COMPAQ
Scalable, Reliable Clustered Computing for the Capital Markets
Bill Woo, strategist, Compaq, Tandem Division
Andrew Wescott,Finance Segment marketing manager, Compaq, Workstation Division

Rapid technological advances—and growing demand for round-the-clock information and services—have defined the final decade of the 20th century. More importantly, they provide an advance look at the ever-changing character of business in the upcoming millennium.

Nowhere are these defining forces more compelling than in the global financial services industry and the computing infrastructure that supports it. And never has a strong computing partner been more essential for success.

One computing company stands above the rest in meeting the complex information technology needs of the financial services industry: the new Compaq, long the leader in PC-based industry-standard computing and now further strengthened by the strategic acquisition of Tandem Computers and Digital Equipment Corp. Tandem and Digital represent a huge presence in financial services; for example, the solutions from these two divisions account for over 111 exchange implementations in more than 105 exchanges worldwide.

As the second-largest computing company in the world, Compaq now offers the broadest range of products, solutions and services in the industry—all the way from the hand-held C-Series to Professional Workstations to NonStop® Himalaya® systems on which major companies run their core business.

This full range of offerings is united by the new E2000 platform architecture unveiled by Compaq earlier this year. E2000 represents the synthesis of the company's efforts in driving commodity Intel-Microsoft technologies into a broad spectrum of capabilities through clustering, i.e. the combination of multiple computers into a single system. The goal is leading-edge, affordable computing with availability, manageability, scalability, performance and support of existing applications, all at attractive price points and low total cost of ownership.

Compaq has two approaches to scalable computing for the capital markets industry: workstations and business-critical systems.

SCALABLE WORKSTATION SOLUTIONS
The workstation is a key productivity tool for traders and analysts, who must be able to access massive amounts of data in real time, analyze prevailing market trends, and make rapid and pertinent decisions. Customers in the financial services industry are migrating to industry-standard Windows NT/Intel systems at a rapid rate. Compaq's Intel processor-based Professional Workstation family incorporates the latest Intel processors, industry-leading graphics capabilities and a unique standards-based architecture with high-performance memory and I/O subsystems.

As the industry evolves to Windows NT/Intel, there is an increasing emphasis on multiprocessor systems. Manufacturers are able to offer cost-effective multiprocessor systems due to the drastically different economics of Intel and RISC architectures. Application vendors are now investing in multithreading their applications for Windows NT due to its pervasiveness and standardized programming model. Traders typically use multiple applications simultaneously, such as spreadsheets, data distribution clients, Web browsers, trading interfaces, etc., which Windows NT can easily schedule across multiple processors. Analysts share these requirements, but they also need bursts of computational performance from individual applications, which will be delivered through multithreading.

Some customers have requirements for scalable "workstation class" applications that exceed the capabilities of individual workstations. As a part of the move to industry-standard workstations, these customers have ported these codes to Windows NT and are in various stages of deploying Windows NT-based workstation clusters. Customers have also indicated that Microsoft Excel is gaining tremendous popularity as a tool for 'what if' or Monte Carlo simulation for financial analysis. However, due the

complexity of the models being used, they are experiencing extremely long run times on single processor systems.

In an effort to accelerate the performance of these popular Monte Carlo simulations, Compaq has partnered with Decisioneering, Inc. and Scientific Computing Associates to market the Crystal Ball Turbo (CBT) product. CBT is a turnkey solution for the parallel processing of an Excel spreadsheet-based Monte Carlo simulation across a cluster of Windows NT-based multiprocessor workstations. Crystal Ball is a well-known add-in for Microsoft Excel in use throughout the Fortune 500. CBT represents the integration of Crystal Ball and Scientific's "Paradise and Piranha" technologies for parallel/distributed computing. We have seen early interest from banks working in applications such as global risk analysis (long duration simulations) and trading (short duration), and in markets such as fixed income and derivatives. One customer recently reported a speedup of 40 times when comparing the performance of an in-house model running on a uniprocessor workstation vs. a cluster of 25 dual processor workstations.

Customer Enron Capital & Trade Resources Corp. (ECT) is seeing great results with Crystal Ball Turbo in their energy trading environment. John P. Tollefsen, director of infrastructure and integration for ECT, says, "We value technology as a competitive advantage. We invest in it because we believe it enables us to provide new solutions to our customer base." For their complex spreadsheet models with thousands of variables, ECT has implemented a cluster of rack-mounted Compaq Professional Workstation 6000s and AP500s running Crystal Ball Turbo. "Imagine you are investing hundreds of millions of dollars," says Philippe Bibi, Chief Information Officer for ECT. "You want to know what would happen to the project if inflation changes, or interest rates change, or foreign exchange rates change, or the price of natural gas changes, or the price of power changes, or construction costs change. The partnership with Compaq, Decisioneering and Scientific has really paid off. Our simulations would take 10, 20 or more hours to complete without CBT and the workstation cluster."

