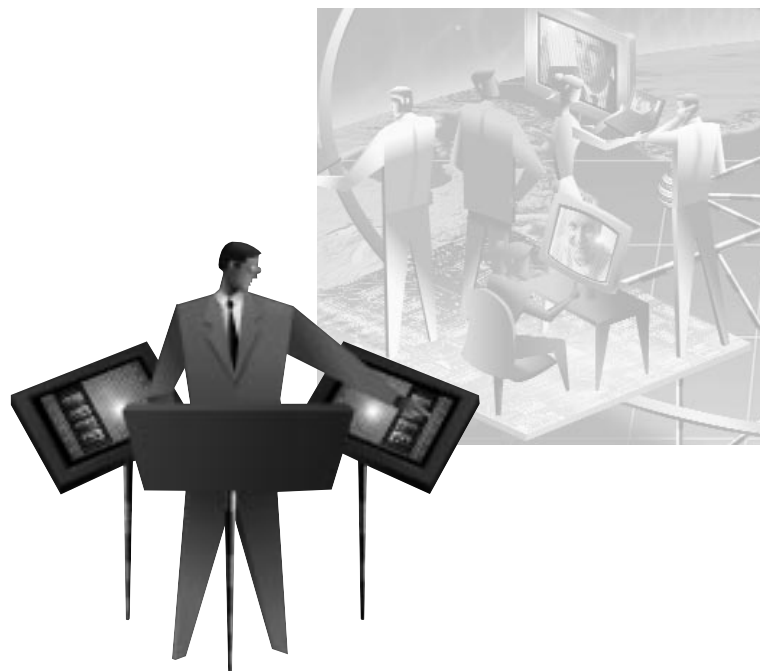




Citrix solutions in telecommunications.

**Lowering costs and enhancing efficiency
with application serving.**



Introduction.

Telecommunications companies today face rapidly changing business and technology environments. As new technologies create new markets, companies must quickly and cost-effectively respond to the needs of an expanding customer base. As mergers continue, companies must manage an increasingly extended and diverse enterprise. And as competition grows more intense in an increasingly global marketplace, they must win and support customers with reliable, flexible and highly efficient services.

To provide high-quality customer service, telecommunications companies must give employees the applications and data they need to enhance responsiveness. And to meet the business needs of their customers, they must provide the latest communications products and services such as application access over wireless devices. The question is how to simultaneously achieve these internal and customer-related goals.



Server-based computing gives telecommunications companies a powerful tool for streamlining operations and extending new services. It simplifies application management, delivery and upgrades. And it echoes the benefits of the industry's centralized provisioning model.

The server-based model makes computing as simple and easy as a phone call. Just as telecommunications companies efficiently provide services from a central location and let customers upgrade without changing equipment, server-based computing enables applications to be rapidly delivered from a single point to users on any type of device or connection—wired, wireless or Web.



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A new era for telecommunications.

The telecommunications service industry has entered a period of extraordinary change. As its business is transformed by economic, regulatory and technical forces, the industry is experiencing tremendous growth—it will soon exceed one trillion dollars in worldwide revenues¹—as well as massive technical and economic shifts.

Where markets were once dominated by a few single companies—both government-run and privately held—telecommunications companies of all sizes must now compete on a global scale. As these firms reach beyond national boundaries or specialized markets, and as they divide or merge into new entities, the opportunities—and the challenges—are enormous. In order to capitalize on these opportunities, telecommunications companies will need to deploy new technologies to meet both their internal business requirements and the need for expanded customer service.

Technology-driven change.

Many of today's industry changes are being driven by dynamic new technologies, including mobile phones, the Internet, fiber optic cable and fixed wireless. The development of these technologies is causing massive shifts in the economics of the industry. As a result, nearly all revenue growth is in these new markets.

These technologies are also beginning to draw revenue and resources from existing markets such as traditional voice service, long distance and fax traffic. And, since these traditional markets form the foundation of the telecommunications business, companies must have effective strategies for maintaining existing positions while they expand into new markets.

Despite the emerging multi-national character of the industry, the pace of technical and market change around the globe is uneven. Europe and Japan lead

in mobile communications, while the United States is far ahead in the Internet. And the world's most sophisticated telecommunications market is the Nordic region, led by Finland.

Intense financial pressures.

