Virtual Desktop System – the mobile corporate solution

PowerNetix™
Network Utility Computing

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Abstract

Wireless business enablement for enterprises are needed to bring about cost savings, increased productivity, improved business processes, and realized return on investment (ROI). With a growing appreciation of the value of live data and through an enhanced ecosystem of wireless technology, wireless enablement of corporate resources is becoming an increasing priority. However, the currently available solutions can only address part of the wireless business needs as the wireless devices are inadequate in providing the business functions. Furthermore, the high cost of the devices is not able to address the realized return on investment. The PowerNetix Virtual Desktop System (VDS) has a new approach to achieving wireless business enablement and bring about cost savings, increased productivity, improved business processes, and realized return on investment (ROI). The Virtual Desktop System employs low-cost wireless devices which connect, wirelessly, to highly efficient servers. These VDS wireless devices offload almost all processing load onto the Virtual Desktop System servers. This architecture enables huge cost savings as processing and data storage is placed within the Virtual Desktop System servers. Also, the wireless devices are extremely low cost due to inexpensive processors and minimal amounts of memory within the device. In addition, the servers allow new functions and more useful aggregation of data and resources to the wireless enterprise user. Also, due to the ubiquity of Internet Protocol, the PowerNetix VDS provides a global roaming Voice Over Internet Protocol system.

Introduction

There is a lure to mobilizing corporate applications that enterprises will find increasingly hard to resist. On the surface of awareness is a fairly obvious understanding that mobile devices can be platforms on which business users can leverage a range of personal and corporate data with greater flexibility than that offered by desktop and notebook computers. However, it is the insightful organization that will recognize the returns that come from putting the most up-to-date data into the hands of those in the field who can do the most with it. Whether it is for interacting with customers, working with suppliers, or allowing employees to make the most of time spent away from their desks, access to live data saves time through increased efficiencies, instills confidence through demonstrable competency, and ignites ideas for building a new freedom and flexibility for corporate operations. Mobile and wireless fit into a variety of useful business scenarios, many of which will evolve and expand over time as companies come to better understand the benefits of the instant access and dissemination of knowledge. The momentum in mobile initiatives have been strong in industries such as retail, manufacturing, education, health care, and the public sector, where employees tend to spend more time out and about than sitting at a desk. There also has been considerable success within financial and legal services, where there is value in receiving data now rather than later. Every industry, however, has workers who have some degree of mobility in their work life and can potentially benefit from a mobile solution. The face of modern business has been changed by recent technological advances, such as wireless networks, broadband connectivity, and a proliferation of compact, portable communication devices. Forward-looking enterprises are finding that mobility applications and mobile devices have advanced in combination with improvements in remote access techniques. A gradual progression is evident, ranging from basic capabilities, such as email and calendaring, to deeper functionality, such as remote database access. However, current technology offerings are still not yet widely deployed due to the high prices of the mobile devices. The PowerNetix Virtual Desktop System (VDS) has a new approach to achieving wireless business enablement at low prices to increase adoption. Furthermore, the PowerNetix Virtual Desktop System architecture enables much high level of functionality.

WIRELESS AND MOBILE USERS

To address the role of mobility within the enterprise, it is important to understand the terms *mobile* and *wireless* and the differences between the various levels of mobility across multiple types of connectivity modes. First, mobility refers to the action of working away from your primary workplace regardless of the connectivity. Connectivity could be offline access, dial-up access using a standard telephone line, or access through a high-speed wired connection or through a variety of wireless connections. Wireless connectivity includes wireless LAN (WLAN) access or off campus wireless that refers to cellular technology or wide-area wireless access. Connectivity varies across a number of parameters, including device types, enterprise needs, corporate policy, and mobile user requirements.

Typically, connectivity includes the following modes:

Offline access refers to local access on a PDA where synchronization may occur over a cable to a PC or server. There is no wireless access in this scenario.

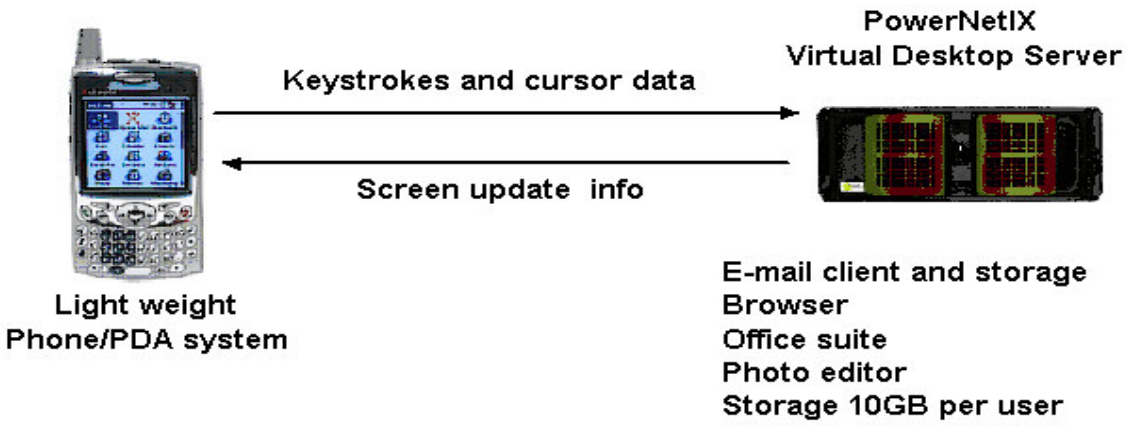
Hybrid online/offline is a wireless offering that also includes access to data offline when a network connection is not available. The device is capable of local access, and synchronization occurs across a variety of devices — handhelds and converged mobile devices.

Real-time wireless only access refers to connectivity where there is no local access. The majority of these connections occur using a mobile phone. In this scenario, access is available only through the device's browser over a wireless
connection.

