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Thin Clients Get Second Chance in Emerging Markets

Jan Krikke

If the IT industry had an award for the most promising technology that failed to make its mark, the thin client would be a major contestant. Heralded in the 1990s as an alternative to the PC, the thin client or “network PC” promised lower maintenance cost, higher productivity, and improved security. But the market had other ideas. The thin client remained a niche market, and the PC still rules the desktop. Some industry insiders predict the thin-client model will have a major impact in emerging markets. Will the billion-plus future computer users in India and China save the day for the thin client?

STRUGGLING FOR ACCEPTANCE

Worldwide sales of TCs, while growing in recent years, stand at less than 2 million annually, a fraction of PC sales. Why has the TC model failed to break through in the corporate environment? Corporate IT departments have complained for years about the endless cycle of software upgrades, the short life cycle of PCs, and high maintenance costs. The problem, say critics, is that the TC model is too rigid, that it requires expensive servers, and that most end users insist on local processing and storage. If the network is down, they point out, operations halt. Others point out that market developments have worked against the TC.

“The original motivation for the

development of TCs was to save money on making the hardware,” says Steve Leibson, technology evangelist at configurable-chip vendor Tensilica. “Thin clients were supposed to save money by giving companies a cheaper box to put on workers’ desks instead of expensive, US\$5,000 PCs. But the concept ran into trouble because PCs got much cheaper much faster than anyone expected. Today, any \$500 PC can act as a thin client on a desktop, so there’s no longer

TCs can offer substantial benefits, especially in environments where computing tasks are clearly defined and require little local processing.

an economic justification for a special desktop box called a ‘thin client.’” Leibson also points out that Ethernet has made it easy to link PCs to corporate networks.

IMPROVING TECHNOLOGY

That’s not to say the TC model is dead. Millions of people around the world use the stripped-down terminals for computing tasks that don’t require powerful PCs. Citrix Systems, the

world’s leading TC solutions provider, claims its flagship product MetaFrame Access Suite has nearly 50 million users in more than 120,000 organizations worldwide. Wyse Technology, the world’s number one supplier of TCs, has an installed base of over 2 million and reports growing interest in server-centric computing (SCC) among corporations, governmental departments, and educational institutions. According to IDC, the overall TC market grew 7 percent year-on-year in the second quarter of 2004.

Mike DeNeffe, senior director of the Wyse Winterm business line, claims improvement in Internet technology, client operating systems, and management software have all but eliminated earlier problems with the TC model. “The question is really whether companies can embrace server-centric computing in general,” DeNeffe says. “SCC is a more strategic thought process than loading every possible application on each PC and keeping a fat LAN pipe connected to servers. Anytime a company has either a focused application or a large set of users with common computing needs, there is an opportunity for SCC, and they can realize the benefits of TCs over PCs.” DeNeffe adds that virus attacks have been a critical factor in pushing some IT managers to deploy TCs.

There’s no doubt TCs can offer substantial benefits, especially in environments where computing tasks are clearly

defined and require little local processing. TCs prevent end users from changing the device's configuration or loading unauthorized software. IT departments can create secure portals and offer remote access to company data. Roaming users don't need to sync data, and no data is lost when a TC is stolen. Unlike PCs, TCs have no floppy drives, fans, or other moving parts, making them highly reliable. The average mean time between failures is about 175,000 hours, compared to 25,000 hours for PCs, according to a Gartner study.

RICH AND MANAGED CLIENTS

Despite TCs' benefits, many IT managers are reluctant to migrate to the pure TC model, and workers are often reluctant to give up "their" PCs. But vendors now offer a hybrid solution known as "rich" or "managed" clients that extends the life of existing hardware and offers the best of both worlds—local processing and central management. In May 2004, IBM announced Workplace Client Technology, a new framework for creating server-managed business applications. The company said it's addressing "the growing demand for dynamic, powerful applications—known as 'rich client experiences'—that can be centrally deployed and managed, affordably."