To achieve revenue growth, existing providers must capitalize on these new technologies. Many companies, for example, are focusing expenditures on developing Internet-based mobile services—a big financial gamble given that the technology is untested and consumer acceptance is uncertain. And while the cost of developing cutting-edge offerings requires enormous capital expenditures, intense competition and the push for market share drive profits down.

Capital needs are so great, in fact, that only larger companies with strong borrowing capacity can survive. This has forced the industry into a wave of domestic and international mergers and has created competition that is more intense than ever.

New trends in regulation.

Today, local phone prices and long distance services are still regulated in most nations. But this traditional structure is breaking down as the use of inexpensive mobile or cable-based phones and IP telephony becomes widespread.

Generally, wireless telephones face minimal regulation—though some degree of telecommunications regulation is expected to remain in force everywhere. In many instances, regulators are forced to choose between slowing down change to protect their local “national champions” and helping consumers by speeding up competition through deregulation.

A new era for telecommunications. (cont.)

Each national regulatory body will present different sets of challenges and opportunities. In the U.S., it is expected that deregulation will speed up. Combined with expenditures on new infrastructure, this will result in tight profits, more mergers and faster technological change. In Europe and Japan, changes in regulation are expected to slow down, though price competition among the largest companies worldwide will remain fierce as markets continue to open up.

Ironically, some re-regulation (most likely by national authorities, rather than local regulators) could appear, as antitrust issues might arise over the consolidation of long distance and mobile phone providers.

The need for a new solution.

In the wake of such tremendous technological, economic and regulatory change, many major telecommunications companies are under pressure to reevaluate their business models. In response to huge debt incurred to finance new mobile services, companies have become extremely cost-conscious and have attempted to identify less-expensive ways to boost revenues. Projected revenue growth, in fact, has been drastically scaled back. At the same time, companies must integrate their newly acquired technological and global diversity with their existing infrastructures — which often face new demands that their capacities cannot meet.

Like businesses of all kinds, telecommunications companies must provide employees with immediate access to applications and information, whenever and wherever they need it, and on whatever platform they have available. They need comprehensive IT solutions that support the seamless integration of emerging technologies and unique infrastructures. And they

must accomplish all this while minimizing operational expenses and leveraging existing investments in hardware and infrastructure.

To succeed in today's demanding communications world, however, these companies must take a further step. They need a technology that enables them to provide application services in the same manner that they provide telecommunications services — by implementing services from a central location and allowing employees, partners and communications customers to access these services using their existing equipment.



Challenges and opportunities emerge: managing business more efficiently.

Despite the challenges they face from rapidly changing technology and the cost of managing change, today's telecommunications companies have a tremendous opportunity to serve new global markets and expand into new technologies. But as mergers and acquisitions become more common, these companies must manage an increasingly complex enterprise that extends worldwide. Ultimately, success in this competitive marketplace depends on the entire organization's ability to respond quickly to customer needs. Companies that cannot meet the growing challenges of their own businesses are unlikely to be able to satisfy customers' demands for prompt, effective service and the latest technologies.

Mobile and Internet technologies.

It is estimated that within 10 years, most adults in developed nations will have a single mobile telephone number as their primary voice access. This expanding market will drive significant revenue growth in the mobile phone sector. The further integration of mobile phones and the Internet also promises to create a particularly lucrative market. But such integration can be complex. And large profits can be a long time coming. The immediate need will be to control the large investments required to integrate software for such functions as messaging, reservations, billing and corporate scheduling. The companies that can achieve this control will obtain a comparative advantage in generating revenue from Internet content provision and mobile commerce.

Infrastructure upgrades.

Technological change is forcing telecommunications companies to expand and upgrade all of their wireless, Internet and cable networks—an endeavor that will require enormous expenditures on infrastructure. At

the same time, industry deregulation and competition continue to force prices down. As the combination of costly infrastructure development and limited revenue growth keeps profit margins thin, IT strategies that minimize infrastructure expenses will be critical to every telecommunications company's bottom line.

Mixed platforms and configurations.

As a result of recent mergers and acquisitions, telecommunications companies face an environment of multiple platforms, operating systems and applications. While one company may equip its employees only with PCs, it may merge with a second company whose employees use a mixture of desktops, including Macintosh® computers, UNIX® and Linux® workstations, network terminals and wireless handheld devices. Such blended environments often result in technology incompatibilities—and require solutions that can bridge gaps that occur as a result. It is imperative that today's international and recently merged telecommunications companies effectively operate and support a diverse, mixed-breed computing environment—without detracting from performance.

