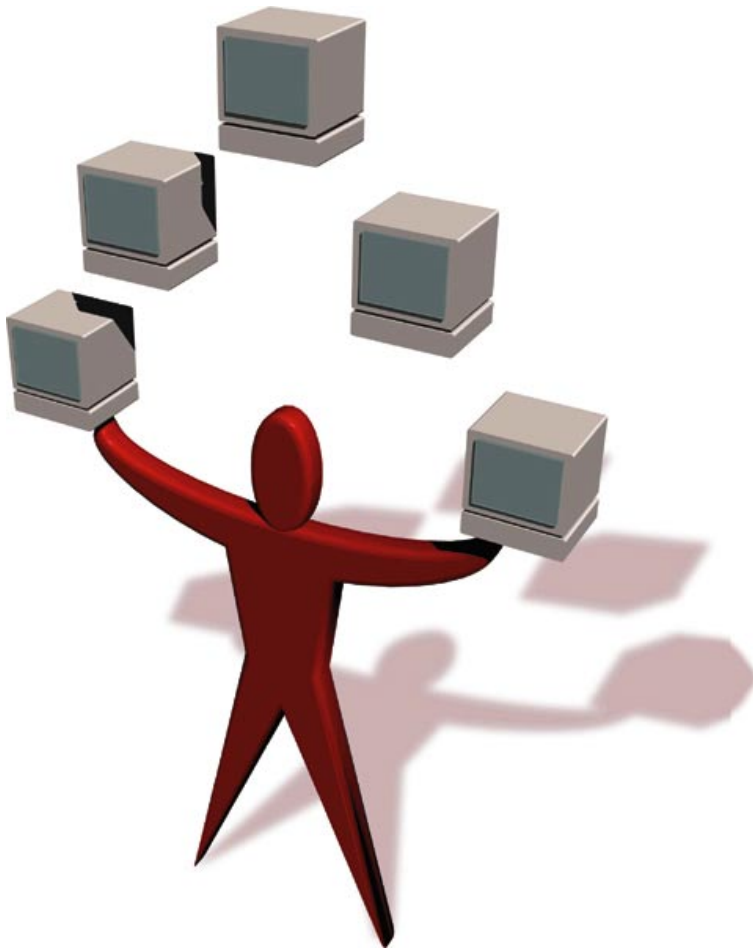

Automation Control Products

Benefits of a Network Boot Thin Client



Automation Control Products



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About ACP Technology

ACP has developed a Server-Side Enabler and Server-Based Management Software for the configuration and real-time monitoring of Thin Clients. The Management Software, ThinManager™, uses an interface similar to Windows Explorer, and displays Thin Client connection information and allows for configuration of both Clients and Servers.

Virtually any x86-based system can be converted to boot and run as a fully functional Thin Client if it meets the following hardware specifications:

- 486DX 66 MHz or better x86-based processor board
- AMI, Award or Phoenix BIOS
- 32 MEG RAM
- VGA thru XGA video support
- 10 or 100 Mb board level or bus-based network interface card
- Keyboard and mouse ports
- Serial and Parallel ports (optional)
- Sound board (optional)
- Touch Screen (optional – MicroTouch, PenMount, ELO)

***Note: Non-Volatile storage and hard drive are not required.

Methodology

ACP creates a small BIOS image for the system that ‘enables’ it to remote boot from an NT or Window2000 Server running ACP’s ThinServer™ NT service. At boot-up the modified unit receives its operating system (Linux), Xwindows environment and Citrix ICA Client software from the server. Once the ‘enabled’ client has booted Linux it reconnects to the Server to request its configuration.

Configuration items include (but are not limited to):

- Video resolution
- Session information (The server the client connects to, its ID and password)
- Start-up application (What application, if any, is run once connected.)

Additionally, clients can receive modules from the Server. Some of the available modules are:

- Touch Screen
- Sound
- Hardware Drivers (ProfiBus, Devicenet, Wireless Ethernet, High Speed Serial etc.)