Where mobile workers require the greatest range and flexibility in access to corporate email, Personal Information Management (PIM), and other applications, a wide area network–based (WAN) solution makes sense. In this environment, workers are not typically fixed within one area for long periods of time but rather are mobile across large areas, where a wide area network is most efficient. Although a spot where there is no connectivity is indeed prevalent (especially in North America), a store-and-forward method providing a transparent offline experience for the mobile worker is critical for a productive work experience. However, these mobile devices come at a cost for such convenience due to the high cost : powerful processors and large storage memory in the devices. This high cost is holding back widespread adoption.

Wireless LAN or 802.1x connectivity refers to a fixed mobility environment, but with an opportunity to access a much higher connectivity rate at most likely a lower cost than a WAN connection. This type of connectivity can be found in private environments, such as across a multiple-building campus environment, be it a higher education institution, private business, or government environment, as well as in public environments, such as airports, convention centers, hotels, and restaurants. In both environments, the use of real-time access and synchronization over this fast connection is typical. In both cases, the working environment consists of a fixed amount of time at the site, rather than a continuous usage environment — whether it is a visiting employee from the West Coast leveraging the WLAN for the day or the 20 minutes at the gate of an airport.

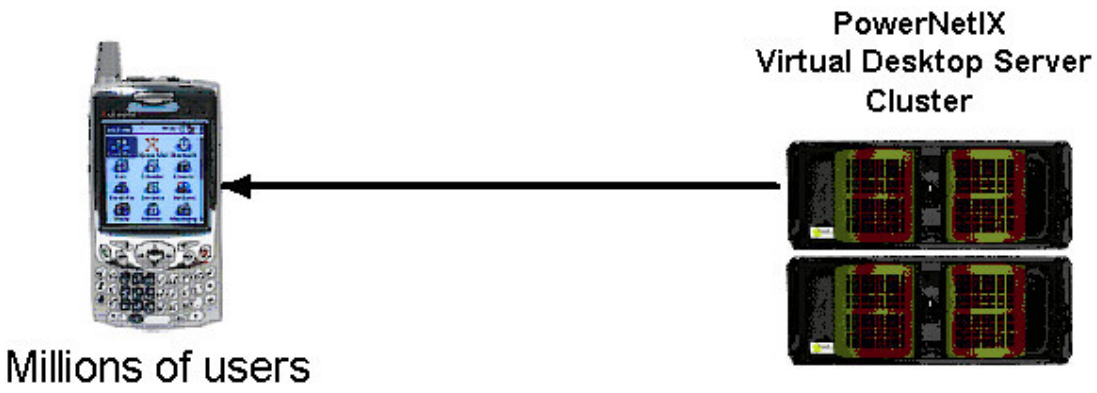
No matter what type of connection is used, all these are now becoming IP (Internet Protocol) centric. This ubiquity of IP access enables a new generation of wireless business enablement. The basis of the PowerNetix Virtual Desktop System uses the ubiquitous nature of wireless IP access. The PowerNetix Virtual Desktop System (VDS) Server pushes screen update information to the mobile lightweight Phone/PDA (MLWPP) system. Input from the user in the form of keystroke and pointer information is sent to the VDS server. This amount of information sent to the server is very small and ranges from 1 to 16 kilobits per second (kbps). The server also sends small amounts of screen update information from 10 to 52 kbps. The sizes are small because the screen update information is compressed data containing only the changes for the screen and not entire screen information. Also, the screen resolutions for the MLWPP device is relatively low , when compared to a desktop system, and does not need much data to update. As the amount of data handled by the mobile lightweight Phone/PDA (MLWPP) device is small there is little need for a powerful and expensive microprocessor. As there is virtually no storage needed on the MLWPP device, there is little need for large amounts of expensive memory. The VDS servers, on the other hand, have powerful processors and large amounts of memory. This high processing power of the VDS server gives the user a good user experience in terms of response and performance. There are economies-of-scale achieved by concentrating processing power in the VDS servers to provide these services.



As all the applications are served from the VDS servers and are not physically run in the MLWPP devices, there are significant advantages in updates and new service offerings. An update at the VDS server level can provide updated application functionality to millions of users overnight. Also, new applications and services can be added to the VDS servers to provide more applications to the users with no requirement for the user to install, upgrade nor update his MLWPP device. There is the ability to offer applications on-demand with such VDS system. In essence, the PowerNetix VDS is an "EXTENSIBILITY READY" system. This on-demand extensibility applies not only for applications but also for storage for each user on the servers. A user may have his useable storage size increased from 10 Gigabyte up to 1 Terabyte(or 1000 Gigabytes) on request with no changes needed in his MLWPP device.

In addition to web access, initial VDS systems will offer the following applications: mail client, word processor, spreadsheet, presentation, database, drawing, photo gallery, math, and photo editing applications. All these will be fully operable with features and capabilities that can match and exceed that of many desktop systems.

The VDS servers are highly efficient and leverages on supercomputer cluster technology to scale in size. The “Cluster” computer in today's supercomputer cluster architecture design comprises multiple compute nodes and aggregates the overall processing power to provide supercomputer performance. In the computer cluster definition, a cluster is a group of homogeneous, whole computer systems running in concert to divide and conquer a computing task and used as a unified computing resource. This cluster architecture enables the “supercomputer” to start with fewer compute nodes and add more as needed. The cluster architecture was developed to provide the high performance and low cost. Other advantages include high-availability where the cluster continues to perform even when some of the nodes stop working.