Users can access Workplace via a Web browser, letting them log on to the server anywhere using any device. Applications can run either on the server or client, depending on the device and type of connection. The server manages the application, user interface, data, transaction, and messages. Unlike the pure TC model, Workplace lets users work offline. Data is synced up with the central server when the user reconnects. Workplace supports "thick client" operating systems such as Windows and Linux, and OSs for wireless and embedded devices, including Symbian, the dominant OS for smart phones. Mac/OS support is expected in the fourth quarter of 2004.

Linux vendors are also targeting server-based computing. According to

IDC, Linux powered over 20 percent of TCs in 2003 and is growing at a rate of 60 percent per year, making it the fastest growing TC operating system. Wyse Technology, long dominant with its proprietary TC software, also jumped on the Linux bandwagon. Its Wyse Linux V6 unit is based on the Linux 2.6 kernel and runs software from embedded Linux specialist MontaVista. Number two player Neoware estimates Linux already represents 40 percent of its business. Sun Microsystems, an early champion of the TC model, recently announced that its Sun Ray Server Software Version 3.0 will be available for Linux this year.

Linux specialist Shaolin Microsystems in Hong Kong offers a middleware network computing architecture called Fit Client that turns networked client PCs into Linux-based managed clients. The company claims its flagship product Aptus reduces the complexity of PCs to the level of TCs while preserving PCs' benefits, flexibility, and processing power. Shaolin says Aptus clients can run multiple applications, including CAD/CAM software and multimedia, without affecting other users' performance.

Generally, TC performance depends on the server, connection speed, number of concurrent users, and type of applications. A single PC server can power 10 TCs used for data entry and other light computing tasks. Demanding applications such as image editing require a powerful server: 30 clients will need a dual Pentium 3 platform with 2 Gbytes of RAM. Sun recommends a two-processor Opteron server for 20 Sun Ray users. The city of Largo, Florida, installed a 933-MHz dual-processor ML370 and a 1-GHz dual-processor ML350 Compaq server running Red Hat Linux 7.2 that can support about 220 concurrent users performing routine office tasks.

EMERGING MARKETS

The number of PC users worldwide stands at about 660 million, and at cur-

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Pervasive Computing Undergoes a Near-Body Connectivity Experience

Bernard Cole

Engineers and developers could soon find themselves swimming in a new alphabet soup of technologies, protocols, and specifications as activity in pervasively connected computing heats up.

These new technologies are variously called personal-area networking, near-in networking, near-body and in-body communications, near-field magnetics, and near-field communications.

A SLEW OF PLAYERS

The players include established companies such as Philips, Samsung, NEC, Nokia, NTT Docomo, IBM, and Microsoft as well as startups such as Aura Communications and Ident Technology. Their aim: to solve several issues that face designers of wired and wireless computing devices relating to security, safety, operational simplicity, and convenience.

Ident's Skinplex is the newest player in what Texas Instruments research fellow Gene Frantz calls "last meter connectivity." Their technology uses the human skin as transmitter, moderator, and catalyst of extremely low-voltage and low-current signals that are sent to a constellation of pervasive computing devices worn by the user.

According to Stefan Donat, Ident's president and co-founder, Skinplex is essentially passive. It uses little more than a microvolt capacitor to generate a 30-nanoampere static charge, some simple electrical components, and an 8-bit microcontroller to generate a coded signal.

This digital signal is used to modulate the generated

quasi-static electric field that under normal conditions would have no influence beyond 50 centimeters. But brought near to or placed on the human skin, the body acts as a partial conductor, generating its own static field to extend the effective range to about an arm span and a few inches beyond. Prototypes have transmitted a 128-bit code at 9,600 baud using a 195-kHz oscillator, clearly identifying the bearer.

With Skinplex, when a person wears an identifier on his or her skin or simply touches the identifier, an activated static field delivers the 30nA current across the bearer's skin.

"Unlike most alternatives, such as RFID, no active RF signal is transmitted," says Peter Fasshauer, a technology consultant for Ident. "The generating unit is only modulating a static electric field and then only when in the vicinity of a capacitive link to a receiver. The same is true for the receiver."

Because they are active only intermittently, the devices can be powered by batteries that could last for three or four years, he says. Also, compared to most other alternatives, the componentry is low tech, even mundane, with materials 30 to 50 percent less expensive than any other alternative, he estimates.