ACP Enabled Thin Client hardware requires the ThinServer™ software to be installed on a networked computer running NT 4.0 Server TSE or Windows 2000 Server. Each connected Client requires a ThinManager™ connection license. ThinManager™ software is sold through ACP’s Distributors, Resellers and Manufacturers. If you are a hardware manufacturer and would like to have your products added to the ACP Thin Client Hardware Support List, please send one unit to:

Automation Control Products
6865 Shiloh Road East, Suite 250
Alpharetta, GA 30005
(800) 846-4655

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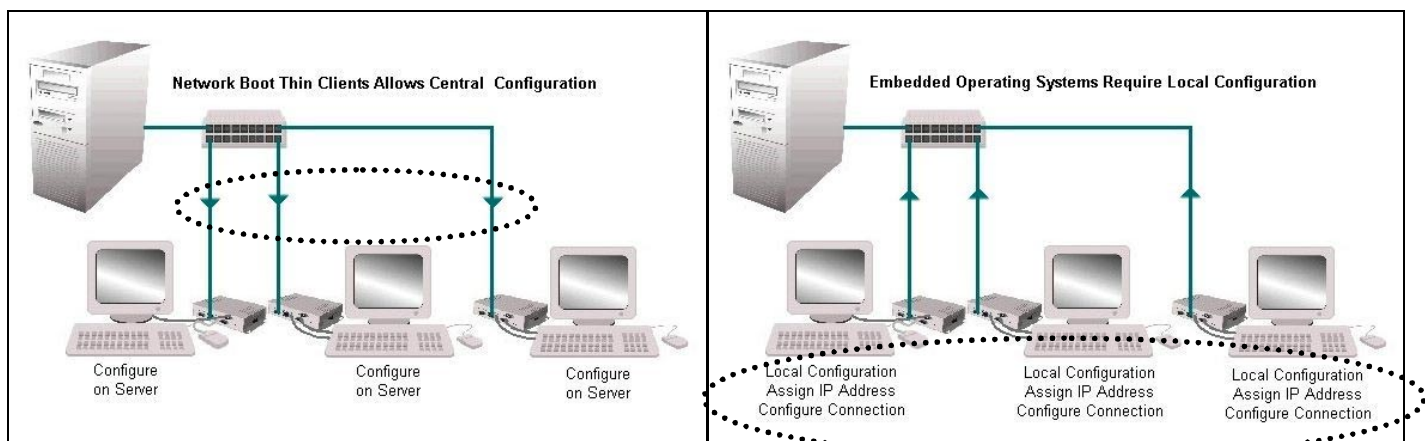
All Thin Clients rely on a small local Operating System (or O/S) to display a program's output, get input from the user, and handle any local communication requirements. This O/S can either be embedded in the Thin Client when it is manufactured, or it can be downloaded from the server when the Thin Client is powered up. Booting a Thin Client from a server eliminates the need for local storage, which actually has two major benefits - it reduces the hardware cost of the Thin Client and simplifies client management. Today, only three companies have a Network Boot Thin Client offering – IBM, ACP and Wyse Technologies.

Network Boot Thin Client Lowers Client Cost

By far the most common operating system used as an embedded O/S for Thin Clients is Windows CE, and by far the most common method for storing CE in the client is by embedding it in a DiskOnChip (DOC). Initial versions of CE can be completely contained within an 8MB DOC, which costs approximately \$25. It should be noted, however, that just like all other Microsoft Operating Systems CE has been growing steadily since its introduction. Booting from the network eliminates the need for DOC and thus saves the \$25 component cost. Additional savings are realized because a Network Boot Thin Client doesn't incur the cost of the Windows CE license, another \$25 (estimated, price varies depending upon volume).

