Attachmate

WHITE PAPER

The Next-Generation PC X Server

How It Maximizes the Value of Your UNIX Applications

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For decades, servers running the UNIX operating system have hosted the applications that power your business. They range from financial applications that monitor the stock market, to oil exploration applications that display graphical views of geological surveys, to design applications with layout and test capabilities for complex circuits. The UNIX platform supplies the robustness and scalability demanded by these applications.

The job of the PC X server is to tie Windows® desktops and UNIX applications together. But today's technologically mature PC X servers are beginning to show their limitations. Modern IT and business initiatives—such as server consolidation, virtualization, green computing, reliable remote access, and better collaboration among geographically dispersed employees—are driving the need for new capabilities that traditional PC X servers are not equipped to deliver.

Next-generation PC X server requirements fall into one broad category: the ability to support today's remote, distributed, highly collaborative business environments. This white paper describes these business-critical capabilities in detail. It tells how they can strengthen the value of your business—by enabling you to maximize the value of your UNIX applications. In the final section, you'll find a table that highlights the capabilities now available in Attachmate's next-generation PC X server.

Multiple Stakeholders, Multiple Needs

There are different types of UNIX applications. The earliest applications—nongraphical and character-based—continue to be accessed through VT terminal emulation software. Many of today's more modern applications are hosted on web servers running on UNIX servers; the only requirement is a web browser on the user desktop. There are also countless business-critical applications known for their rich graphics and user-friendly features. Initially accessed through X terminals, these applications are now accessed from desktops via PC X servers.

It is this last class of UNIX applications, built on the X Window System, which stands to gain the most from new developments in PC X server technology. That's because the people with a vested interest in these applications—IT managers who run data centers housing UNIX servers, CIOs with shrinking budgets, and increasingly mobile and geographically dispersed business users—have so much to gain. Their specific challenges are outlined below:

- **IT managers**
  Modern initiatives supporting server consolidation, virtualization, and green computing are driving the use of fewer, more powerful UNIX servers. Acting on these initiatives means housing a reduced number of physical UNIX systems—and locating them in primary data centers.

  In this scenario, users who once connected to regional UNIX servers now use PC X servers to access applications running on a geographically distant UNIX server in the data center. From IT's perspective, the benefits are worth the effort: fewer physical systems to manage and maintain, optimized server utilization, and less power consumption.

  Long-term success, however, hinges on IT's ability to maintain application availability and performance—especially in light of mounting pressures to support heterogeneous desktops. Faced with phased OS rollouts, Linux-centric user communities, and increased workforce mobility, IT managers need PC X servers capable of supporting users from the office, from the road, and from home.

- **CIOs**
  The modern CIO is facing two challenges: a shrinking IT budget and a growing need to comply with external security regulations.

  Capitalizing on core assets—for example, by extending the life and usability of your UNIX applications—is one way to operate within existing budgets. For this reason, CIOs are looking to breathe new life into existing UNIX applications by extending their reach, usability, and accessibility.

  Because data security breaches are increasingly damaging and public, CIOs must budget for stronger security. Any application that transmits sensitive information, including customer financial records, patient health information, proprietary corporate data, or even user passwords, must be able to securely move that information over open networks. Encryption and authentication capabilities are a modern PC X server necessity.

- **Business users**
  Business users face productivity challenges on a daily basis. In today's electronic world, they must be able to start a project in the office and then pick it up again from the road or from home. They must also be able to collaborate with co-workers or partners in other locations, sharing documents or application user interfaces in real time.

  To address this requirement, modern PC X servers must be able to provide reliable remote access to UNIX applications, transfer active applications from one location to another, and share views of UNIX applications in real time.

It's imperative that PC X servers support these modern IT and business initiatives, without sacrificing performance or usability.

What's Needed Now?

The needs of today's IT managers, CIOs, and business users translate into a new set of capabilities that traditional PC X servers are not equipped to handle. These new capabilities include:

- **Secure remote access**
  Users accessing UNIX applications from outside the corporate intranet or through a WAN connection expect reliable access and performance. In order to provide anywhere, anytime access, IT security managers must ensure that users are authenticated and that sensitive information traveling between desktops and UNIX servers is encrypted.
- **Session persistence**
  Users need to be able to start a UNIX application, leave it running, and reconnect to it at a later time—perhaps even from a new location. If a network error or desktop crash occurs, users need to know that the application will be available when their systems recover.
- **Session transfer**
  Users often start working with a UNIX application from their office desktop and then later relocate to a different desktop in another office or at home. They need to be able to resume work where they left off.
- **Session sharing**
  Colleagues in offices around the world should be able to concurrently see the same view of the same X session in real time. They should also be able to collaborate on projects in real time.
- **Multiplatform support**
  Given today's heterogeneous desktop environments, the modern PC X server must be capable of supporting a variety of desktop platforms and platform versions.