The majority of enterprise applications are server-based and run on UNIX or variants of it. The PowerNetix VDS server cluster has a Linux-compatibility mode that can run many of these enterprise applications. Common back-end systems such as Siebel, Oracle,SAP, and PeopleSoft offer standard development frameworks that can easily be extended wirelessly. Beyond product sets, vendors providing professional services, consulting, and implementation or other support services deliver additional solution-level value to customers seeking customized implementations. This can be achieved through a vendor's in-house services organization or through a third-party partner. Hence, the PowerNetix VDS server cluster is highly scalable, highly available and also highly extensibility ready.

Benefits need to be assessed in terms of the total cost of ownership (TCO) of the wireless extensions.
Benefits are seldom built without associated costs — not all of which are in monetary form. Any benefit that a mobile solution can bring should be weighed against its short-term and long-term costs. Up-front costs of mobilizing enterprise applications will include an investment in self-analysis to discover where mobile technologies have the most impact. Include application development, systems integration costs, and an investment in mobile devices because setting and enforcing IT policies on devices is more easily done when the company owns the devices outright. Ongoing costs will include systems and application maintenance and monthly operator costs if there is a wide-area wireless component. Then you need to add in technical support and training. In essence, the line items for adding mobility to corporate data are similar to any IT project and, therefore, need to be balanced against the alternative ways and costs of getting the job done.

The total cost of ownership of mobilizing data to handheld devices, ideally, would be competitive with the next best substitute, such as accessing the data with a laptop through a secure remote access connection. As the costs of the alternatives diverge, benefits and outlays of the solutions should be scrutinized in a context that considers the accelerating trend that enterprises be responsive, connected, and collaboratively informed. What is the cost of catching up? What is the cost of regaining a competitive advantage?

The critical concerns of enterprises need to be addressed.
Enterprises face a variety of hurdles in their pursuit of mobile connectivity, hurdles that many companies will be forced to contend with as more workers untether from the office.

SECURITY

As workers are able to access corporate systems through a variety of devices and networks, the chance of a security breach intensifies. A mobile workforce means companies must leverage new security technologies and procedures that will stand up to the challenges created from mobile enterprise applications. Companies have already invested significant resources toward building secure corporate infrastructures, which cannot be compromised by the wireless extensions added to applications.

Security needs be addressed at a device level to protect local data and to minimize the threat of releasing a virus within corporate systems. It also needs to be inherent to the transport layer of the solution because there is no guarantee that IS (Information Systems) will be able to keep pace with the proliferation of devices that workers try to connect with. The PowerNetix VDS addresses this use directly by using secure data

transmission from the handheld device to the VDS server and vice versa. Also, a key factor for data security is the lack of storage on the handheld device. If the handheld device is stolen or lost, no data is lost because no data resides on the handheld device. Furthermore, administration can stop any further access from a reported lost or stolen handheld device. Also, the PowerNetix VDS servers can ensure all email is filtered for viruses and SPAM (unsolicited email) before passing to the user's email account. In addition, virus proliferation is inhibited because no unauthorized application may be installed at the Virtual Desktop on the VDS servers without being thoroughly scanned for viruses. The virus signatures are always up-to-date as virus detection is centrally managed at the VDS servers.

EASE OF MANAGEMENT

IS departments have gone from managing a single computer per user to managing potentially an endless number of machines and devices. They will be charged with managing the authentication of not only who is gaining access to the network but also from what device, which is critical to managing access policies as well as the look and feel of applications on the variety of available mobile devices. Employing server-based mobile technologies allows centralized control and thwarts many of the problems stemming from IT support, asset management, authentication, and other device noncompliance issues. The PowerNetix VDS is ideally suited in this role as it can centrally control the access of the mobile light weight Phone/PDA (MLWPP) device. Also, management can control which applications are permitted for the user.

SCALABILITY

Mobility in the enterprise will play a roll as a self-perpetuating force that builds off each small win that companies gain from data being more accessible than it was before. At its broadest level, mobility will give workers secure access from any device, whether in the office or out, to any piece of information they need, and they will do it as easily as they check their email today. With that vision, the key attribute for success of initial wireless deployments is the ability to deploy a scalable solution, as an expectation of larger user deployment in additional phases. Scale should refer to not only addressing an increasing number of users leveraging a wireless solution but, perhaps more important, the ability to scale beyond the initial application or project scope. As many customers are focused on an initial project and specific problem being solved, scaling the initial offering across a broader portion of the organization is a significant criterion to consider. With the PowerNetix VDS, scaling in terms of numbers of users is not an issue as supercomputing cluster technology is deployed at the server. Furthermore, scaling of the performance and functionality of the applications is easily accomplished as no upgrade or installation is needed at the mobile light weight Phone/PDA (MLWPP) device.

MOBILE DEVICES

Building an enterprise mobile strategy eventually requires a decision regarding the mobile devices that will be supported. The market is flooded with choices in form factor and platform that will continue to evolve and converge at a quickening pace with the strengthening enterprise interest. From PDAs that synchronize through cables or connect through WiFi to smart phones styled in the spirit of a data-centric PDA to those that add data capabilities to the mobile phone form factor, enterprises have a variety of available choices.

As enterprises begin their evaluation of devices, it is important that it's conducted in the context of the business tasks to be mobilized and with an understanding of the devices' unique mobility constraints. The key attributes to assess when evaluating enterprise solutions include the following:

Battery life. The length of charge among various devices can be a few hours, a few days, or even a couple of weeks, depending on the size of battery, a device's capability set, and its built-in power management features. An understanding of the mobility patterns of a company's mobile workforce will help determine the span that a charge needs to last. Also, because advanced capabilities such as WiFi, WAN, color screens, and GPS further tax battery life, enterprises sensitive to power should invest in devices that offer appropriate, not excessive, capabilities for the tasks at hand. Even more critical is the processing power and memory as these use substantial amounts of battery power in today’s ever more demanding applications that are run in the current mobile devices. The PowerNetix VDS systems make use of low power mobile lightweight Phone/PDA (MLWPP) device. These MLWPP devices use low-power low-speed microprocessors to further extend the life of the mobile device.

