**What's new**

There is a new discussion of claims and counterclaims covering IBM's broad corporate level messages, independent of specific product lines.

The paper also reflects changes in the AS/400 and RS/6000 product lines as a result of product announcements in late 1992.

**Corporate overview**

International Business Machines (IBM) was founded in 1914 and is headquartered in Armonk, New York. IBM is the world's largest manufacturer of information technology processing equipment and systems. John Akers' objectives (upon becoming Chairman of IBM in 1985) of becoming a $100 billion company by 1990 have been severely scaled back. For the fiscal year ended December 31, 1991 IBM posted revenues of $64.792 billion with 344,396 employees.

IBM's decline in profit margins is coming under increasing scrutiny. IBM's reorganizations have attempted to give more independence to the various product groups in an attempt to make them more competitive, more efficient, and more profitable. Certain shareholders believe that completely autonomous units would slash overhead costs and break their bad habits much quicker. The success in the case of Lexmark, a PC printer business that IBM sold off in a leveraged buyout in 1991, is something that certain shareholders seem interested in replicating. A Washington-based group, the United Shareholders Association, is launching a proxy fight to force IBM's outside directors to hire investment bankers and study the feasibility of spin-off or sale of one or more units.

IBM showed an increased focus on building partnerships during 1992. In addition to using technology as a competitive advantage, partnerships also enable IBM to share costs, leverage outside technology and expertise, and expand its presence in the industry. The company also announced collaborations in new application areas that might result in revenue for the maturing product lines. Some highlights include the following partnerships:

- an equity stake in Groupe Bull, for better access to the European market and access to symmetric multiprocessing technology for the RS/6000.

- joint ventures with long-time rival Apple: Taligent, to develop object-oriented software environments and Kaleida Labs, to develop multimedia applications.

- with Apple and Motorola, to develop a new architecture (PowerPC) for the low-end desktop and portable computers.

- with National Broadcasting Corp (NBC) and Nu-Media Corp, to provide multimedia services using computer technology.

- with Bell Atlantic, to develop data transmission over unused cellular voice channels.
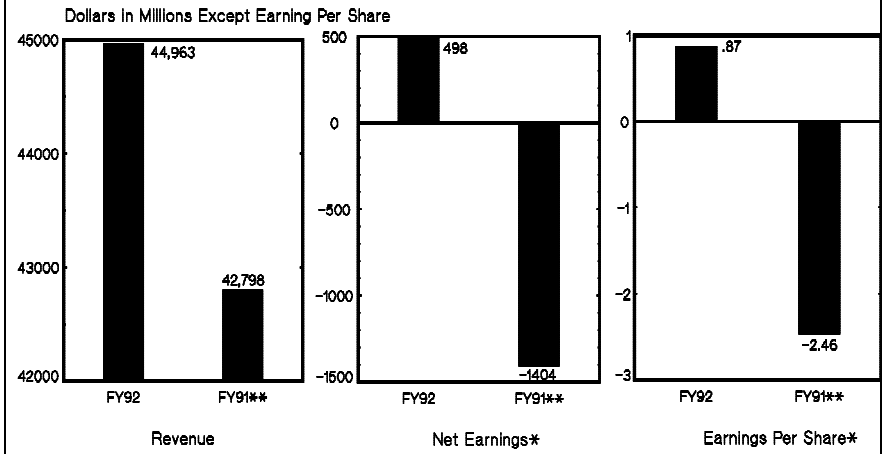
**Key executives**