When armed with these next-generation capabilities, IT managers, CIOs, and business users will no longer have to grapple with the performance and usability issues raised by desktop diversity, geographical distances, and user mobility.

Traditional PC X Servers Fall Short

Clearly, the modern PC X server has a big job to do—one that a traditional PC X server can't easily handle.

Historically, PC X servers have operated within a two-tier model for delivering graphical applications from UNIX systems. The PC X server runs on the desktop and connects directly to the X client application running on a UNIX server; the X client then communicates back to the PC X server (see Figure 1). The protocol used between the PC X server and the X client is called the X protocol.

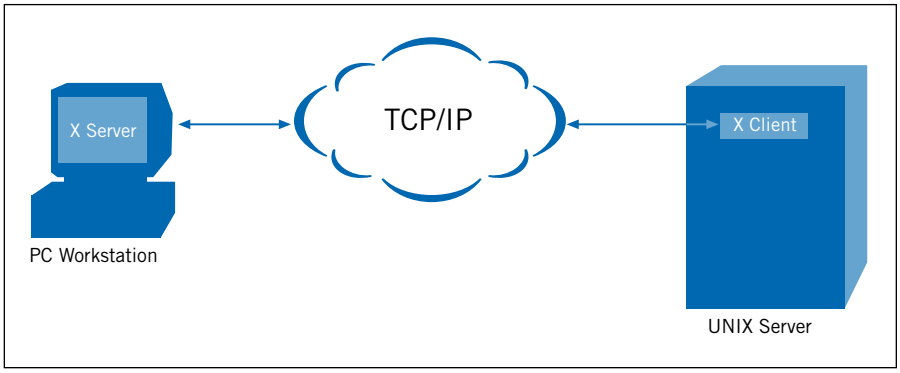

Figure 1: Traditional PC X server connectivity

While time tested and reliable, traditional PC X servers operate best when users are tied to a single desktop and location; these users require a low-latency connection to the UNIX server. But today's remote users work outside of that rigid set of conditions. Packets of data must travel through multiple network devices (routers, switches, and bridges) over potentially high-latency network segments. Because much of the network may be public and beyond an organization's control, there is often a correlation between physical distance and the performance of the application.

In addition to these conditions, the simple two-tier model falls short of meeting modern requirements for three reasons:

1. **High packet volume**
   Whenever an X client instructs the PC X server to display the graphical elements of the applications, it generates packets of data. Data packets are also created by user-driven events, such as cursor motion and button presses, which must be communicated back to the X client by the PC X server. Beyond that, an X client will frequently ask the PC X server about its status and capabilities.

   These "inquiry-only" requests represent a large number of data packets placed on the network. What's more, many of these messages are transmitted synchronously, meaning that they must be received and responded to before the next message can be sent.

2. **Large packet size**
   When an X client transmits an inquiry to the PC X server regarding its status or capabilities, the inquiry response messages frequently contain large amounts of data, which become sizable network transmissions. Because larger data messages take longer to transmit, they can have a significant impact on the responsiveness of the X application.

3. **Connection persistence**
   The X protocol relies on a persistent TCP/IP connection between the PC X server and the UNIX system hosting the X client. If that connection is broken, deliberately or inadvertently, it cannot be reestablished. The X client ends (or hangs) and must be restarted. In the process, data may be lost. Because of this limitation, users are unable to start work within an application, leave it for a period of time, and then resume work from the same or a different location.

In short, reliable remote access is difficult to achieve, even for the most optimized and efficient X applications. The modern PC X server must somehow reduce the number and size of the data packets traversing the network between PC X server and X client. And to ensure session persistence and reliable session transfer capabilities, the traditional two-tier architecture must be revamped.

The Solution: A Distributed Architecture

The modern PC X server needs to be able to distribute the work it does across multiple systems. A distributed approach would shift some of the traditional user desktop functions to a system that is co-located with the UNIX server, or to the UNIX server itself.

Central to this approach is finding a way to host a set of core X functions as a set of middle-tier services. These functions can then communicate with both the X client executing on the UNIX server and the X display services running on the user desktop (see Figure 2).

