

New System *Requires* New Entrepreneur

CIOs at most major corporations around the world have adopted a new mantra: "Make assets sweat." The shift in emphasis, long discussed, has taken on a sense of imminent action. The result, from a venture capital perspective, is a new — some would say historic — opportunity for groundbreaking enterprise investment.

The trend is receiving an impetus from the current squeeze on corporate profits. CIOs face the imperative of scaling up user capabilities within scaled-down budgets. That means buying less hardware and software, consolidating operations at every possible level and managing increasingly complex computing environments without adding people.

But the new activity is actually much more profound than a mere response to one economic downturn. We would argue, in fact, that as an industry we find ourselves in the early days of the first fundamental rearchitecting of enterprise information technology in several decades. The resulting architecture will turn each of the three tiers of the data center into virtualized resource pools — storage, compute and the front end. The new architecture will create all the operational advantages of centralized computing while facilitating improved application and information integration.

In essence, we are seeing another swing of the innovation pendulum. Thirty years ago everything was in one place: the data center at corporate headquarters. In the intervening years, computers spread to everyone's desktop, and mini-data centers to support them spread in parallel. It is not uncommon today

for a large multinational corporation to maintain 10,000 or more servers in dozens of data centers worldwide. With each passing year, however, the inefficiencies of distributed systems have become increasingly apparent. Each of the data centers requires its own servers, software, firewall, load balancer, etc. Though underutilized — less than 25 percent of capacity is the norm — each data center requires its own onsite IT manager.

The gravest problem, however, has proven to be CFOs' difficulty in synchronizing day-to-day business reporting. Scattered, sometimes incompatible systems spread across wide-ranging geographies have necessitated extraordinary efforts at data cleansing and transformation. To the degree those efforts have fallen short, the results have been less than optimal inventory and financial controls and a significant erosion of profit.

Consolidation to just a handful of centers per company offers the promise of accurate daily closing of the books, better capacity utilization and, with it all, enormous savings. Today we are on the verge of reconsolidating and reintegrating everything but the desktop computers themselves; e.g., data centers, servers and applications. In the process, headquarters will regain control of operations and efficiencies even as users maintain their present freedom to access applications and storage when and where they want.

Most big corporations, according to the IT consultants who support them and our own discussions with CIOs, are in the advanced stages planning for consolidation.

According to Jeff Gilliam, president of Information Solutions West, a unit of EDS in San Ramon, Calif., the process is being driven "by the business process guys who want to streamline their operations and the IT guys who want to cut costs.

by **Ken Gullicksen & Gary Little**

Consolidation

Eventually, the two groups will wind up in the same long-term strategic place.” Many corporations began execution of initial projects last year.

A Non-Disruptive Revolution?

How could such a movement be advantageous to entrepreneurs and their venture capital investors? Despite widespread recognition of the need for change, CIOs are understandably hesitant to rewrite working applications in tough economic times. They will do everything they can to avoid forklift upgrades. And, even though the drive for central control adds to their

internal political clout, most CIOs and CTOs will be reluctant to tell their peers in senior management that they are betting company futures on technology from startups.

And, yet, if one thing has become clear in recent months, it is that bolt-on solutions don't work. Something as fundamental as recentralizing computer architectures can't be attacked working backward through legacy systems and, in many cases, their vendors.

What is required in these times are entrepreneurial teams who can develop bold solutions, yet configure and package them to work alongside legacy systems. No small challenge, but for those who meet it, one with high potential rewards.

The Triumph of Virtualization

After several years of promise and hype, virtualization is finally coming into its own. At its best, virtualization allows users to pool discrete resources so that they are transparent, infinitely scalable and universally accessible. The overbuilding of long haul telecommunications pipes has resulted in an unexpectedly inexpensive foundation on which to achieve these ends. When implemented correctly, virtualization will emerge as the single greatest step in recentralizing computer systems and the single greatest healing agent for corporate pain.

Storage is the tier where virtualization has reached its greatest maturity. Both established vendors and a few hot startups have demonstrated real cost benefits for customers. The movement away from direct attach to network storage is already established. It was only after this trend was well underway, however, that system administrators discovered that the hoped for ease-of-management benefits were less than advertised. With the

addition of support for virtual volumes — and, in the case of network attached storage, of virtual file systems — the promise is now becoming reality. The problem of unforeseen hotspots that require frustrating amounts of manual management and time is, we hope, on the way out.

At the compute tier, IBM, with its virtual Linux on the mainframe, and Sun Microsystems with its N-1 initiative, are in the early stages of adding virtualization. Their vision is to provision a server with a given application on the fly when needed — rather than the days or weeks that it often takes today.

But it is at the front end of the data center that we see the greatest entrepreneurial opportunities to bring virtualization technology to the market. The emergence of the Web in the mid-'90s led to a proliferation of front end appliances — first firewalls to plug new security holes that had opened up, and then a whole series of appliances to offload functions that proved too taxing for servers (e.g., VPNs, load balancing, SSL offload, Web acceleration). Since then, as nearly all new and many legacy applications have moved to Web architectures, the complexity of the underlying appliance infrastructure at the front end has increased to an unmanageable level. The vendors are highly fragmented, and most do not appear to have the market power of an IBM or an EMC to fend off next-generation challengers.