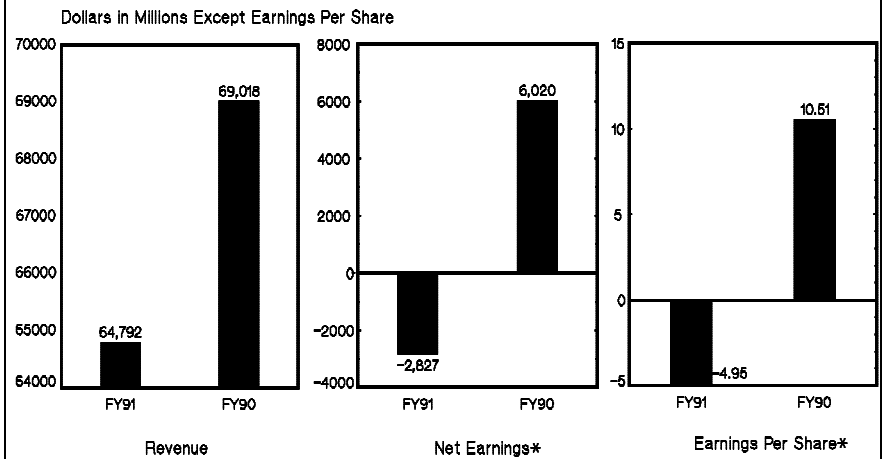| | |
|---|---|
| John Akers | Chairman of the Board |
| Jack Kuehler | President |
| Frank Metz | Senior VP Finance and Planning |
| Robert LaBant | VP U.S. Sales |
| Ned Lautenbach | VP IBM Asia |
| James Cannavino | VP Personal Systems: RS/6000, PS/2, and OS/2 business |
| John Thompson | VP Application Business Systems: AS/400 business |
| Nicholas Donofrio | VP Enterprise Systems: ES/9000 business |
| Bernard Puckett | VP Application Solutions: service, support, and consulting business |

**Financial performance**

IBM's financials are under severe pressure due to the declining mainframe business. The revenue and profit growth is primarily from services and software. Due to workforce reductions and plant consolidations, IBM has had to take restructuring charges amounting to $2.7 billion during 1991 and $4.4 billion during the first nine months of 1992. This has also affected the financial results.

## IBM Financial Highlights

### For Nine Months Ended September 30

Dollars in Millions Except Earning Per Share

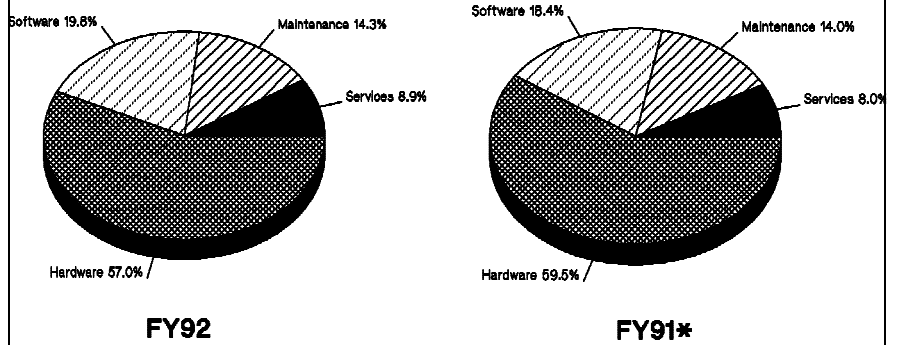| Revenue | Net Earnings* | Earnings Per Share* |
|---|---|---|
| FY92: 44,963 | FY92: 498 | FY92: .87 |
| FY91**: 42,798 | FY91**: -1404 | FY91**: -2.46 |

\* Taking into account the effect of change in accounting for non-pension post retirement benefits.
\*\* Restated for the AICPA Statement of Position "Software Revenue Recognition."

## IBM Financial Highlights

### For Fiscal Year Ended December 31

Dollars in Millions Except Earnings Per Share

| Revenue | Net Earnings* | Earnings Per Share* |
|---|---|---|
| FY91: 64,792 | FY91: -2,827 | FY91: -4.95 |
| FY90: 69,018 | FY90: 6,020 | FY90: 10.51 |

\*Taking into account the effect of change in accounting for non-pension post retirement benefits.

# Revenue for Nine Months Ended
## September 30

Software 19.8%          Maintenance 14.3%

Services 8.9%

Hardware 57.0%

**FY92**

Software 18.4%          Maintenance 14.0%

Services 8.0%

Hardware 59.5%

**FY91***

\* Restate for the AICPA Statement of Position, "Software Revenue Recognition."

