

White  
Paper

# Total Cost of Application Ownership (TCA)

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## 1. INTRODUCTION

In today's rapidly changing business environment, competition is intensifying and accelerating by the hour. Success is dependent upon the speed at which an organization can empower its employees and reach customers. Technology now plays a strategic role, and of all the tools available to the business community, applications are the most critical. Organizations that can extend the reach of business-critical applications to users wherever, whenever and however they are needed, are developing a strategic advantage in the networked economy.

Users need ready access to applications in order to be productive, whether they are employees, suppliers, vendors or customers. Applications enable organizations to generate revenue, offer new and better services, increase levels of user knowledge and enhance overall productivity. For business organizations, applications are crucial to achieving and sustaining a competitive advantage.

But delivering applications in this complex environment is becoming more costly than ever before. Organizations must contend with increasingly diverse hardware, software and network technologies that can be rendered obsolete in a matter of months. As a result, the cost of providing applications to users continues to grow at an alarming pace.

Even though the prices of hardware and some computing technologies are falling, the convoluted nature of today's enterprise environments is causing the overall cost of IT services — and specifically the cost of deploying applications — to skyrocket.

This paper presents a new paradigm for analyzing the costs of providing applications to users in today's complex, Internet-driven computing environment. While most research has focused on a hardware-oriented view of costs, this model presents an application-specific view and considers how applications are deployed, the locations of users, the variety of connectivity options and the varied types of client devices.

According to The Tolly Group, the initial and recurring costs of providing applications can well exceed \$10,000 per user. Client and server hardware costs constitute less than 15 percent of this total. The other 85 percent include the costs of network and communications infrastructure, and the cost of personnel required to develop or acquire, maintain and update applications, and provide ongoing technical support. Finally, there are the hidden costs of lost productivity incurred when users are unable to access important applications with the appropriate level of performance.

The Tolly Group has determined that a server-based approach to computing, such as the Independent Computing Architecture (ICA®) of Citrix Systems, Inc., offers distinct direct and indirect cost advantages. These advantages enable an organization to extend the reach of applications to users throughout the world while increasing manageability and reducing costs by as much as 65 percent.

## 2. TRUE COST OF PROVIDING APPLICATIONS

In the recent past, analysts and IT professionals have developed numerous models for estimating the total cost of IT services, popularly termed “total cost of ownership” (TCO). Such models have typically analyzed the costs of owning and maintaining a personal computer (PC) or other specific forms of desktop computing hardware. This hardware-centric view of costs is increasingly irrelevant in the age of the Internet, Web-based computing and E-commerce. In today’s networked economy, applications must be extended to a growing population of mobile and geographically dispersed users, both inside and outside the company. Applications must be accessible across a wide variety of connectivity options, from low-speed dial-up connections to wireless, WAN- and Internet-connections. And the growing diversity of computing devices, from legacy PCs to network terminals, Macintosh® systems, Unix® workstations, NetPCs, wireless tablets and emerging information appliances, makes the task of application deployment all the more difficult — and expensive.

A contemporary cost analysis should consider the total cost of application ownership (TCA), rather than the total cost associated with specific computing devices. In addition, the analysis must consider how applications are deployed, the locations of users, the variety of connectivity options and the varied types of client devices.

The Tolly Group has developed a model for comparing the TCA of different computing models. This model is based on extensive research and on-site interviews with customers to create and model profiles for more than 60 applications across multiple industry segments and computing environments. Our research investigated the manner in which applications were deployed, and analyzed the costs associated with developing, acquiring, delivering and maintaining these applications.