A RANGE OF APPLICATIONS

Because the effective range is no more than 50 centimeters, Peter Rosenbeck, Ident CEO, says any application that requires an authorized person's presence is a good fit for

rent growth rates, this will reach a billion in 2010. Most new users will be in India, China, and other emerging markets. Deployment of TCs in Asia lags behind that in Europe and the Americas, but a Linux-based TC with free productivity software is an appealing proposition in emerging markets. In India and other Asian countries, the cost of a Windows PC is the equivalent of two years' average wages (in the US and Europe it's about two weeks' wages). Wyse, VXL, and other TC vendors expect Asia to be their most important growth market in the coming years.

Tim Handley, processor platform marketing manager at Taiwan's TC components supplier VIA Technology (see the sidebar on page 10), says TCs are ideally suited to markets such as India and China. "The needs of developing regions can arguably not be met by PCs that have been developed for consumers in developed regions," he says. "Emerging economies like China and India are more focused on access to information, communications, and entertainment rather than all of that plus word processing, the manipulation of spreadsheets, [and] giving presentations with a projector." Handley adds,

"Apart from the cost savings, thin clients have the additional benefits of low power consumption, reliable fanless operation in dusty regions where fans would suck dirt into the case, and ease of use for noncomputer-literate users through a customized, server-controlled environment."

Rajesh Jain, managing director of Netcore Solutions in Bangalore, agrees. He says PCs are too expensive for markets such as India and notes that a growing number of Indian organizations are turning to TCs. "India's largest life insurance organization LIL deployed more than 10,000 thin

the technology. "This opens up a wide range of potentially high-volume applications, including unlocking car doors and car antitheft devices; secure computer use; theft and loss protection of cell phones, cameras, and PDAs; and securing virtually any mobile or portable device," he says.

Another big opportunity for the company is in a wide range of medical devices for use in hospital settings, where active RF-based personal-area networks are not allowed. The current generated is much lower than most medical equipment, Donat says. "Your digital wrist watch would do more harm."

COMPETITION HEATING UP

But as startlingly simple and low-cost as it seems, Skinplex faces serious competition. The best-financed technology with the most market momentum is near-field communications (NFC), promoted by Philips, Nokia, NEC, and Samsung as well as the just-formed NFC Consortium. Another is near-field magnetics (NFM) from Aura, which uses a passive quasi-static magnetic field that is modulated to deliver signals. Also investigating this segment are NTT Docomo, IBM, and Microsoft, all of which use the skin as the transmission medium for active but low-power RF signals.

NFC, which operates in the 13.56-MHz range, delivers data at up to 212 kbps over a few centimeters. Its highest-volume use is in microprocessor-based smart cards, eliminating the need to insert the card into a reader.

Aura's NFM, which also operates at 13.56 MHz,

delivers streaming data and media at data rates up to about one megabit/second. "NFM in essence allows us to create a low-power, nonpropagating, static magnetic field 'bubble' that extends out 1.5 to two meters from the source," said Dan Cui, vice president of marketing at Aura. "Within that bubble, transmissions of even fairly high data rates, such as audio, can be sent with a high degree of quality and no degradation or interference. But outside that bubble, signal attenuation is such that the transmission virtually disappears. This means that anything transmitted or received within the bubble is of very high quality but, because of the attenuation, is also private and secure." The company is going after high-end wireless audio headsets in competition with Bluetooth.

Activity in near-body connectivity is still in the early stage, says Frantz, whose responsibility at TI is to focus on future technology directions and strategies. He doesn't think present wireless concepts meet the needs of last-meter networking as they're presently defined. "Until this new field of applications is better defined," Frantz says, "it will be hard to determine if RFID, NFC, NFM, or skin transmission techniques are even adequate."

But of one thing he is sure: as personal-area networking becomes better defined, the era of "all-in-one" mobile devices will come to an end. They'll be replaced by groups of heterogeneous computing elements worn on the body, each of which has specific functions but which can be organized to accomplish common operations.

clients across its organization, and many banks and educational institutions are considering deploying thin clients," he says. Jain says TCs running open-source software can reduce the cost of computing by more than 70 percent, which he considers essential if India is to bridge the digital divide. He argues a PC server hosting Linux OS costs about the same as a fully loaded Wintel PC.