Screen size. The type of data to be displayed on mobile devices will help determine the screen size that will deliver the best experience. Although PIM data can be displayed on a mobile phone–sized screen as effectively as it can be on a PDA, richer content will almost always benefit from more screen real estate.

Input. Understanding how workers will need to interact with mobile data will help determine what kind data input technologies should be inherent to the device. If email and other forms of content creation are integral parts of the mobile applications, integrated and detachable keyboards can be more versatile and accurate than numeric keypads or handwriting recognition.

Size and weight. At what point is a device too small that it ceases to be useful? At what point is a device too large that it ceases to be carried? The right mobile device for a job will allow meaningful data interactions in a form factor that fits the mobility patterns of the target workers. The PowerNetix mobile light weight Phone/PDA (MLWPP) device uses low powered processors, which use little battery power. A small and more light weight battery may be suitable for more convenience at little expense of cutting short the span of the useable charge.

Storage. The amount of onboard memory determines the amount of data that can be carried and accessed on the device. Applications requiring a mix of online and offline work will require sufficient storage so data can be saved between network or system connections. However, with the PowerNetix VDS, user data and application data do not reside on the mobile device but are stored centrally in secure PowerNetix VDS server storage. This low cost storage brings down the price of the mobile device for more wide spread adoption.

GLOBAL SOLUTIONS

Developing a wireless platform that has the extensibility to address multiple regions is imperative to delivering a global solution. Although addressing language and universal issues is important, understanding the nature of wireless solutions across multiple regions and countries demonstrates the true global reach of a wireless project. As an example, in Europe and Asia the mobile operator will have a much more significant role in mobile deployments today than it will in North America. The ability to provide an adaptable architecture to address multiple infrastructure requirements drives the global nature of the solution offering.

Even with all this exciting new wireless technology, WiFi hot spots have their place. Cellular coverage is far from perfect. Hot spots help fill in the gaps, especially inside buildings. And you can get a day pass for a hot spot, which you can't do with cell-phone networks. In U.S.A., T-Mobile is starting to sell products and service plans that combine WiFi and cellular, heralding the day when your wireless signal will effortlessly hop from hot spot to cellular network. That seamlessness is the dream of the mobile Internet user. Whether you're making video calls or downloading huge e-mail attachments, with these services you don't need to worry about finding the Internet. It will be all around you.

The new mobile wireless or third-generation (3G) cell-phone networks are now more widely deployed. 2G networks were the first digital voice networks, and data was an afterthought. 2.5G systems superimposed more data-friendly protocols on 2G. Now 3G networks move data at least twice as fast as dial-up phone lines, and often much faster, letting you download video, audio, Web pages, and e-mail on the run. 3G Third-generation mobile-phone technology promises a throughput of at least 2 Mbps. Current 2.5G phones use GSM/GPRS and CDMA/1xRTT technologies. Throughput rarely exceeds 100 Kbps and averages about 40 to 72 Kbps. 1xRTT (Single Carrier Radio Transmission Technology) is the first upgrade to CDMA, 1xRTT (2.5G) has speeds averaging from 50 to 70 Kbps. Offered by Verizon Wireless and Sprint. General Packet Radio Service ,or GPRS, refers to a packet-based wireless communication service that promises data rates from 56 up to 114 Kbps and continuous connection to the Internet for wireless phone and mobile computer users. The higher data rates can also have the "always connected" mode of operation for non-voice applications and services.

2G (second generation) is a basic digital cellular network for voice and data. Data speeds range from 9.6 to 14.4 Kbps. 2.5G is a step above 2G, 2.5G networks offer data speeds from 30 to 100 Kbps.3G (third generation) is a new, fast mobile-phone service with data rates of at least 144 Kbps while in motion, and a theoretical maximum of over 2 Mbps from a fixed location.

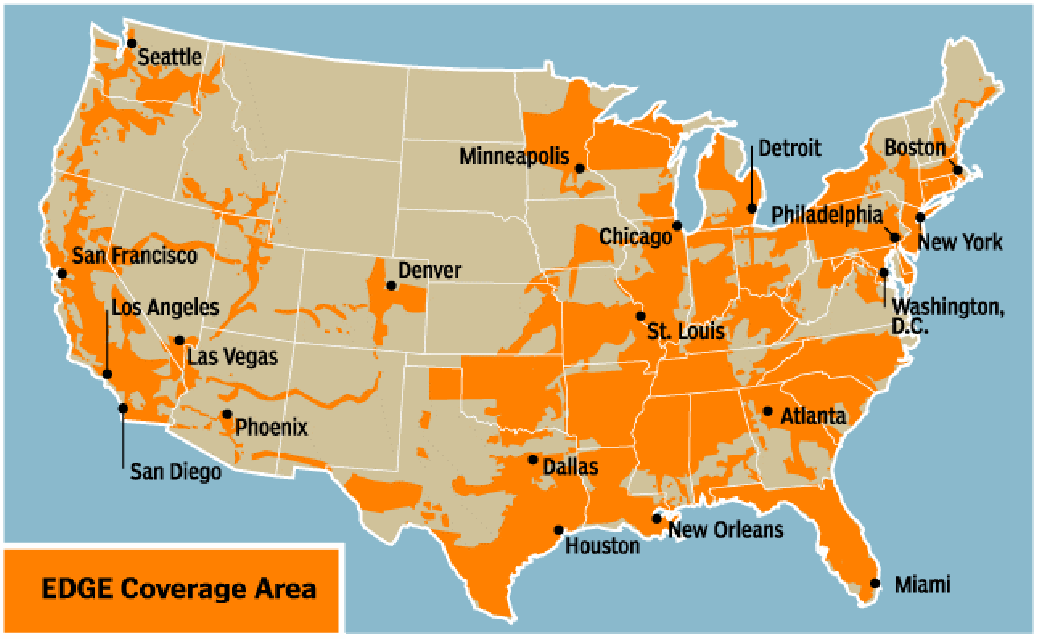
Outside of U.S.A., GSM is by far the dominant mobile phone technology and many of these GSM networks run GPRS to carry data. The Global System for Mobile Communications Service, or GSM, is the most widely adopted, digital cellular technology in use today. GSM uses time and frequency division techniques (TDMA and FDMA) to optimize the call carrying capacity of a wireless network. In addition to voice services GSM also provides a number of carefully standardized and broadly supported capabilities such as Short Message

Service (SMS), circuit switched data (CSD) and General Packet Radio Services (GPRS).