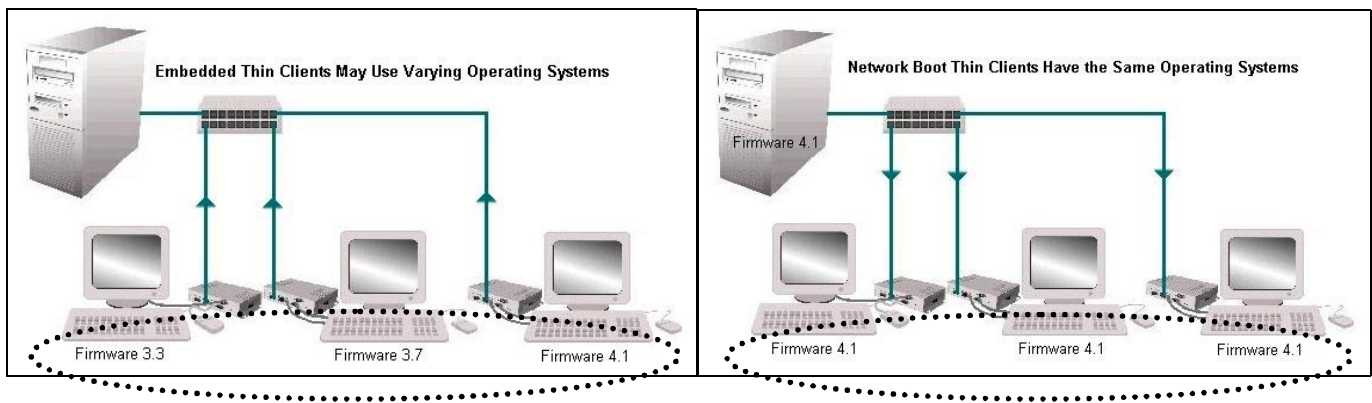
Network Boot Thin Client Simplifies Management

Thin Clients that store the Operating System locally (inside the Thin Client) also require local software to allow for configuration of the client. This typically involves starting up the Thin Client, setting the IP address (or pointing it to a DHCP server), and setting local parameters such as screen resolution, serial port configuration etc. This is a process that must be repeated for each client installed. While not a laborious task for a single unit it becomes daunting when there are dozens of clients and exceedingly expensive when there are thousands of clients distributed across a large geographic area. By comparison, setting up a Network Boot Thin Client is simply a matter of plugging it in and turning it on.



Network Boot Thin Client Simplifies O/S Updates

Having a local O/S stored on the client also brings up the issue of client firmware updates. Over time, the local O/S will grow obsolete and need to be updated. Today most manufacturers allow you to 'flash' the O/S with updates, a process that is fraught with danger. If something goes wrong (and it often does) during the flash process the Thin Client will be rendered useless. The O/S becomes "scrambled" and the unit will need to be serviced by the manufacturer. By contrast, the Network Boot provides a fresh copy of the O/S each time the user powers-up their machine. If there is an update to the O/S it is simply loaded on the server and the next time the user logs on the Thin Client will get the latest version of the Operating System. This means that Network Boot Thin Clients don't grow obsolete as fast as local boot units - pull a 2-year-old unit off the shelf and when it boots it will have the same O/S as all the currently running Thin Clients.



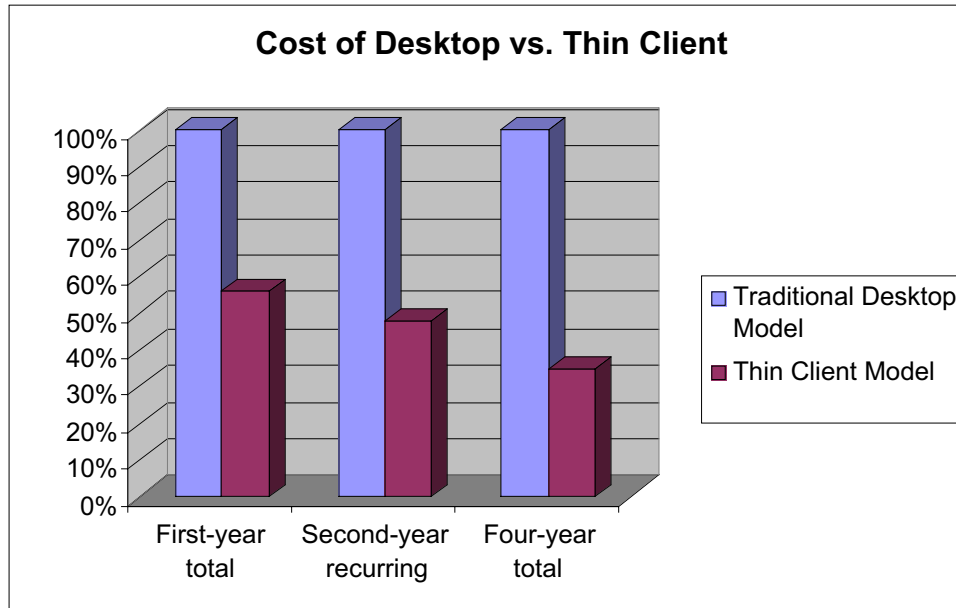
Network Boot Thin Client Simplifies Application Upgrades & Updates

