Thin Clients: Secure and Cost Effective Client Access Devices for Government Organizations

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ABSTRACT

The Vision of Government of India, for making Citizen services accessible to the common man, is slowly shaping up. Most of the Government enterprises are investing on IT and ICT resources. Almost all of the Government departments have series of Personal Computers, which they use as Client access devices for day to day working. This paper is a study and discussion of the using Thin Clients as an alternative to Standard Personal Computers. The paper discusses the advantages of using Thin Clients for e-Governance Infrastructure and their advantages in terms of easy management, low administrative overheads, better Security, lower Total Cost of Ownership and higher Return on Investment. We also discuss and compare various types of Thin Client devices available in the market with recommendations in choosing the best device. This is followed by Thin Client reference architecture.

Keywords: Thin Clients, Access Devices, Thin Clients reference Architecture, Total Cost of Ownership, Return on Investment

1. Introduction

Most of the IT Enterprises and IT enabled Applications, work on a Client Server Architecture, which may be 2-tier or 3-tier depending on the access technology and policies. All most all the IT enabled Government enterprises in the country, today work on this model. Most of the Government web sites catering to e-Governance citizen services are hosted out of the data centers hosting the servers. Clients access the data and applications hosted out of these data centers through PCs. This has led to a PC sprawl in most of the Government offices. Almost all such enterprises face problems related to Management, Administration and issues related to PC Client upgrades, Security, Virus threats and more, ultimately leading to a Higher Total Cost Of Ownership in maintaining these PC based clients.

Lower Cost, ease of management, Simplified administration and Security are amongst the prime required features of most of these enterprises. The Use of Thin Clients as front-end access-devices is an effective and efficient alternative to tackle all of these issues. The idea of using simple easy to use front-end devices to access data and applications from the servers is not new. Dumb Terminals with Command line interface have been used in past since the mainframe days. The advancement in Technology and innovative architectural approaches and also faster Network access has promoted the idea of using Effective and Efficient Thin Clients as front-end devices which are more Secure, easy to Manage and much more Cost

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effective compared to the traditional PCs. This has been endorsed by various Third party Independent Research agencies (Forrester Research Report, 2006).
By 2010, research firm IDC expects 15% of all desktops shipped to be thin clients (Forrester Research Report, 2006). This paper discusses advantages of thin clients, specifically for the Government enterprises, along with various types of thin client technologies and Architectures available from various vendors. We shall also be discussing and presenting a Thin Clients based Secure Architecture suitable for most of the Government Enterprises across the country.

2. Thin Clients: What they are?

Many people have defined thin clients in many different ways. One of the most common generic definitions of a thin client is a device, which does not have a local hard disk and gets its data and applications access from a Server, over the network. Another way to define a thin client is as computer terminals used in central server computing networks. Thin client computing works like a modern-day version of mainframe computing using dumb terminals and central servers for data storage. (www.thinclientcentral.com/ definitions.html).

There are various variants of thin clients available from various vendors. As an example, some vendors supply Ultra Thin Clients, which are totally stateless devices, with No data, Application Or Operating System in whatsoever form. They are supposed to be more Secure and easily manageable compared to other thin clients available in the market.
Government enterprises in the country, who are rapidly moving onto e-Governance Infrastructure, with most of the day to day Government Services being hosted on web sites, should consider going the thin client way because the thin clients provide following minimal benefits.

- Lower Maintenance Requirements
- High Security (Most of them come bundled with Smart card readers or biometric devices)
- No Virus Threats
- Cost savings and Overall Lower Total Cost Of Ownership.
- Easy Administration
- Low Power Requirements
- Less Real Estate Space Requirements.

As mentioned above, various vendors have various types of thin client devices and Solutions, but the Government enterprise should evaluate all the requirements and match it to available models keeping in view at least the basic features discussed in this paper as the selection criteria.

Enclosed here is the summary of some of the commonly available models of Thin Clients from various vendors.

Windows based Thin Clients
These Thin Clients run some form of Windows Operating System, using thin display protocol. Vendors like Wyse (Models like Wyse S10, Wyse S30, 9150SE, 9455XL, 9650XE, 941GXL), (www.thinclient-central. com/ wyseinterm.html), HCL's WINbee 4000 and 3000 series (www.hclinfosystems.com), VXL's and HP's t5xxx/ t5720 are some of the examples of windows based thin clients.