In the U.S.A., two cell-phone companies—Cingular and Verizon Wireless—offer 3G networks. (Cingular has two networks, one from its merger with AT&T.) True, all these networks are cellular-based, but that's where the similarities end. Of the three networks, Verizon's BroadbandAccess—its brand of EV-DO—has the best balance of speed and coverage: DSL-like speeds in 32 metro areas around the country. Cingular's EDGE network has the most nationwide coverage and is the cheapest to use, but it is also the slowest—only about twice the speed of dial-up. EDGE is only marginally 3G; some experts consider it a 2.5G network. But it's still a major jump ahead of the slow (30- to 50-Kbps) GPRS speeds you're used to getting. Cingular's "real" 3G offering is UMTS. It's only slightly faster than EDGE right now, but it will speed up dramatically in the next few years. For now, it's available in only six cities in the U.S.A.EDGE (Enhanced Data for Global Evolution) is a 3G network that is the second upgrade to GSM and a software upgrade to GPRS. Class 10 EDGE offers up to 236 Kbps. Cingular has converted to EDGE, and T-Mobile is following.

EDGE currently covers the most populated areas in the U.S.A. Many rural areas are left out, as are the majority of Montana, Wyoming, the Dakotas, and, oddly, Virginia. But you can still drive from, say, San Diego to Seattle without losing service.

The least expensive of the three 3G networks, EDGE was rolled out nationwide quickly because it overlies Cingular's existing GSM/GPRS network. Obtaining the increased data speeds merely required a software upgrade for base stations.



EDGE works as part of Cingular's existing GSM system. GSM chops up each cellular channel within the band into eight consecutive time slots, theoretically interleaving up to eight voice calls in each channel. Your handset's circuitry knows which time slots to listen to and pieces the call back together so it sounds coherent.

Data systems like GPRS and EDGE can use several time slots at once to multiply their speeds. EDGE's nine encoding schemes allow speeds from 8.4 to 59.2 Kbps per time slot.

There are 12 classes of EDGE devices, based on the number of time slots they can use; higher classes offer faster data transfer. The most advanced EDGE phones currently use Class 10, with four downloading slots and two uploading slots. And though Class 10's theoretical maximum speed is 236 Kbps, actual throughput was 220 Kbps during testing (PCMagazine, 2 March 2005). That's more than three times as fast as dial-up, but still much slower than cable, DSL, or EV-DO.

Unfortunately, EDGE's high latency rates—the time it takes to hear back from an Internet site—make the connection feel slower than it is. And data rates drop off sharply if you're not close to a cell tower. So Cingular publicizes average speeds of only 70 to 80 Kbps—essentially a dial-up experience.

For the rest of the world, 3G is synonymous with UMTS. But in the U.S.A., neither the network nor the devices are quite ready for prime time. Cingular UMTS is not the fastest U.S.A. network, nor the most widespread; it was beaten to the punch by Verizon Wireless EV-DO. Yet it has great potential.

Currently available in just six U.S.A. metro areas—Dallas, Detroit, Phoenix, San Diego, San Francisco, and Seattle—UMTS offers data speeds that average between those of Cingular EDGE and Verizon EV-DO. UMTS, though, lets you transmit voice and data simultaneously. You can make a call while surfing a WAP site, for example. No other network currently lets you do that.

UMTS is an entirely new setup based on CDMA, which is why roll-out has been slow; Cingular's faster EDGE roll-out was a mere software upgrade to GSM. CDMA (Code Division Multiple Access), is the 2G network used by Verizon and Sprint for voice and data transmission, with data transfer rates of about 14.4 Kbps. CDMA upgrades are (in order) 1xRTT, EV-DO, and EV-DV. Whereas GSM networks segregate calls into exclusive time slots, CDMA networks mix a bunch of calls together into a single channel, with each call encoded with a special key. (Think of it as a group of people in a room, each speaking loudly in a different language. Only the decoder with the right key—the one that speaks the right language—can understand each call.)