Operational and support efficiencies.

The high price of acquisitions and spectrum licenses is driving many large telecommunications companies to improve operational efficiencies. One approach is to reduce costs through improving use of resources, merging systems and reducing redundancies. Operations such as billing require cross-platform solutions that are beyond the capability of many existing systems. In most cases, telecommunications companies require quantifiable improvements that can be defined as viable contributors to the bottom line and key measures of customer satisfaction.

Challenges and opportunities emerge: meeting customer needs with wireless.

Over the next decade, it is expected that most fax, long distance and, ultimately, voice traffic will move from existing circuit-switched land networks to wireless and Internet networks. Wireless communication already is the norm in Europe and parts of Asia. In the United States, the market for voice-only services continues to expand and has not yet reached European levels. However, demand for wireless services has slowed recently as a result of delays in implementing third-generation wireless technologies that provide always-on broadband networking with high-speed data access. It is therefore important that wireless network operators reinvigorate the market by providing fast access to services, applications and data. As third-generation technologies are implemented, customers will expect more than voice-only services from their wireless providers.

Expanding the role of wireless.

In the emerging world of constantly connected information devices, the potential to extend rich application services to every employee, business partner, supplier and consumer will become a reality. But while wireless presents a tremendous opportunity to unplug the organization, growth in the wireless sector will be slower than earlier projected. The move to third-generation mobile wireless will be delayed due to slow development of required infrastructure and handsets. And there will be multiple wireless standards for years to come. The growth of wireless services will depend on many key factors, including coverage, reliability and the rate at which wireless network capabilities increase.

New generations of wireless technology.

Many wireless firms are upgrading their second-generation networks with high-speed technologies that can support high-volume voice and data traffic. The first third-generation capabilities are anticipated to begin rolling out in small increments in Japan early in 2001 and in Europe and the U.S. during 2002 and 2003. Despite delays in projected rollouts, third-generation networks are expected to include new capabilities and features such as enhanced multimedia and high-speed transmissions, and roaming capabilities throughout Europe, Japan and North America.

The need for wireless application access.

Businesses worldwide are searching for new ways to quickly and easily extend the reach of their mission-critical applications, data and services. At the same time, mobile workers increasingly need fast, reliable real-time access to the same IT resources they use in the office.

Just as businesses strive to implement the best applications, their employees, partners and even customers need to access these applications on devices that are best suited to the working environment. More and more, built-in wireless capability is becoming a requisite for these devices. While many remote users who need to create and manipulate content are satisfied with laptops, new devices such as personal digital assistants (PDAs) and tablet-style devices with touch screens are growing in popularity.

In the rapidly evolving wireless world, there is a growing demand for a robust, scalable and cost-effective solution that will enable any user to access any application on any device.

A better way to manage technology infrastructures.

Application serving provides a platform that gives telecommunications companies a comprehensive solution for meeting their key challenges. In this approach, applications execute on the server and are accessed by devices ranging from desktops and notebooks to thin-client terminals and even hand-held wireless devices. Scalable, cross-platform, easily manageable application serving solutions centralize management of global organizations and enhance employee productivity — because applications are available from any location, over any network connection, using any device.

Application serving solutions provide a powerful platform for application delivery and management across the Internet, UNIX-based environments and Microsoft's advanced Windows® operating systems. Application serving provides a proven, cost-effective solution for getting business-critical applications to users around the globe using an organization's existing infrastructure.

For telecommunications companies and other businesses competing in the digital economy, application server software fulfills three key needs: flexibility, manageability and net leverage.

Flexibility.

In the application serving model, users get secure, high-speed, high-performance access to robust, full-function applications over any wired, wireless or Web connection — regardless of bandwidth — using any device. This is because application serving shifts application processing to the server. Only keystrokes, mouse clicks and screen updates travel the network. This seamless application access results in a consistent user experience across the enterprise, complete

freedom and mobility, greater speed and simplified management. The total cost of ownership is lower because organizations experience less technology churn and more efficient IT operations. Companies can continue to leverage their existing infrastructure investments, even with the high bandwidth and processor demands of business-critical applications.

Manageability.