Deepak Phatak, a professor at the Indian Institute of Technology Bombay and one of India's best-known champions of low-cost computing, is promoting the adoption of a low-cost semi-thin

client based on VIA's 800-MHz C3 processor. C3 processors are priced at \$22 in 1,000-unit quantities, about a third of the cost of Intel's 2.1-GHz Celeron processor. Phatak believes the number of computer users must grow by 20 million a year if India is to bridge the digital divide. Despite the success stories about India's outsourcing industry, Indians bought only 2.6 million PCs last year, a drop in the bucket given its population of one billion.

VIA Technology supports Phatak's initiative to develop low-cost computing in India. The company's Affordable Computing Lab at IIT is working on tech-

nologies that will help developing technology provide telecom services to homes and offices (that is, the "last mile"), a pressing issue in countries such as India where basic telecom services are either inadequate or nonexistent. Says Jain, "Thin client computing will never do very well in developed markets, but [it] will have a major impact on emerging markets."

NEW OPPORTUNITIES AND APPLICATIONS

VIA's Handley stresses that TC technology isn't just about desktop PC replacement. "As server-based com-

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TAIWAN BULLISH ON THIN-CLIENT MARKET

Taiwan is home to VIA Technologies, one of the world's leading suppliers of TC components. Tim Handley, processor platform marketing manager, says the company is experiencing unprecedented growth in the TC market. "We have a rising number of design wins from the world's leading TC vendors such as Wyse, Neoware, VXL, Fujitsu-Siemens, and IGEL," Handley says.

VIA made headlines earlier this year when it became the first chip maker to announce a full silicon platform in a lead-free package that complies with the European directives RoHS (Restriction of Certain Hazardous Substances) and WEEE (Waste Electrical and Electronic Equipment), which come into effect in August 2005. "We expect our lead-free package will help further strengthen our position in the thin client market," Handley says.

Taiwan is the world's leading TC producer. According to Market Intelligence Center (MIC), Taiwan's share of the global market has been over 50 percent for the past several years. In 2002, global shipments reached 1.5 million, with Taiwan accounting for 901,000 units valued at US\$223 million. MIC estimates Taiwan's production volume will grow at a compound annual growth rate of nearly 50 percent in the next two years, representing 60 percent of the world's TC production volume of 6.6 million units. IDC is less bullish, predicting global production will rise at a CAGR of 22.8 percent and reach 3.4 million units in 2007.

Among Taiwan's leading original equipment manufacturers are Bona Computech, First International Computer, and Chyang Fun. They produce TCs with a basic case, power supply, motherboard, and embedded OS at factory prices ranging from \$200 to \$300.

Chyang Fun, which has the capacity to produce 1,000 TCs a day, can supply a basic factory model with Linux for \$150 FOB. The company also provides TCs that can be integrated with an LCD monitor. Chyang Fun integrates a handle into several models to enhance their portability. FIC produces TCs as well as point-of-sales terminals and broadband gateways, and has 12 automated factories in Taiwan, the US, Mexico, Brazil, and China.

puting technologies mature," he says, "companies are developing different types of thin clients that cater to specific needs in markets other than those for typical corporate thin clients." He points at set-top boxes for digital entertainment, a market Wyse Technology also addresses. Last year, Wyse, together with Intel and Microsoft, announced a set-top box platform for what it calls high-quality digital living room entertainment.

Says Handley, "I believe entertainment will be the killer application for thin-client computing. Hotels already use set-top boxes to generate additional revenue by providing visitors with a video-on-demand system in each room

that streams movies from a central server for a small fee." He adds, "Streaming applications can be extended to IP set-top boxes that operate from the consumer's living room and provide video-on-demand, Internet TV/radio, and even communication services such as VoIP and video conferencing from cable TV or broadband Internet service providers."

Handley believes TCs will not replace conventional PCs, but he expects the market to grow at a rapid pace. "Thin clients enable a host of applications that are not practical with a PC," he says. "This means they present new marketing opportunities and device categories." ■