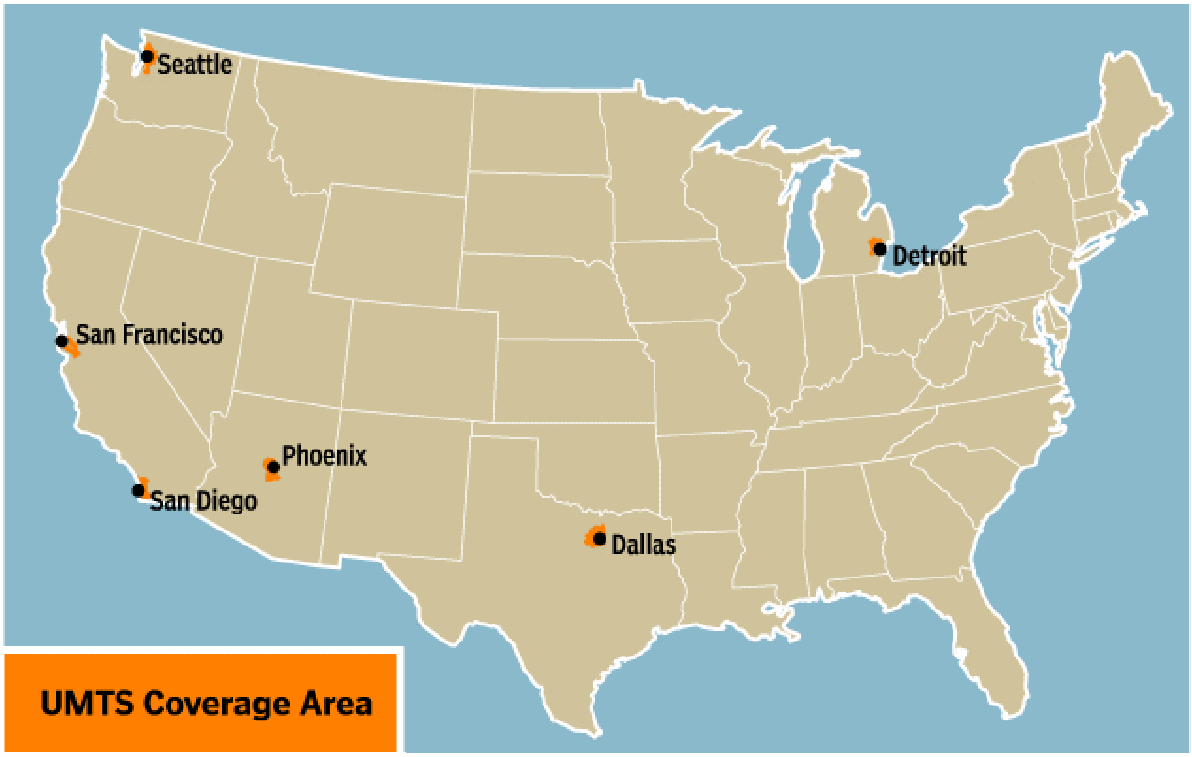
UMTS is also known as WCDMA (Wideband CDMA) because it uses wider channels than standard CDMA. It mixes voice and data in channels and allows for packetized voice—turning voice into data to pack more calls into each channel.

UMTS has a maximum theoretical download speed of 384 Kbps, but real tests didn't get anything approaching that (PCMagazine, 2 March 2005) and topped out at 299 Kbps—not much faster than EDGE. And upload speeds were especially disappointing, averaging 54 Kbps, very similar to our EDGE devices.

Cingular is aware it needs to boost UMTS's verve, so it's already working on an upgrade, HSDPA. HSDPA is a software upgrade to UMTS that uses more advanced coding techniques to achieve average data speeds of up to 700 Kbps. (In theory, HSDPA can zip along at up to 14 Mbps, but that depends on network configuration.) Cingular says it will roll this out in 2006. T-Mobile has also said it will upgrade to UMTS/HSDPA, perhaps by 2007. HSDPA (High-Speed Downlink Packet Access) is the fourth upgrade to GSM and a software improvement on UMTS. HSDPA allows for faster data speeds—up to 10 Mbps. The implementation Cingular hopes to launch in the U.S.A. (by end of 2005), however, will offer 400-to 700-Kbps data rates to start.

Other UMTS test in Asia such as in Hong Kong, tests were done using the LG U8120 handset on Three's UMTS network. The U8120 is the size of an ordinary flip phone but lets you make clear, two-way video calls—even when you're roaming internationally. These high-speed UMTS networks were fast enough for the two-way video call. However, Cingular's network doesn't have such capabilities yet, but we expect to see them in the future.

Even though many countries in Asia and Europe are going with UMTS as their next-generation network, this doesn't mean your U.S.A. UMTS phone will automatically work there. In the U.S., UMTS signals are transmitted on the 1,900-MHz frequency band, while most other countries use 2,100 MHz. It is expected that UMTS world phones will appear later in 2005.



The Verizon Wireless EV-DO network is the clear leader among 3G high-speed wireless options. Already available in 32 U.S.A. metro areas. Verizon isn't just faster than the competition; it is also way ahead in building out its network. Its impressive 32-city coverage area typically includes more than just a core city. For example: Its New York and Philadelphia coverage areas stretch out through New Jersey and nearly join in the middle, and its Washington, D.C., area extends all the way to Annapolis, Maryland. Verizon has committed to covering 150 million Americans by the end of 2005.

Verizon's technology, properly known as CDMA 1xRTT EV-DO, opens a wide channel on an existing CDMA network just for data, which can travel at very high speeds. Verizon quotes average speeds of 300 to 500 Kbps, but the technology can theoretically reach speeds of 2.4 Mbps. EV-DO coexists with, but doesn't alter, a carrier's existing CDMA 1xRTT voice network. EV-DO (Evolution Data Only) is the third upgrade to CDMA, 3G EV-DO delivers average speeds of 300 to 500 Kbps, although it promises speeds up to 2.4 Mbps. Offered by Verizon; Sprint will roll out EV-DO later in 2005.

UMTS, on the other hand, completely replaces older GSM systems with a new, combined voice/data system. UMTS is actually a more radical technology, but it's slower than EV-DO for data because of differences in spectrum usage and signal power management strategies.

On tests by PCMagazine (PCMagazine 2 March 2005) in New York, northern Virginia, and Las Vegas, they achieved speeds averaging 677 Kbps, with highs up to 1.1 Mbps and lows down to 216 Kbps. In other words, the slowest EV-DO connection was just about as fast as our fastest EDGE connection. The tests even achieved up to 693 Kbps on a moving train. Upload speeds were much slower, averaging 90 Kbps.