BUSINESS-CRITICAL COMPUTING
Alpha Systems: Performance for business growth.
With the addition of the Digital OpenVMS and Alpha systems, Compaq offers a new spectrum of business-critical capabilities, including fault-tolerant disaster recovery solutions and high-performance, high-availability clustering technologies. Both built on Alpha chip technology, Digital's OpenVMS represents the cutting edge in terms of 64-bit computing, with Digital UNIX 64-bit leading in the commercial UNIX space.

Current roadmap trends demonstrate the Alpha chip will outperform Intel's Merced chip, due in late 1999. The significance of this fact is obvious: Compaq can offer 64-bit computing capability today, on NT, UNIX and OpenVMS platforms.

Himalaya: The pinnacle of business-critical computing.
Tandem's NonStop Himalaya cluster system is the most available, scalable, business-critical platform in the market today. The exciting new technologies that underpin the Himalaya product line make this platform—and its associated solutions—ideally suited to the computing needs of the present and future financial services industry.

The newest addition to the Himalaya lineup is the S-series, which derives its name from the revolutionary ServerNet system area network (SAN) interconnection architecture. ServerNet technology adds a new dimension to NonStop Himalaya systems, with greatly increased bandwidth, capacity and throughput for the complex transactions that characterize today's business environment. The unique combination of fundamental reliability and leading-edge interconnect architecture of the NonStop Himalaya S-series delivers fast, reliable transaction processing, any time, any place.

Earlier parallel-processing cluster architectures were hampered by proprietary and expensive interconnects. The ServerNet technology has solved this problem through a scalable, "any-to-any" interconnect architecture that delivers high reliability at low cost. Based on a single chip, ServerNet technology speeds interprocessor communications and also moves data between I/O devices—from disk to disk, disk to backup tape, or disk to network—without CPU intervention. ServerNet technology enables applications

that will continue to grow in importance as we enter the new millennium. Compaq's Tandem division has been shipping NonStop Himalaya with the ServerNet technology for more than a year.

Recent record-breaking trading volumes on global stock exchanges underscore the need for reliable, scalable computing. Corruption of data, transactions or information would be unthinkable in the fast-paced economic marketplaces of the world. The Compaq systems underpinning these critical transactions have operated flawlessly.

Today on the Internet, real-time transactions containing graphical content and Java applets may span multiple megabytes of components and objects. These transactions require the highest-bandwidth, lowest-latency interconnect architecture possible. As newer and more complex applications continue to emerge, and as the amount of online data continues to grow exponentially, the benefits of a scalable interconnect like the ServerNet technology will become increasingly valuable.

VIEWING THE FUTURE

The most exciting news in server technology is Compaq's industry-standard cluster roadmap, all based on the E2000 platform architecture. The ability to use standard, high-volume components—whether based on Intel or Alpha technology—for commodity CPU and memory will enable an even broader family of clustered systems with a very low total cost of ownership.

The heart of these new systems will be the ServerNet technology, which makes it possible to combine standard ProLiant and Professional Workstation into clustered systems supporting NT and other operating environments, e.g., Novell and SCO UNIX. Compaq's strategic partnership with Microsoft is rapidly accelerating the acceptance of Windows NT in the enterprise. The bottom line is industry-standard computing, improved price/performance and scalability, all at an attractive price.

We are entering an exciting period, one in which information must be available, in real time, to more people in more places. Increasingly, business decisions and transactions are going online, with financial applications being completed anywhere in the world at any time of day.

The new Compaq represents the three-way synergy of Compaq's leading edge, standards-based technologies; Digital's rich history of technology innovation and services expertise; and the most available, scalable fault-tolerant cluster systems from the Tandem division.

Today, the new Compaq is the leading IT solutions firm for the financial services industry. We will continue to grow with you, and we will ensure that our leading-edge technologies continue to be key elements in your business success.

ABOUT THE PRESENTERS:

Bill Woo is the strategist for Compaq's Tandem division. His high-technology career has spanned more than 25 years, during which time he has developed real-time operating systems, decision support systems on relational databases and high-volume OLTP systems. His experience in both workstations and high-end computing is extensive, having held management, development, marketing and strategy positions at Hewlett-Packard, Metaphor, Tandem, Sun and several start-up companies. Mr. Woo holds a BSEE degree from the University of California at Berkeley.Andrew Wescott is the finance segment marketing manager for Compaq's Workstation Division. His high-technology career has spanned 10 years and focused primarily on technical computing with specific activities in software development, product marketing, business strategy and segment marketing. Prior to joining Compaq he worked for Hewlett Packard and British Petroleum. Mr. Wescott holds a BSChE degree from Ohio State University.