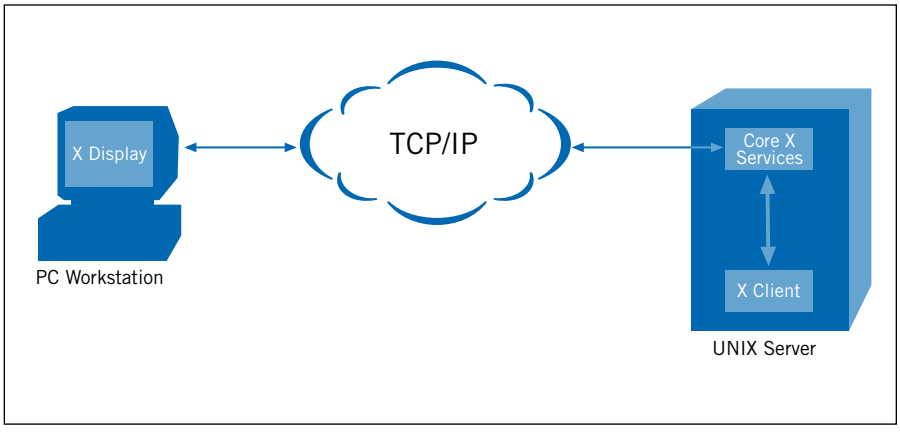

Figure 2: Core X services communicating with the X client and the X display

By running a set of core X services on the UNIX server (or another system), we can improve substandard X application performance (characteristic of geographically distant desktops) and ensure connection persistence in three ways:

1. **Reroute inquiry-only requests—and reduce packet volume**
   The core X services executing on the UNIX server (or another system) can respond to X client inquiry-only requests for capabilities and status, eliminating the need to send all such requests and their responses the full distance between the desktop and the UNIX server. Furthermore, certain synchronous messages will not need to wait as long for a response.

2. **Compress the X protocol—and reduce packet size**
   The X protocol that flows between the core X services in the middle tier and the X display can be compressed, reducing the size of the packets flowing over the longer network path. Smaller data packets require less time to transmit along the full distance between the desktop and the UNIX server (see Figure 3).

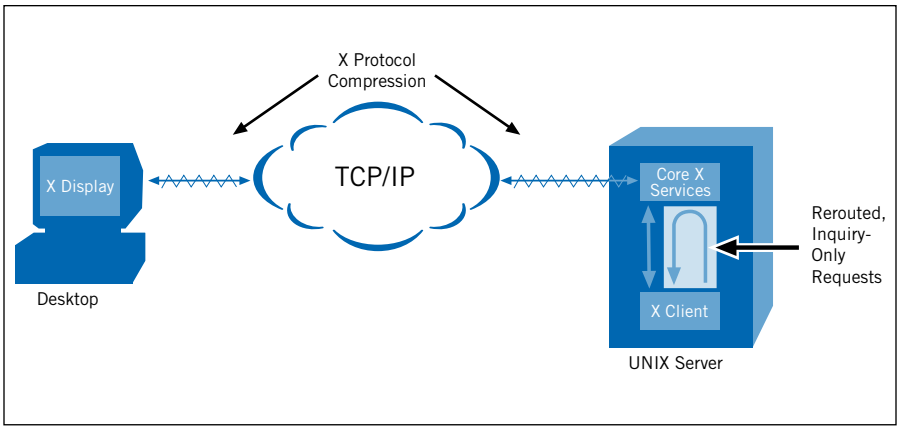

Figure 3: Rerouted inquiries and X protocol compression

3. **Maintain persistence and synchronicity—and improve user productivity**
   The addition of distributed core X services also addresses the need for connection persistence. The TCP/IP connection to the X client can be established and kept active by the core X services running in the middle tier. This structure allows the X client connection to persist, even when users shut down their desktops or experience a system crash or network outage (see Figure 4).

Similarly, when we enable the core X services in the middle tier to maintain a synchronized copy of the X display running on the desktop (an X server session that generates no user interface on the middle-tier server), the X display can be suspended on the desktop and reacquired at a later time. The copy residing on the middle tier remains unaffected.

The synchronized copy of the X display can even be created and displayed on a desktop other than the one that originated the session. And multiple copies can be created to exist simultaneously on multiple desktops. These copies will be synchronized by the core X services in the middle tier.

The benefits associated with these capabilities are enormous:

- Users can leave an active session and rejoin it at a later time.
- Users that leave an X session running on one system can rejoin that session from different desktop running on a different OS platform.