- Linux Based Thin Clients: These Thin Clients run very thin version or full-featured Linux as the Operating System on the client end. Examples include Wyse (S50, V50L), HP t5xxx/ t5525.
- Ultra Thin Stateless Thin Clients: These are the most secure and easily maintainable devices, which do not have any operating system, in any form. They are just like Graphics enabled dumb terminals that do not have anything of the own and work over the network. Sun Microsystems Sun Ray Thin Clients (Models Sun Ray 270, Sun Ray 2/2FS) are examples of this type of devices.

3. Desired Features

This section highlights the desired features, which should be evaluated and considered while deciding and choosing the type of Thin Client device.

i) Thin Client should be an Appliance with no moving parts.

A Thin client device should be like a telephone, which can just be plugged into the socket/network, and it should start working, there should be no moving parts and no configuration required at the client-end to ensure Easy installation and no maintenance.

ii) Minimal Power and Space Requirement

This is an important criterion in deciding the type of thin client. The device should not take much of power and space. There are models available in market, which just take 20W of power (compare to 400W of a generic PC). If the devices will not have any local data in whatsoever form, as being offered by some of the vendors, these devices may not even require a UPS and should work on just a stable power. Since there is no Operating environment, Data or Application at the front end, the device needed not be kept always on using a UPS. This will lead to tremendous savings in Power and cooling.

iii) Security Features

The Device should have bundled Security Features like Biometric devices or Smart Card Readers, to ensure secure authentication and session management. One should always look for encrypted data transfer between the thin client device and server.

iv) No Virus Threats

Thin Clients in general minimize the risk of virus attacks, but one should select a device, which is shielded from virus threats. A device which will not have any data, in whatsoever form (including Firmware based Operating Environment), at the client end will be more secure than any other device, as it will not have any provision to transfer data from and to the client, unless enabled by the system administrator.

v) Built-in Graphics and Other I/O ports

Most of the thin client devices of today have good graphics capabilities and display high-resolution applications in standard GUI format. While selecting a device one should ensure that the normal web pages should be displayable. Also the device generally has keyboard, mouse and audio ports. It is recommended not to have web cam ports as these devices are not meant to act as a Multimedia PC, but are Secure Client access-devices to access Government services in a secure manner.

vi) Simplified Management and Simplified Patch and Upgrade Facility

Since all the applications and data are on the server, there should be no need of any Upgrades, not even firmware upgrades at the client end. Even patch management is simplified, as it needs to be done only at the server level.

vii) Session Management

For most of the thin clients, users sessions are maintained at a central thin client server. This server maintains users sessions, independent of the physical thin client device. Some vendors like Sun offer hot desking capability, in which a user session moves with the user, as the user moves from one physical thin client device to another. One should choose devices, which ensure session maintenance even in case of power cycle at the client end.

viii) Lower TCO and Higher ROI

Advantages of simplified management, lesser administration overheads, less power consumption leads to

overall lesser Total Cost of Ownership (TCO) and better Return on Investment (ROI).

ix) Virtualized Secure Desktop and Heterogeneous Environment
Most of the thin clients available today, allow for access to heterogeneous environment, consisting of Unix, Linux or Windows. The Thin Client is a Virtual desktop which should be able to use and display any kind of operating environment, be it Unix, Linux, Windows or even main frame. The ideal situation is when the Thin Client device is not having or is not dependent on any Operating System.

4. Comparison of Various Models in terms of desired features

As discussed above, various models of Thin Clients are available from various vendors. While deciding and choosing on a particular model, one should evaluate all the features discussed above along with the Total Cost of Analysis over a specific period of time. The enclosed table summarizes the features of a typical Thin Client and compares various models available in the market.

While deciding on a particular model, the Government enterprise should focus on evaluating these features, which include:

- Configuration and Administration at the client end: lesser the configuration needed at the client end, easier is the management and administration. If there is no configuration required at the client end, The Government enterprises save a lot of resources required to manage and administer the clients. The Thin Client device should not require frequent upgrades or patching. Lesser the configuration required at the client end better is the Thin Client. Ultra Thin Clients like Sunray fit best into this category.
- No Operating System at the Client End: For ease of Administration and no vendor lock in, the Government enterprise should go in for thin Clients which have no Operating System in whatsoever form, including no firmware based Operating system at the client end. There are Thin Client models available in the market, which are based on Linux or Windows, but one should always prefer Thin Clients with no Operating System at the client end.
- Security: Secure Access to the data and Applications is the prime criteria of most of the Government enterprises. The Thin Clients should have embedded security. They should be provisioned for Secure Authentication and Session Management. The Data flow between the Thin Clients and the Servers should be encrypted. The devices should be embedded with a Smart Card reader or biometric device for controlled Secure Access.