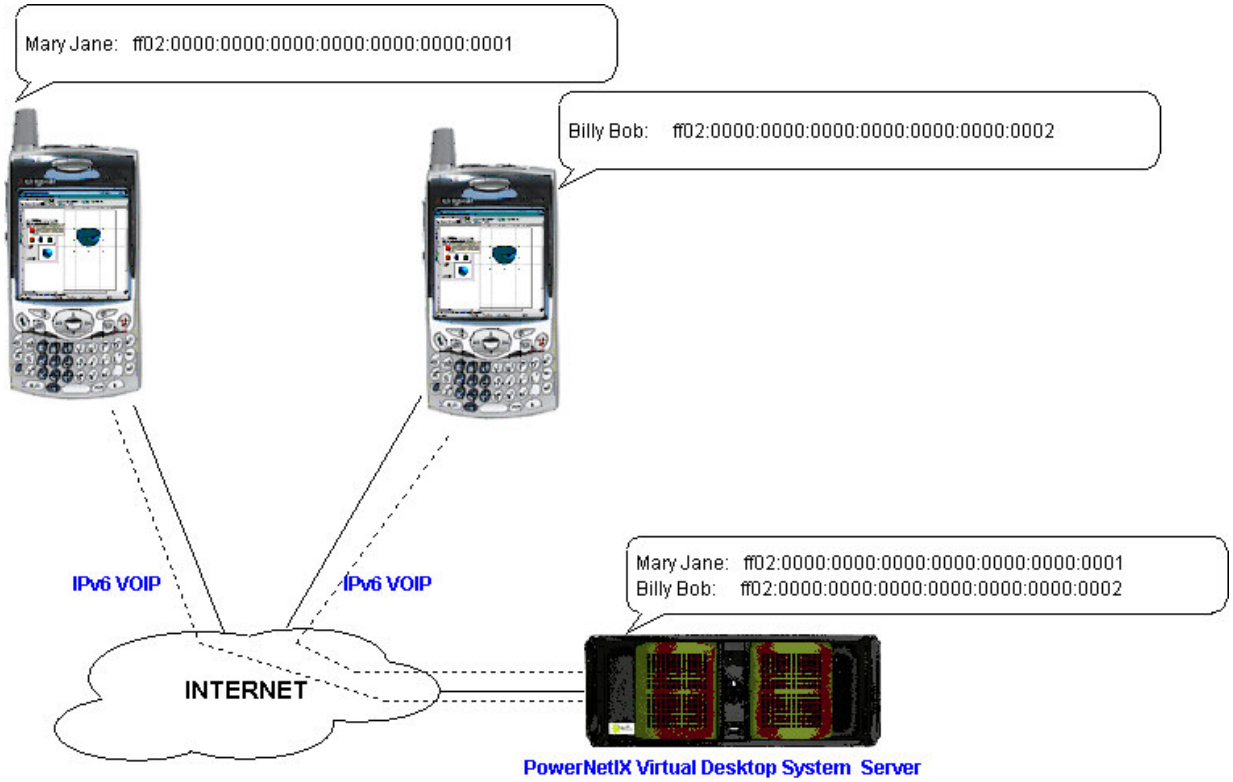
All the wireless networks above provide wireless access to the Internet. The ubiquitous IP network is the ideal platform for running the PowerNetix VDS system. As illustrate above, the best coverage in U.S.A. is the GSM/GPRS/EDGE system and it is also the least expensive. The earliest launch of the PowerNetix VDS mobile devices would support this system first and later extend to support the other various wireless network systems. Furthermore, the GSM/GPRS is the most widely deployed type of wireless data network in the world. Cingular has GPRS data roaming agreements in 75 countries, and it uses the faster EDGE data network in 18 of those countries. However, there is no need for pre-arrangement with the network operator because standard Internet Protocol (IP) is used. In all the wireless networks discussed above, the network speeds are sufficiently high that using the PowerNetix VDS would provide a good user experience.

Voice

The current “killer application” in the mobile world is still voice. Voice is the most widely used “application” in the wireless mobile world. On 2G, 2.5G or 3G, it is still “voice” or voice phone calls being used the most. However, there is not one single type of voice wireless network. As illustrated above, there are many kinds ranging from 2G to UMTS. In order to use these networks, people have had to purchase mobile phones called “multi band” phones. Also, there is no inexpensive call roaming and users have had to pay large amounts for the international roaming calls. However, PowerNetix is leveraging the ubiquity of IP by embedding a Voice Over Internet Protocol (VOIP) into the MLWPP device. Voice can be compacted and sent in an IP data packet quite efficiently nowadays. VOIP is widely deployed in many telephone companies to save money because the VOIP data is smaller than the traditional voice circuit data. Using small VOIP data has saved the telephone companies money by letting them use lower cost smaller data circuits. These have normally been used to interconnect VOIP gateways. The VOIP gateways connect back to traditional telephone voice equipment to reach the end-users regular phone (may be mobile phone). The VOIP packets are sent to these fixed-location VOIP gateways, which have fixed Internet Protocol addresses.

As in the PowerNetix Virtual Desktop System for applications, PowerNetix applies the virtual concept to the IP network for carrying voice. As the mobile users connect to their network provider, they are assigned an IP address. This IP address is an Internet Protocol version 4 (IPv4) address and is temporary. The user may not be assigned the same IPv4 address the next time he connects to the wireless data network for Internet access. This becomes a problem of sending the VOIP packet to the end user because he has no fixed IP address. There would be no way to know what will be the IP each time so it would be impossible to "phone" the user. To make the IP address permanent, PowerNetix embeds a fixed Internet Protocol version 6 (IPv6) address in the MLWPP device. This IPv6 address is unique to each mobile device and is listed in the PowerNetix VDS servers and a directory is set-up to make VOIP calls easier. The mobile device connects to the PowerNetix VDS server whenever it is on. As it connects to the VDS server, it registers its current IPv4 IP address. With this registered IPv4 address in the PowerNetix VDS servers, the VDS overlays a virtual IPv6 IP address. Since the IPv6 address is already pre-encoded in each mobile device, the architecture enables a user to be located by his IPv6 address no matter on which IPv4 network he is connected.