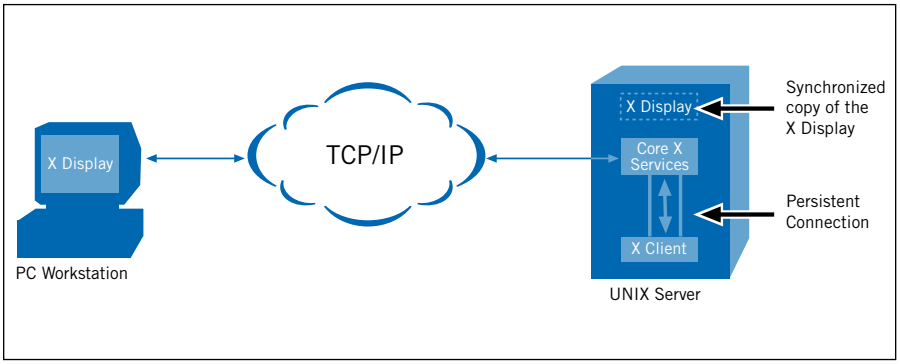

Figure 4: Session persistence

- More than one user can connect to the same X session, allowing both users to share the X client application simultaneously—and to collaborate on projects in real time (see Figure 5).

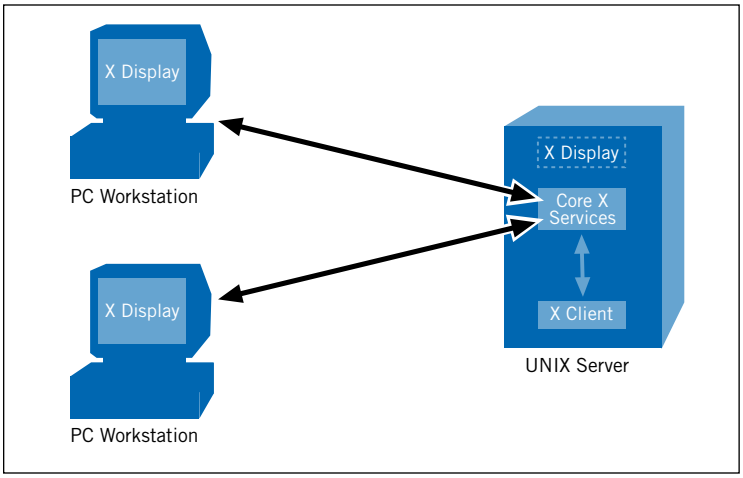

Figure 5: X client application sharing

By redesigning the two-tier architecture employed by the traditional PC X server, we can achieve new configurations that meet today's IT and business user needs. Protocol compression and rerouted inquiry-only requests support server consolidation and mobility initiatives by providing reliable remote access and performance. User productivity and collaboration is enhanced through X display persistence, transfer, and sharing—made possible by distributing elements of the X sessions to middle-tier servers. Ultimately, organizations are able to maximize their UNIX-based investments by providing broader access and improved usability.

The Next-Generation PC X Server: Reflection X Advantage

Reflection® X Advantage, Attachmate's next-generation PC X server, delivers the capabilities needed to support modern IT and business requirements—which means you can realize ongoing value for your UNIX applications.

While continuing to offer traditional two-tier PC X server connectivity, Reflection X Advantage also supports the distributed architecture described above (see Figure 6). The product is divided into three distinct modules, each with a unique role and each capable of running on a variety of platforms:

- **X display**
  The X display performs the traditional role of a desktop-based PC X server. It generates the user interface and communicates user-driven events for an X client application. The X display is also capable of running in a nondisplay mode on middle-tier systems. A synchronized copy of an X display kept in the middle tier enables features such as session persistence (for leave/rejoin and fault tolerance) and session transfer.

- **Protocol router**
  The function of the protocol router is to manage the end-to-end communications between the client connector (see below) and the X display. In a distributed environment, the protocol router can reside on the UNIX server or a middle-tier server. The data communications between the protocol router and both the X display and the client connector can be compressed for more efficient communications over longer network distances. Finally, the protocol router can manage multiple concurrent and synchronized instances of an X display in support of session sharing between users.

- **Client connector**
  The client connector accepts incoming connection requests from X clients and forwards X protocol requests received from the X client to the protocol router. The client connector also receives X protocol replies, events, and errors and then forwards them to the appropriate X client. This module helps keep the X client connection alive for session persistence. It also supports X protocol compression to the protocol router.

In Reflection X Advantage, the functions of the core X services mentioned above are distributed between the protocol router and the client connector.