With a local O/S like Windows CE, there can be subtle differences between the CE versions that are actually installed. And because of the way that each build of CE is selected as a subset of all of CE's components, different manufacturers will choose different CE components depending on their particular hardware. While many companies strive to only install the same model and version of hardware, it is almost impossible to achieve a homogeneous collection of products, and consequently slightly different versions of CE will exist on the same network. This makes it difficult to assure that upgraded applications will react the same way at each client. Fully testing the different versions of CE for application compatibility would require testing at each physical location. By contrast, a Network Boot Thin Client provides a uniform operating system to all clients that can be rigorously tested prior to initiating an application upgrade.

Network Boot Thin Client Lowers Total Cost of Ownership

Using a Network Boot Thin Client also provides for more predictable operating costs. The cost of upgrading the WinCE O/S on all installed Thin Clients is difficult to measure, as several steps are required. First there is the cost of the Microsoft CE software upgrade, then the cost of additional testing, and finally the cost of deployment. And more than likely you'll have the cost of fixing some of the Thin Clients if there is a problem along the way. There are less points of failure in the Network Boot Model, and compatibility will be less of an issue because there won't

be a dozen different versions of the WinCE O/S installed in the Thin Client hardware. A Network Boot Thin client doesn't require going through the flash process because a fresh copy of the O/S gets loaded every time the machine boots. And testing will take less time because all clients will be running the exact same O/S. The following is for Thin Clients in general:



Cost Analysis of Desktop vs. Thin Client		
	Traditional Desktop Model	Thin Client Model
First-year total	100%	56%
Second-year recurring	100%	48%
Four-year total	100%	35%
Percent Differential Relative to the Traditional Desktop Model		
Source: The Tolly Group, June 1999 - Document no. 199503		

Network Boot Thin Clients are More Secure

Many Thin Clients with local CE function as a small computer (similar to a PDA) even when not connected to the Thin Client network. This makes it a useful item, and one that people might be inclined to steal. If a Network Boot Thin Client is removed from the network there is no chance that it can function, reducing the chance it will be stolen.

A local O/S also invites the introduction of viruses, as the unit can be brought up and 'tinkered with' and viruses can be introduced into the client's O/S. For a Network Boot Thin Client, the operating system is stored on the server, which is typically kept in a secure location, greatly reducing the chance of a virus being introduced to the system.

Network Boot Thin Clients are Easier to Service

When compared to standard PCs, Thin Clients are much less prone to failure because of the lack of moving parts. But if a unit is destroyed or damaged in some way, even a computer novice can replace a Network Boot Thin Client. Simply plug it in and turn it on, and the Thin Client will automatically configure itself. On the other hand a CE Thin Client will most likely need to be told the username/password and the address of the boot server (do you know your IP address?).

Network Boot Thin Clients Startup Faster

Amazingly, the entire process of loading the O/S at boot time takes only about 5 seconds over standard 10MB Ethernet, which is considerably less time than it takes to read the same size file out of a local Disk On Chip. This is because of the speed associated with current DOC technology, combined with the limited speed of processors that are typically found in Thin Clients.