Front end appliances and applications are also the source of an enormous amount of corporate frustration. Each new appliance or application adds exponential complication. In our view, the solutions that emerge will have to be architected from the ground-up with virtualization in mind, from hardware level enforcement and acceleration to resilient modular software that provides isolation between applications. IT managers will have to be convinced that a failure in one module won't impact other applications, that the performance of every application can be guaranteed and that the platform will work in 24x7 continuous operation. Products that meet this challenge will reduce both capital and operating overhead by up to 10x while dramatically improving both the velocity of application deployment and application uptime.

Fixing Breaks

Centralized worldwide computing will inevitably break down as it pushes against the limitations of the old system it is replacing. Take the problem of differing rates of technology evolution within servers. CPU performance has expanded 20-fold since the last

continued on page 34

urs

New System Consolidation

continued from page 33

major advance in PCI bus architecture. This imbalance has left most servers I/O bound — they can process information much faster than they can get it in or out of the system.

InfiniBand, long envisioned as the solution for the imbalance, has proven too complex and suffers from a lack of backward compatibility. Some entrepreneurial companies, however, have found ways to use next generation interconnects to turbo-charge PCI by converting PCI's bus architecture to a switch architecture, thus multiplying aggregate I/O bandwidth and scalability by 8x to 16x. Recent announcements by Intel and the PCI standards organization regarding PCI Express and PCI Express Advanced Switching give credence to these efforts. Importantly, such solutions are both fully backward compatible with existing PCI peripherals and forward compatible with next-generation systems and devices and thus meet most CIOs' cost savings requirements.

Entrepreneurs are attacking the I/O bottleneck at the application level as well, developing real-time event management systems based on ultra fast in-memory data managers that eliminate slow mechanical disk I/Os from the transaction stream.

Another key challenge is latency experienced by end users in accessing applications that are increasingly delivered through a Web architecture. Largely forgotten during the era of mini-data centers, latency is certain to return with a vengeance as companies reduce the number of data centers to four or five.

The problem seems counter-intuitive. The combination of new big pipes and a Web architecture that permits centralization of applications should lead to instantaneous response time. But the reality for Web-based applications when looked at worldwide is more like six seconds to 10 seconds — an unacceptable time lag for users. Big pipes permit a near-infinite amount of traffic (bandwidth), but, unaided, still can't solve latency problems.

The solution, we believe, requires a rethinking of network-level architecture to effectively clean out communications overhead that clutters the links between users and the servers where data resides. Existing caching and intelligent congestion-based routing approaches simply have not done the job. Every Web page must be delivered to the end user's desktop in less than one second, or the user experience will be severe frustration. Unless CIOs are able to overcome this problem, they are likely to face considerable organizational resistance to their recentralization plans.

Above all, consolidation will expose the ever-more glaring problem of security. Security systems should, in fact, be viewed as already broken because they have already become far too complex for administrators and users alike. To work effectively, security has to be transparent and part of the DNA of the system in which it operates. That will mean a change in culture for many software vendors and cause them to place much

greater emphasis on security — with the likely side benefit that software quality will also improve as greater effort is put into code reviews and testing.

It will also mean rethinking some fundamental technologies. Public key infrastructure (PKI), for instance, once promised to secure virtually all messaging and transactions, but has proven too complex to implement. Similarly, intrusion detection systems once seemed likely to prevent hacking, but in fact have resulted in a flood of data that is too hard to interpret. Moreover, the process of intrusion detection moves far too slowly to actually intercept and stop attacks, and burdens IT operations with a barrage of false alarms.

In this era of heightened security awareness, consolidation represents both a threat and an opportunity. A centralized environment provides a well-defined target, while at the same time making the task of creating a security architecture and monitoring the environment much more manageable. With careful planning and vigilance, security in the new consolidated environment can serve its essential function far more effectively than in the past.

Consolidation to just a handful of centers per company offers the promise of accurate daily closing of the books, better capacity utilization and, with it all, enormous savings.

Toward a New Geography of Corporate Computing

Five years from now, the face of worldwide corporate computing will look far different than it does today. Data centers will number between two and five for most corporations, finding the right balance between the efficiencies of centralization and the business continuity needs via redundancy. The trend line of IT

employment will be sloping far more horizontally as management benefits grow. CIOs will be able to virtually and instantly provision all key resources in the data center, and they will be able, for the first time, to offer their colleagues real-time visibility into business processes.

As venture capitalists, we expect to see about a dozen new entrepreneurial companies that will be recognized, both by customers and by Wall Street, as having made major contributions to the new business order. We can modestly hope that at least a few of those new winning companies are ours. ■

Gary Little is general partner of the Enterprise IT Practice at Morgenthaler in Menlo Park, Calif. His past experience includes executive positions at IBM, Sun and Apple. Little holds an MBA from Harvard and a BSEE from UCLA.

Ken Gullicksen is a partner in the Enterprise IT Practice. Prior to Morgenthaler, he was the founding CEO of FiberStreet Inc., a Gigabit network service provider. Earlier, he held several positions at Sun and Nortel. Gullicksen holds an MBA from Stanford University and a BSEE from San Jose State University.

Founded in 1968, Morgenthaler Ventures is one of the nation's oldest venture capital firms. Current investments include Inkra Networks, Netli, Nominum, Stargen and Times10 Performance Software. Please visit www.morgenthaler.com.