extended; thin clients less expensive than fat clients.

CONS
- Network outage = total work stoppage
- Large initial investment in money and time to implement.
- In a non-uniform environment, not as effective.
- No hand-me down computers.
- Processor or graphics intensive applications may not work: Photoshop, CAD, etc.

LAWR Specifics
- Staff computers are lowest maintenance PCs
- Lab computers run DOS software as well as higher end applications which may not translate well to Thin Client architecture
- Network is adequate to run a thin client solution

PC & Monitor: $1000
Thin client & Monitor: $700
Servers: $3000
- Two for load balancing, mirroring of profiles?

Licensing: <$4 per user for TS CAL under MCCA
MICROSOFT CALL
- Not widely used as thin clients
- Specific applications served
- Did not seem excited about Terminal Services
- Softgrid Application Virtualization

DEAN'S OFFICE LOOKING INTO IT

Extra Requirements:
- Multiple Terminal Servers for running the apps
- Load balancing solution
- Softgrid server for pushing out large apps to terminal server
- Licensing server for handling licensing of all terminal servers
- Profile server (could also be file server) for profiles
- Can't run profiles on server because local email is too large
- Can't run profiles on server as profiles need to be accessible from any TS
- E-mail server as terminal'd email could get messy...
- Virtualization software for ease of transfer between new and old systems

PILOT PROJECT?
- Find a medium-build machine, put user on it. Store their profile and email local to the server (ugly).
- See how it goes.