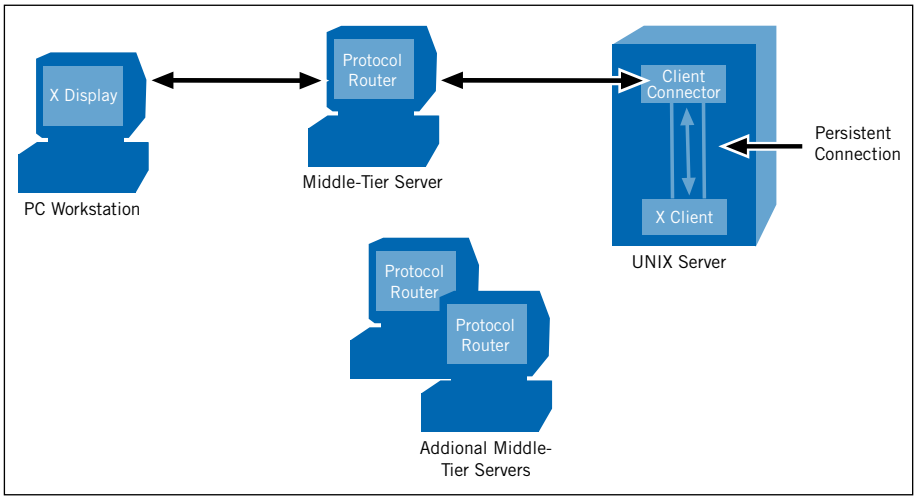

Figure 6: Reflection X Advantage's multi-tier architecture

The following chart describes the features in Reflection X Advantage, how they support the new PC X server capabilities needed for today's environments, and the recommended configuration for each capability.

Reflection X Advantage Feature	New PC X Server Capability	Recommended Configuration
Encryption and enhanced authentication through SSH X11 port forwarding	Secure remote access	• All Reflection X Advantage configurations (traditional and distributed)
Protocol compression and rerouted inquiry-only requests	Secure remote access	• Reflection X Advantage on desktop • Reflection X Advantage protocol router and client connector on UNIX application server
Leave and rejoin an X session	Session persistence	• Reflection X Advantage on desktop • Reflection X Advantage protocol router on middle-tier server • Reflection X Advantage client connector on middle-tier server or UNIX application server
X session fault tolerance	Session persistence	• Reflection X Advantage on desktop • Reflection X Advantage protocol router on middle-tier server • Reflection X Advantage client connector on middle-tier server or UNIX application server
X session load balancing	Session persistence	• Reflection X Advantage on desktop • Reflection X Advantage protocol router on two or more middle-tier servers
Leave and rejoin an X session from another desktop	Session transfer	• Reflection X Advantage on desktop • Reflection X Advantage protocol router on middle-tier server • Reflection X Advantage client connector on middle-tier server or UNIX application server
X session sharing (user interface and application control) with another user	Session sharing	• Reflection X Advantage on all desktops involved in shared session • Optional: Reflection X Advantage on UNIX application server or middle-tier server
Support for Windows Vista, Windows XP, Linux, and Sun Solaris	Multiplatform support	• All Reflection X Advantage configurations (traditional and distributed)

In addition to providing the capabilities listed in the table, Reflection X Advantage offers:

- Multiplatform support, including support for end-user and middle-tier operations in Windows, Mac OS X, Sun Solaris, Linux, and other UNIX-based platforms.
- *Microsoft Certified for Windows Vista*® logo status.
- Intuitive installation and configuration interface.
- Load balancing for optimal performance in heavy-use environments.

Through these new capabilities, Reflection X Advantage is supporting today's leaner, greener computing environments, along with a longer, more productive lifespan for your UNIX-based applications.

About Attachmate

Attachmate delivers advanced software for terminal emulation, application integration, and secure communications. Our NetIQ business provides solutions for automating IT processes and managing performance, security, and compliance of distributed IT. With our technologies, more than 65,000 businesses worldwide are putting their IT assets to work in new and meaningful ways. www.attachmate.com.

Attachmate

Corporate Headquarters
1500 Dexter Avenue North
Seattle, Washington 98109
TEL 206 217 7500
800 872 2829
FAX 206 217 7515

EMEA Headquarters
The Netherlands
TEL +31 172 50 55 55
FAX +31 172 50 55 51

Asia Pacific Headquarters
Australia
TEL +61 3 9825 2300
FAX +61 3 9825 2399

Latin America Headquarters
Mexico
TEL +52 55 9178 4970
FAX +52 55 5540 4886

WEB attachmate.com
E-MAIL info@attachmate.com

For regional office information, visit **www.attachmate.com**.