The Table 1 shows that Ultra Thin Clients with built-in card reader and secure authentication are more secure than any other thin client available in the market.

5. Thin Clients v/s PCs: TCO Analysis

Moving to a Thin Client architecture from a PC based architecture can lead to cost savings. (Forrester Research Report, 2006) Calculating the Total cost of Ownership of PCs or Thin Clients requires evaluating a combination of costs for installation, Configuration, maintenance, Administration, Upgradation, Virus Protection, and Licenses etc. While doing a TCO analysis, of using Thin Clients instead of PCs, all these costs should be taken into account. Various online TCO tools are available over the Internet (www.2x.com, www.netvoyger.co.uk) for doing Thin Client v/s PC, TCO Analysis. Enclosed is an example of TCO analysis of using 20 PCs verses 20 Thin Clients over a period of three years. The example assumes a typical conservative PC costing Rs 35,000/ per PC verses an entry level Sun Ray Thin Client, which costs about Rs 35,000 per seat (including cost of Servers and Software and Licenses). Doing a Total Cost of Ownership analysis over Three years, The Thin Client Architecture proves to be at least 40% cheaper than a traditional PC architecture.

Table 1: Thin Client Comparison

Thin Client Features/Types	Ultra Thin Stateless Clients	Windows Based Thin Clients	X Terminals / Linux Thin Clients
Local Operating System	No	Yes	Yes
Local Configuration	No	Sometimes Required	Required
Secure	Best	Less	Less
Smart Card based Session Mobility	Yes	No	No
Client Remote Administration	Not Required	Sometimes Required	Sometimes Required
Color Depth/ Audio Quality	24 bit color high resolution	Depends on local models/configuration	Depends on local models/configuration
How to increase Client Performance	Adding memory or processor to client DOES NOT affect Performance	More memory and processor power Required to improve performance	More memory and processor power Required to improve performance
Upgrades Required	No	When OS, Protocols or applications change	When OS, Protocols or applications change
Management / Administration at Client	Not Required, automatically managed	Required	Required

The cost factors taken into account in calculating the TCO include:

- Desktop Administration Cost: An Ultra Thin Client like Sun Ray does not require any Desktop Administration and has zero administration cost attached to it as compared to a PC which requires regular desktop maintenance and administration. Typically a System Administrator is required to maintain and administer these PCs. In this example we have assumed a minimal Salary of Rs 60,000 p.a for a PC administrator.
- Desktop Software Cost: A Typical PC will have Windows Operating System along with Office Productivity suite like MS Office installed on it. In this example, a cost of Rs 20,000 per seat has been assumed for the same. In contrast a Thin Client like Sun Ray will not require any software to be installed on the client end. It connects to the OS and Office productivity suite like Star Office or OpenOffice residing on the server. Most of the Government organizations will prefer using Open source free Operating System (like Solaris or Linux) and free Office productivity Suite (OpenOffice, StarOffice). There is no acquisition cost attached to the same.
- Desktop Refresh Cost: Typically a PC will require patches, Service packs or sometimes hardware or firmware upgrades. There is no such requirement in Ultra Thin Sun Ray thin clients.
- Helpdesk related Cost: A PC kind of environment typically has day-to-day user related calls. A thin client environment generally has at least 25% less calls, as they are self-maintainable thin client appliances.
- Service/Repair Cost: A Thin Client environment is based on a reliable, highly available and easily serviceable server, typically requiring no or very little maintenance at the client end.
- Security/Viruses Related Cost: Thin Clients, specifically Sun Ray Thin clients do not have any data, applications or Operating system and hence are not prone to viruses and hence do not require a anti-virus software typically required in every PC. Antivirus Software cost of Rs 2000/ per PC is assumed in this example. The Sun Ray Thin Client comes bundled with encryption capabilities of data and Smart card reader for secure access. Typically a smart card reader would again cost about at least Rs 2000+/ per seat.

- Power/UPS Costs: Typically a PC required 400W,whereas a Thin Client device requires less than 20 W of power. A PC has an Operating system and requires a UPS to avoid crash of Operating System due to multiple power failures. On the contrary a Sun Ray thin client has no data, OS or Applications and hence does not mandatory require a UPS.