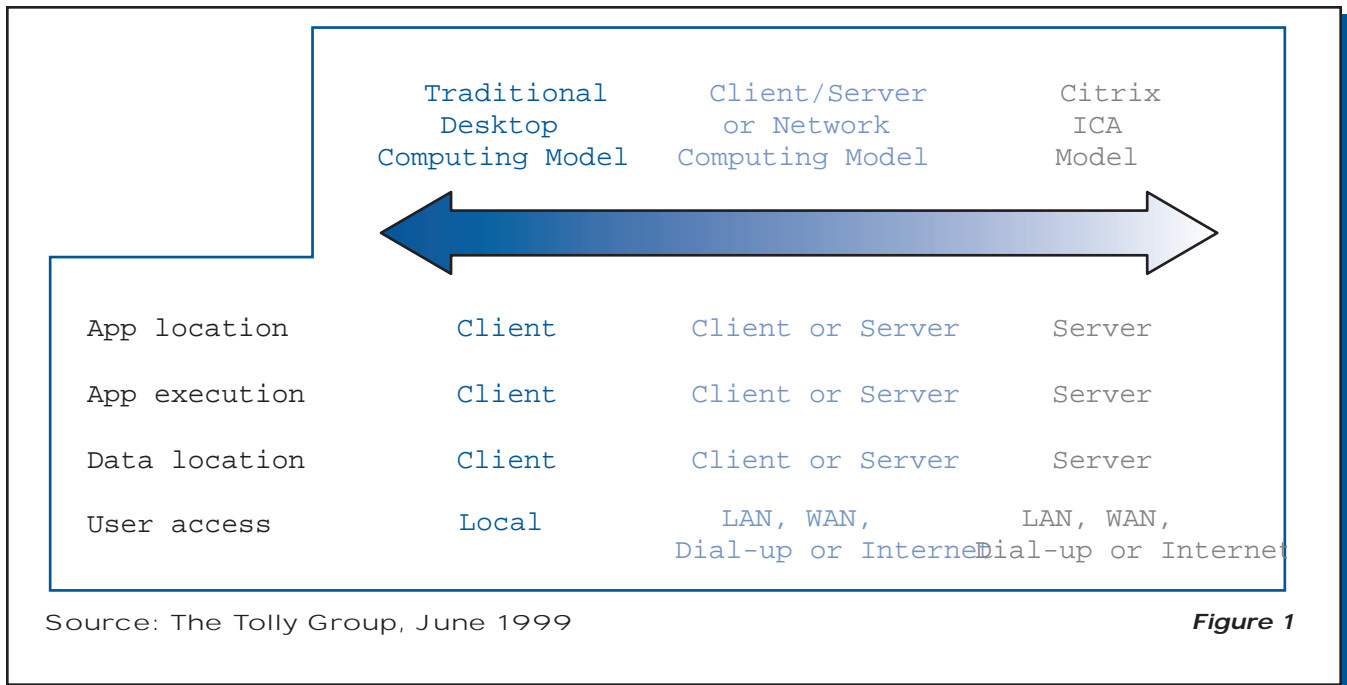
### 3. TOTAL COST OF APPLICATION OWNERSHIP

The Tolly Group's analysis identified four critical factors that determine the cost of application deployment. These include the location in which the application is stored, the location in which the application is executed, the location of the data and the location and means of connectivity of the user. The total cost of providing applications can be analyzed more accurately and with greater predictability by considering these four factors:

1. **Physical location of the application:** The choice of where an application is stored — on the server or on the client — is a determining factor in the cost and complexity of deploying and managing an application over time. IT personnel costs, as well as the time required to distribute, install and configure an application, and the cost of managing updates on tens of thousands of computing devices must also be considered.
2. **Execution location of the application:** The choice of where an application actually runs — whether on the server, on the client or on some distributed combination — determines the hardware, network and connectivity required to access the application. If executed locally, the device must be capable of running the application. This often involves the need for extensive hardware upgrades or wholesale replacement of platforms. If the application is downloaded from a server to run on a client, ample network bandwidth must be available to provide the necessary level of performance and responsiveness. These factors have a direct impact on end-user productivity.
3. **Physical location of the data:** The location of stored data can also determine the speed at which information is available, as well as the cost associated with protecting and backing up valuable corporate data.
4. **Location of the user and means of connectivity:** A user's location and network connectivity can have a dramatic impact on the cost and complexity of deploying an application. Other cost factors include support personnel, network infrastructure and the amount of bandwidth required. When considering all of these factors, the cost of deploying a business-critical application to hundreds or thousands of users in dozens of branch or international offices around the world can be prohibitive.

Figure 1 summarizes the manner in which applications can be deployed and the corresponding computing model.

**Figure 1:  
Application Deployment Approach and Computing Model**



### TCA and Computing Models

For the purposes of modeling and comparing TCA, this document classifies three computing models (see figure1):

- ❖ Traditional desktop model — All applications are stored and executed on the desktop, creating the need for fully functional PCs and workstations to run the application
- ❖ Client/Server and Network Computing model — Applications are stored on a server, downloaded, and executed on networked or “thin” client devices such as a NetPC, network computer or PC
- ❖ Citrix® ICA model — All applications reside and execute on the Citrix server, enabling any client device to access the application

## **Traditional Desktop Computing Model**

In order to provide access to the latest and most sophisticated applications, the traditional desktop computing model requires a full-function, fully configured PC. This approach also demands a sizable support staff to deploy and maintain applications and to address problems created when users modify their systems. Since a hardware or software failure on any individual desktop can render an application unavailable, lost productivity becomes a major cost factor. As a result, the traditional desktop computing model usually leads to the highest cost of application ownership.