Application serving provides the power to control servers and server farms, applications and users across a network or the Internet from a single point. With application serving, IT managers can proactively predict system requirements and maximize availability and performance. They can centrally configure and manage software distribution to multiple servers in numerous locations in just minutes. And they can monitor and control application usage, resource utilization and user activity.

Net leverage.

Using an application serving solution, a company can make applications available to its corporate portal over the universal Net — the seamless integration of LANs, WANs, the Internet, intranets and extranets — without rewriting code. This enables a business to reach beyond its internal infrastructure to give customers, suppliers and partners access to applications and information quickly and easily via any device that supports a standard Web browser. Secure connections are provided with encryption technology such as Secure Sockets Layer (SSL) and ticket-based authentication. And applications and content can be personalized for users. As a result, users experience true mobility and enhanced productivity.

Productivity and efficiency to meet industry challenges.

Citrix application server software provides an ideal solution for telecommunications companies because it provides the ability to deliver business-critical applications to anyone, anywhere, anytime. This approach enhances the productivity of employees, provides the most effective way to leverage recent acquisitions and enables companies to quickly and easily deliver applications via emerging wireless technologies.

Mobile and Internet technologies.

To capitalize on the convergence of mobile and Internet technologies, telecommunications companies must be prepared to integrate corporate, personal and telecommunications software—everything from general business software to specialized applications such as billing software, customer service databases, call center management systems, account management systems and help desk applications. Because Citrix application serving environments are centralized, applications can be deployed quickly. And users experience LAN-like performance even over low-bandwidth connections.

Infrastructure upgrades.

To make the most of thin profit margins, today's telecommunications companies must simultaneously upgrade their infrastructures and minimize IT costs. But upgrades can introduce a range of technical complexities. Because it is centrally managed, Citrix application serving enables telecommunications companies to quickly and easily deploy applications, diagnose and resolve IT problems and efficiently monitor and manage ongoing operations. Citrix application server software ensures that growth for both Windows- and UNIX-based environments can occur smoothly.

Mixed platforms and configurations.

Telecommunications companies often rely on a mix of legacy desktop hardware, network connections and operating systems, as well as legacy and new software, making access to business-critical applications difficult and expensive. With Citrix application server software, enterprises can quickly and easily deliver full-function, high-performing applications to virtually any device or network connection in the enterprise.

Operational and support efficiencies.

Application serving can help lower the total cost of application ownership because less time is needed for installing, configuring, deploying and supporting applications. Systems can be managed remotely, and backups are simpler and more secure. As a result, a company can provide enterprise-level support for more users with fewer staff—and respond to customer needs and industry shifts more quickly. Third-party call centers, for example, can be set up in as little as 72 hours. And systems for customer self-service also can be more quickly deployed. In the final analysis, the application serving approach can both increase manageability and reduce costs by as much as 65 percent.²

Meeting customer needs with wireless.

As wireless network capabilities grow, an increasing number of companies will provide customers with wireless access to applications. And while a lack of standards for wireless will make this a difficult and complex undertaking, companies that wish to gain a competitive advantage will need to move ahead with their plans. Citrix solutions enable telecommunications companies to increase their offerings by closely integrating applications and mobile wireless devices to provide rich application services over wireless technology.

Finding success with Citrix solutions.

Birch Telecom.

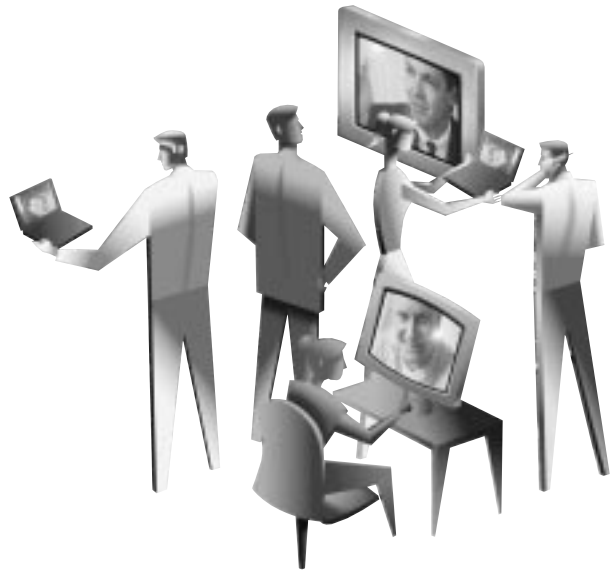
Headquartered in Kansas City, Missouri, Birch Telecom is one of the largest competitive local exchange carriers (CLECs) in the Midwest. The company offers a wide range of telecommunications services and is expanding its geographical reach. As Birch grew, its ability to serve customers efficiently was significantly impacted by the slow performance and unreliability of its provisioning application as it ran over the company's WAN. Adding to the inefficiency, 140 salespeople in 60 field offices were submitting work orders via overnight mail services.