Summary

Zona Research (Redwood City, CA) states that Windows-based Thin Client systems typically cost 56 percent less to own and operate than do distributed PC environments.

The Network Boot Thin Client provides additional benefit above and beyond the traditional Windows CE Thin Client.

- **Lower Client Cost**
- **Simplified Management**
- **Simplified O/S Updates**
- **Simplified Application Upgrades and Updates**
- **Improved Security**
- **Improved Serviceability**
- **Faster Startup Time**

Using a Network Boot Thin Client provides cost savings when you purchase, deploy and manage your computer infrastructure.

Appendix

The Thin Client Computing Defined

In the early days of computing, mainframe computers provided centrally located computing resources. This design provided easy access for maintenance and backups while the systems were housed in a secure facility with power management. The downside of mainframe computing was the reliance on a text-based interface that made usage difficult.

The PC revolution was fueled by the user-friendly Graphical User Interface (GUI) that made computing much more accessible to the average user and PCs became a fixture on every desk. However, the proliferation of PCs caused a system management challenge accompanied by the high cost of maintaining so many individually configured and personalized machines.

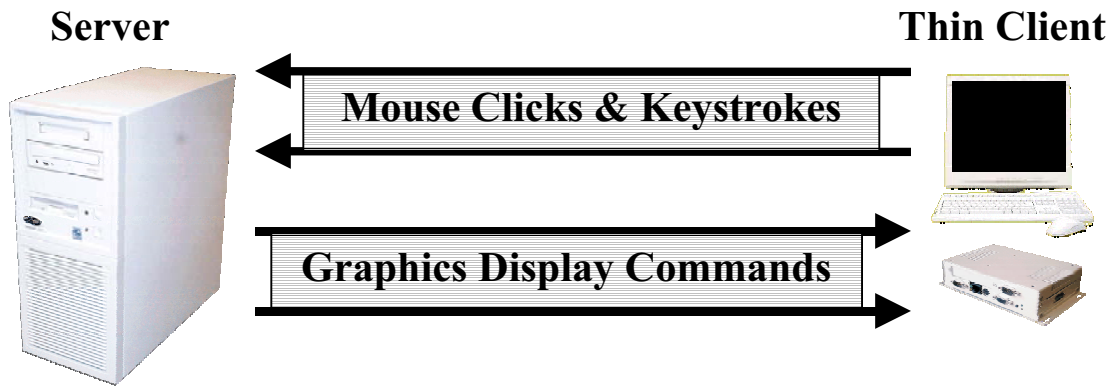
The Thin Client returns to the concept of a centrally managed server for ease of management, with each client running a session on a Microsoft Windows NT/2000 server to provide a familiar, user-friendly interface for the end user. All the applications a user would typically run on a desktop PC (Outlook, Word, Excel, PowerPoint, etc.) now run on the server.

Each user logs on as if they were the only user on the server. Other sessions are transparently managed by the server operating system and are independent of any other client session.

Unlike the traditional client/server environment that runs an application on the client hardware, Thin Clients run an application only on the server in the Microsoft Windows NT Terminal Server/Windows 2000 Server environment. The Thin Client does not perform any local processing of applications. Thin Clients do not have, nor do they need, a hard drive. The Thin Client does not need much memory (32 MB) or CPU power (486) because its only tasks are processing keystrokes and mouse clicks and displaying information on the monitor. All other processing takes place on the central server.