## **Client/Server or Network Computing Model**

In the Client/Server or Network Computing model, the most common configuration is where applications and data are stored on the server but downloaded just to the client during execution. This often generates excessive network traffic and leads to higher network costs. Lack of network bandwidth can also result in loss of productivity due to poor application response. This can be particularly problematic for mobile and remote users. In addition, a downloaded-application approach still requires a high-end client processor, which can preclude an organization's ability to leverage existing investments in desktop hardware. Other thin-client models dictate that customers incur the cost of replacing their installed base of "obsolete" PCs.

## **Citrix ICA Model**

A client-independent approach, such as Citrix's Independent Computing Architecture (ICA), yields the lowest cost of application ownership of the three models analyzed. Since applications reside and execute on the server, the time and costs of installing, configuring and deploying applications to users is greatly reduced. And since only the graphical user interface (GUI) of the application is distributed to the client, virtually any device can access even the most sophisticated applications. This client-independent approach can distribute applications over any network to virtually any client device in any location and deliver LAN-like performance. It doesn't matter if users are working on high-end PCs, legacy (386, 486) PCs, Unix workstations, Macintosh systems or network- and Windows®-based terminals.

While server-based computing is usually perceived to drive up network usage costs, this is not the case with the ICA model. Only key strokes, mouse movements and screen updates are distributed to the client, so high performance is possible even over low-speed connections. This approach not only reduces network traffic, it can improve performance and productivity for WAN, Internet-connected and remote dial-up users by as much as 10 times while using existing network infrastructure. Organizations are able to avoid the significant costs of network infrastructure upgrades for additional bandwidth and significantly reduce ongoing data communications service costs.

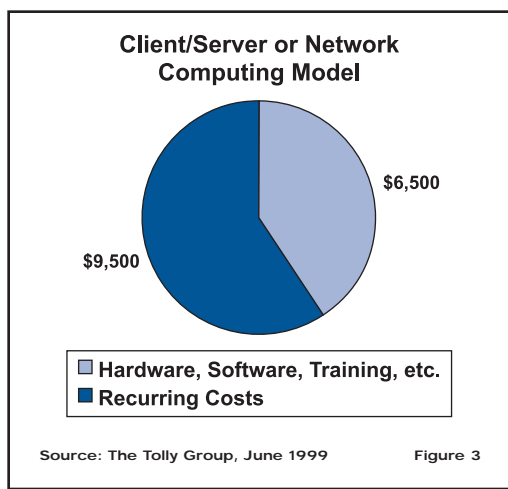
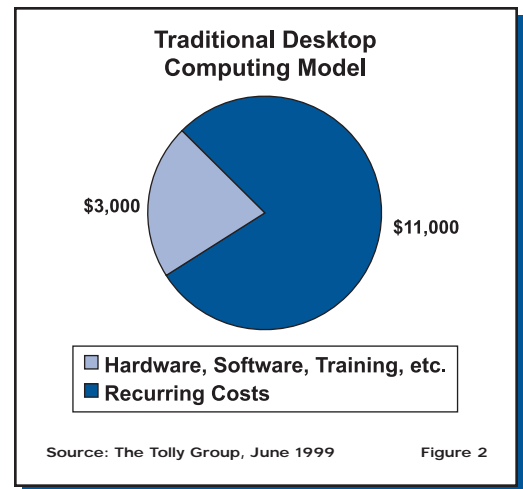
Finally, users can access virtually any application, including tens of thousands of Windows-based applications. These applications can be rapidly deployed across any type of network or form of connectivity, including corporate intranets or extranets, and the Internet.

## 4. ANALYZING TOTAL COST OF APPLICATION ELEMENTS — AN EXAMPLE

As an example, consider a medium-sized enterprise of 2,500 users, with 175 users on the road or working from offices at home. The enterprise's application distribution and management is not automated and the networks are utilized at 65 percent of capacity. Given this scenario, The Tolly Group computed per user total cost of application ownership against three potential computing models.