To address these issues, Birch implemented Citrix® MetaFrame™ application server software to deliver the provisioning system and a new custom work order form application (SOFIE) to 850 users in the company's call centers and sales offices. As a result, Birch improved application performance by 200 percent, saved \$100,000 annually in overnight delivery charges and sharply reduced demands on help desk and IT staff.

“Running the provisioning application on Citrix MetaFrame for Windows 2000 Server solved the dramatic performance problems caused by deploying the fat database application over the WAN,” said Jan Banks, manager of Intel Systems for Birch.

“Application performance has vastly improved. Now our customer service staff can spend their time assisting customers instead of waiting for computer screens to paint or calling the help desk. Implementing SOFIE on MetaFrame has allowed work orders from the field to be electronically processed into Birch's provisioning and billing systems while eliminating overnight delivery charges and speeding up new order processing.”

In addition, Citrix MetaFrame centralized application deployment has eliminated the need to “touch” each desktop for monthly application upgrades. Banks concluded, “Citrix MetaFrame application server software has enabled us to improve our efficiency, flexibility and responsiveness in serving customers in this ever-changing market.”



Conclusion.

TELUS Mobility.

TELUS Mobility provides wireless voice, data and Internet services to more than 2.2 million customers across Canada. TELUS Mobility's rapid growth — the company tripled in size in the last two years due to mergers and acquisitions — made customer service a top priority. With the help of Citrix MetaFrame application server software, TELUS Mobility provides over 650 customer service representatives (CSRs) with instant access to customer data.

By using Citrix MetaFrame application server software with Microsoft® Windows 2000 Server in its three call center facilities, TELUS Mobility was able to migrate from an outdated “green-screen” service-bureau supplier system to state-of-the-art billing applications. As a result, the company has been able to deploy and scale business-critical applications, such as Amdocs (billing/customer care software), RUMBA Lite (terminal emulation) and Predictive Dialer (direct marketing software) to every CSR. Applications can be upgraded transparently, without ever disturbing the user experience on a CSR's desktop. And Citrix MetaFrame dynamic load balancing enables TELUS Mobility's IT staff to quickly and easily add or replace servers in a farm without any disruption of service.

“Thanks to Citrix MetaFrame, TELUS Mobility's CSRs can instantly access up-to-date information on any account,” says Bob Richards, IT architect for TELUS Mobility. “The end result is superior customer service for TELUS Mobility's rapidly expanding customer base.”

“Citrix application server software is the wave of the future for our company,” explains Michael Edworthy, Manager, IT Operations Alberta. “Citrix MetaFrame has played a key role in enabling TELUS Mobility to expand our service throughout Canada.”

Citrix application server software can improve the performance of any telecommunications company, large or small. The application serving approach supports the seamless integration of emerging technologies and resolves technical incompatibilities introduced by unique infrastructures. Using Citrix application server software, telecommunications companies can lower computing costs through centralized management of applications across diverse platforms and the ability to leverage existing investments in hardware and infrastructure for lower total cost of ownership.

Application serving also makes it possible for companies to offer customers, employees and partners access to business applications over any connection — wired, wireless or Web. With application serving, telecommunications companies have a way to make computing as simple as making a phone call.

For more information on Citrix application server software products and services, contact your nearest authorized Citrix Solutions Network™ member. Or visit the Citrix website at www.citrix.com to learn more about Citrix application serving solutions.

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Footnotes.

¹ International Telecommunication Union, "Yearbook of Statistics: Telecommunication Services Chronological Time Series 1989-1998," February 2000 and Spectrum/SPS, "Global Economic and Information Technology Market Forecasts, 2000-2005," August 2000.

² The Tolly Group, "Total Cost of Application Ownership (TCA)," 1999