Example: Mary Jane's mobile device has this IPv6 address **ff02:0000:0000:0000:0000:0000:0000:0001** and Billy Bob's IPv6 address is **ff02:0000:0000:0000:0000:0000:0000:0002.** Using the PowerNetix VDS servers, Billy Bob can use the VOIP feature by just entering " maryjane" and Mary Jane's MLWPP device will ring and let Mary Jane "pick-up" the phone call.



The VOIP coder/decoder or compression/decompression algorithm (codec) used to encode and decode (or compress and decompress) the voice data for the VOIP packets would use the GSM codec since it is a widely used standard. The GSM codecs uses only 14 kbps of which 8 kbps are for the actual voice and 6 kbps are for error correction. Another benefit is that GSM is cheaper to deploy because it does not require any licensing fees to distribute and use.

This PowerNetix VOIP roaming service can be offered at a flat rate since cost is fixed. Furthermore, with the fixed virtual IPv6 address the user can be reached no matter which network provider is being used. Additional benefits include no cost long distance phone calls.

IPv6 was chosen for the virtual network because IPv6 is the next generation Internet. IPv6 solves many problems of the existing IPv4 Internet: IPv4 is short of available IP addresses while IPv6 has enough addresses for each person on earth thousands of times over,

Product differentiation

There are some comparisons between the PowerNetix Virtual Desktop System and other products such as PDAs, mobile phones and even the Research In Motion Blackberry. Due to the functions, applications, and large storage, the PowerNetix VDS system is more like an enterprise desktop system but with the added benefits of low cost and wireless mobility. Also, the PowerNetix VDS uses the IPv6 addressing with Voice Over IP (VOIP). This VOIP stands out as a low cost global phone service not available with any other device whether phone nor PDA.

	PowerNetix MLWPP device	***PalmOne Treo 650***	***HP iPAQ 6340***	***RIM Blackberry 7100G***
Cellular technology	GSM/GPRS/EDGE	GSM/GPRS/EDGE	GSM/GPRS	GSM/GPRS
Wireless access	WiFi(IEEE 802.11b/g/a)/ Bluetooth	Bluetooth	WiFi(IEEE 802.11b)/Bluetooth	Bluetooth
Price	Low	High	High	High
Battery Life	Long	Average	Short	Long
Office suite /mail	Word processor, spreadsheet, presentation, database, and powerful mail client.	PIM and email, third party add-on for Office suite.	Mobile Office: cut down versions of Word, Excel and outlook.	No office suite/mail only(can view but not edit office application data)
Storage	10 GB available on remote VDS servers	Limited internal storage: 22 MB	Limited internal storage: 64 MB	Limited internal storage: 32 MB
On-demand system upgrade	YES	NO	NO	NO
Storage expansion	Up to 1 TB on remote servers	Limited to internal SD slot (2GB maximum size June 2005)	Limited to internal SD slot (2GB maximum size June 2005)	NO
Web browser	YES	YES	YES	YES

	PowerNetix MLWPP device	***PalmOne Treo 650***	***HP iPAQ 6340***	***RIM Blackberry 7100G***
Presentation software	YES	NO	NO	NO
Database software	YES	NO	NO	NO
Graphic editing software	YES	NO	NO	NO
Central enterprise management	YES	NO	NO	NO
Secure data storage	YES	NO	NO	NO
Shared remote application data capability	YES	NO	NO	Email only
Ipv6 address support	YES	NO	NO	NO
Flat-rate Voice Over IP	YES	NO	NO	NO

SUMMARY

Although there will be growing pressure to keep pace with the mobility efforts of competitors, mobile solutions should always be centered in a business case that weighs its benefits and costs against the alternative methods for getting the job done. Enterprise mobile strategies should focus on extending standing investments and unleashing the value of existing applications. The most powerful applications are those being used every day by workers. The ability to provide access to these applications to mobile workers is the true value of a mobile deployment project. Providing mobile workers with key sets of application access within a mobile environment delivers significant business advantages and addresses the strategic needs of the organization. The PowerNetix VDS provides a full and complete suite of office applications plus email access. These applications are used everyday by the enterprise and the truly mobile deployment enables strategic benefits to the enterprise.

In addition, the extensibility-ready architecture of the PowerNetix VDS is inherent in the wireless offering providing offline access to wireless email and other applications, and a framework for deploying applications. Let the business goals, worker mobility patterns, and attributes of the data to be mobilized determine a solution's wireless platform. The degree to which workers need to access the most up-to-date data, the requirement for voice communication to be part of the solutions, and the location from which data will be exchanged — from the field, on a campus, or within a building — will
determine whether a wide-area, local-area, wired synchronization, or combination of methods is most appropriate. The centralized architecture for data storage, low cost of mobile device, high processing power of the PowerNetix VDS servers enables a wider and more thorough set of applications and solutions for the mobile worker. Furthermore, built-in IPv6 support for next generation Internet provides the most extensible platform for network growth and capabilities. In addition, global Voice Over IP capability provides the cost effective low cost voice solution.

Future direction includes the integration of WiMax wireless data connectivity. WiMax transmissions can be sent and received at ranges of 20 kilometers. As of this writing, Intel Corporation has already produced and started shipping WiMax chip sets to manufacturers for testing and designing into mobile devices. With WiMax wireless connectivity, the PowerNetix mobile devices will have even better functionality and lower operating costs. It is expected that WiMax will become as ubiquitous as the current WiFi systems. Due to the long range of WiMax and the low cost of components it would be even more widely used than any current wireless technology.

PowerNetix Virtual Desktop System
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