### Traditional Desktop Computing Model

In this case, the first year TCA is about \$14,000. Approximately \$3,000 of this cost was used to acquire hardware, software and required network infrastructure, and to provide end-user training. Annual recurring costs, including technical support, application maintenance and productivity-related costs came to approximately \$11,000. By automating the maintenance of the application, the annual cost per user could be reduced by approximately \$2,000. Recurring costs remain constant during subsequent years.



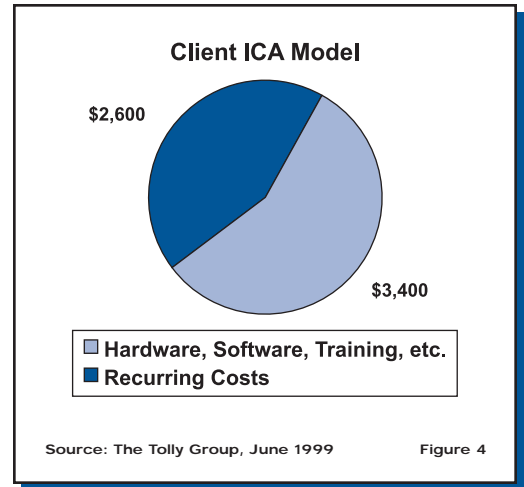
### Client/Server or Network Computing Model

A Network Computing approach requires an up-front investment to replace existing client hardware. This results in a first-year TCA of approximately \$16,000. Of this amount, initial hardware and software acquisition, training and network infrastructure costs run approximately \$6,500. Recurring costs during the first year are approximately \$9,500. However, due to lower recurring costs, this model becomes less expensive than the traditional desktop model from the third year forward.



### Citrix ICA Model

The Citrix ICA model yields the most favorable TCA of \$6,000, because it enables any type of client device to access any application across any form of connection. For IT, this model provides single-point deployment and management of applications, and the ability to maximize performance independent of bandwidth or form of connectivity. This approach also yields productivity cost advantages for remote and mobile users because of increased application responsiveness and performance.



## 5. THE MOST EFFICIENT COST MODEL

The Citrix ICA solution is a server-based approach to application deployment and management. It offers organizations the independence, speed and flexibility needed to extend any application to anyone, anywhere. As a result, IT organizations are able to provide high-performance access to any application from any type of client, independent of bandwidth.

As shown in Figure 5, the Citrix ICA model provides substantial cost advantages over other forms of application deployment, both initially and over time. Even with automated application distribution, the total cost advantage over four years can be as much as 65 percent.

**Figure 5:**  
**Cost Analysis of Client/Server and ICA Client Models**  
**Percent Differential Relative to the Traditional Desktop Model**

	<b>Traditional Desktop Model</b>	<b>Client/Server or Network Computing Model</b>	<b>ICA Client Model</b>
<b>First-year total</b>	<b>100%</b>	<b>114%</b>	<b>56%</b>
<b>Second-year recurring</b>	<b>100%</b>	<b>96%</b>	<b>48%</b>
<b>Four-year total</b>	<b>100%</b>	<b>85%</b>	<b>35%</b>

Source: The Tolly Group, June 1999

Figure 5

The Citrix ICA model delivers the most efficient and cost-effective solution to application deployment and management because it offers the following strategic advantages:

- ❖ Enables organizations to rapidly deploy applications, even across the most complex computing environments
- ❖ Increase manageability and security of applications
- ❖ Provides application access to all users, regardless of location or form of network connectivity
- ❖ Leverages all existing investments in hardware, software and network infrastructure
- ❖ Provides access to sophisticated applications with performance similar to high-end PCs
- ❖ Requires no changes to applications or client hardware
- ❖ Eliminates capital costs of upgrading PCs every two to three years

- ❖ Reduces network bandwidth requirements to a fraction of what an application would normally require, enabling greater capacity to be derived from the existing network infrastructure
- ❖ Enhances response time and productivity for WAN and dial-up users
- ❖ Provides access to tens of thousands of applications without any programming changes
- ❖ Supports the widest range of client devices, both Windows- and non-Windows
- ❖ Delivers substantially greater cost reduction in TCA than any other solution

For customers looking for a low-risk way to rapidly deliver applications to users anywhere, anytime, Citrix ICA offers the most manageable and cost-effective solution, today.

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