Table 2: TCO example

Category	SunRay Thin Clients	PC
Initial Cost	35000	35000
Desktop Administration	0	60000
Desktop Software	0	400000
Desktop Refresh	0	20000
HelpDesk	54000	72000
Service/Repair	0	20000
Security/Smartcard	0	40000
Virus	0	40000
Power	0	40000
	89000	727000

All Costs in INR

Conservative Estimates only

The estimates taken in this example are conservative assumptions. Any further savings in individual items will further lead to a better overall Cost savings. The idea is to highlight the factors to be considered while calculating a TCO of Thin Clients versus PCs. As can be seen from above TCO analysis, example, for a period of three years, using 20 Thin Clients compared to using 20 traditional PCs gives at least a 70% cost savings.

6. Recommended Architecture

Thin Client implementation can range from a small network within a single office to an environment where thin clients are deployed over multiple locations to multiple end-user groups. The enclosed reference architecture in Figure 1, is based on the Ultra Thin Stateless Client devices. These stateless thin client devices are connected to a thin client server, which authenticates the users and maintains users sessions. Two Thin Client Servers are recommended for load balancing and High Availability, so that even if one server fails users can still get authenticated and access the applications.
Generally the cost of individual thin client, in this kind of architecture is includes the server, software and licensing costs.

With this kind of Thin Client reference architecture, users can virtually access any application environment, be it Unix, windows, Linux or even mainframe environment. The Applications can also be securely web enabled using remote desktop protocol or Secure Global Desktop Client Software/s. Because the application, data and operating system resides on the server, the thin client devices requires no administration at the desktop and a users session is hosted and maintained on the server. This centralization of data, applications and operating system creates a stateless desktop environment that is both secure and efficient to maintain.

Some vendors like Sun, have their Ultra Thin Stateless clients, which with a built-in smart card reader. The Smart Cards can be used to enable “Hot Desking” and Session maintenance, which is an ability for a user to move their sessions, from one Thin Client to another across offices, even over WAN. This implies if two Government offices, say one in Delhi and Other in Hyderabad are connected over network, if a user initiates a session at Delhi and starts working on the application, he can access the same session, in exactly

same state from Hyderabad. These smart cards can further be java enabled to provide increased levels of security with biometric authorization.

This kind of architecture leads to reduced administration, less power consumption and easy management and advantages of session mobility with hot desking features and are strongly recommended for Government organizations.

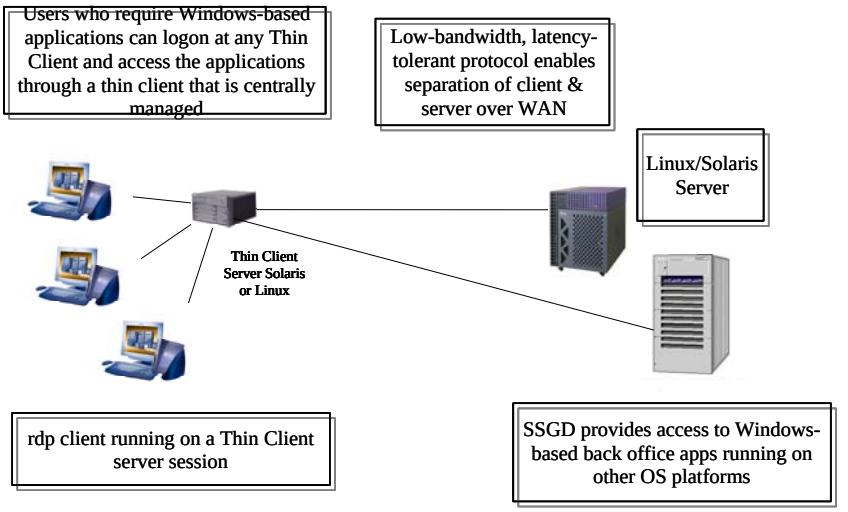

Figure 1: Ultra Thin Client Architecture

6. Concluding Remarks

Deploying Thin Clients as front-end Client Access devices leads to many benefits. It is recommended to deploy "Stateless Ultra Thin Client devices" for most of Government departments.

Efficient and effective deployment of these devices will lead to many advantages as highlighted below.

- The use of Ultra Thin Secure stateless devices instead of PCs leads to decrease in maintenance, employee user time, IT Operations and Software license costs, leading to Reduced TCO and better ROI.
- Decreases risk of Virus attacks
- Eases Management and operations
- Reduced downtime, and gives a highly available architecture.
- Decreases the chances of theft of data from the client end.
- Leads to fewer environmental requirements and lower energy costs.
- Stateless Ultra Thin Clients like Sun's Sun Ray Thin Clients, offer better security and additional features like hot desking and session mobility.
- Thin Clients should be deployed as Secure Client access devices and should not be considered as replacement of Multimedia PCs.

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