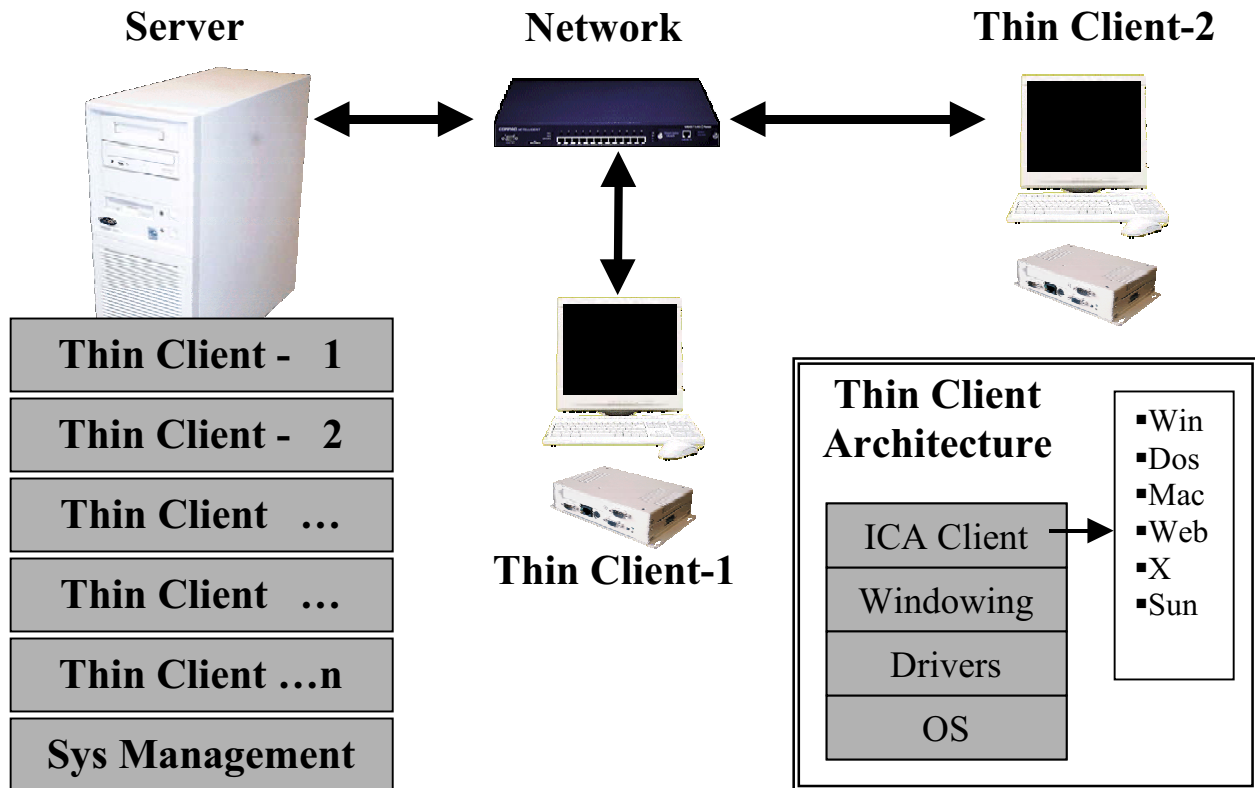
Network bandwidth requirements for Thin Client computing are minimized because the only information transferred on the network are mouse clicks, keystrokes and graphic display commands. The Thin Client sends user inputs (mouse movements and keyboard strokes) to the server where they are processed. The result (the information to be displayed on the Thin Client monitor) is sent from the server to the Thin Client via a network connection.

For example, a graphic display command might be DrawNewWindow(Top, Left, Bottom, Right) to display a window on the Thin Client. This is much more efficient than sending a bitmap of a window over the network.



The Applications Run on the Server and are Displayed on the Thin Client

This design provides stability and reliability. The application is not client-dependent, which means, the Thin Client can lose power, or even be destroyed, but the data is intact and running on the server. Once the Thin Client's power is restored, or if necessary, the Thin Client hardware is replaced, and the connection to the server is re-established, the session will continue where it left off. For example, if a user were in the middle of writing an email that hadn't been saved, and the Thin Client lost power, once the power is restored to the Thin Client and the connection to the server established, the user would find the email just as it was before the power outage.



Thin Clients are a solution that just makes sense. We believe that in the not too distant future most of the applications run will be on the Thin Client model, and ACP will continue to provide state of the art technology and products to further the acceptance of centralized computing.