# IBM Revenue by Region
## FY91

Asia Pacific 14.0%

U.S. 38.0%

Americas 8.0%

Europe/Middle East/Africa
40.0%
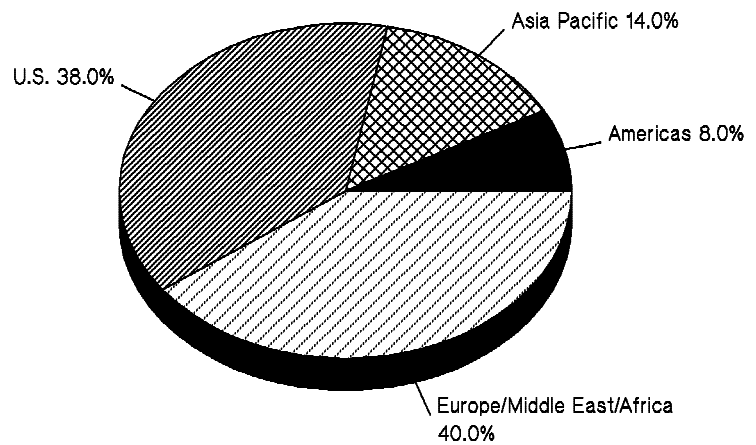
## Organization

Plant consolidations and employee cutbacks have been extensively used on a worldwide basis in order to reduce corporate expenses. By 1992, IBM had reduced its manufacturing space by 40 percent compared to 1985 levels and cut more than 40,000 jobs. This includes elimination of 8,000 jobs in Europe and 4,000 jobs in Asia. Analysts report that most of the job eliminations relate to the mainframe business which has been in decline for some time. Analysts expect IBM to continue to reduce jobs by about 20,000 per year over the next five years.

IBM has reorganized and tried to streamline the corporate structure, granting far greater independence to the various business units to enable them to move quicker and compete more effectively. The new organization emphasizes revenue by individual product line; although the new IBM is better able to focus on specific products, it is expected to be less capable than ever of providing overall architectural leadership across its product lines.

The business units have worldwide responsibility for development, manufacturing, and delivery of products to geographic marketing units and other equipment manufacturers. With further decentralization of corporate control, the Lines of Business (LOBs) now have greater freedom to compete with each other for overlapping market segments. Thus the high-growth product lines such as the RS/6000 will be able to compete more freely with the mature product lines. This also means that the more profitable product lines such as the ES/9000 will not be financing the less profitable product lines. Armonk (IBM headquarters) will only set revenue and profit margin guidelines for the LOBs and attempt to manage synergy and consistency.

The nine LOBs are:

| | |
|---|---|
| Enterprise Systems | ES/9000 mainframes |
| Application Business Systems | AS/400 systems |
| Personal Systems | Personal computers and RS/6000 systems |
| Adstar | Disk and tape drives for midrange and large systems |
| Pennant Systems | Printers for large systems |
| Programming Systems | Office automation software |
| Application Solutions | Service, support, consulting, and project management |
| Technology Products | Electronic components |
| Networking Systems | Networking technologies and consulting |

To ensure an emphasis on profitable sales, the field organization is assigned revenue as well as profit targets. The geographic units that provide marketing, services, and support to customers include:

IBM Asia Pacific
IBM Canada
IBM Europe/Middle East/Africa
IBM Latin America
IBM United States

In 1991, IBM structured its sales force around a trading area organization. The major difference with the older structure is in the span of control and level of business responsibility assigned to the general manager. Each trading area acts as a separate marketing and service company and is measured on its profit and loss, thus enjoying more autonomy in managing its resources. There are 63 trading areas in the U.S. reporting into 7 marketing areas. The European field organization has been split into 200 "field business units" organized around specific market segments.

**Sales and marketing tactics**

IBM's traditional approach of maintaining account control continues even today. IBM's marketing representatives will:

- Call high in the account
- Focus on the customer's business issues
- Maintain account control through:
  - proprietary products
  - prime contractor role
  - systems integration
  - financing & leasing

### Strategic goals and major claims

Messages related to specific product lines are covered in the respective sections related to the various product families. Overall strategic goals for IBM include:

- Account control: IBM's goal is to maintain strong relationships with its customers at all levels of the customer organization. Note that Aberdeen Group and other consultants report that the (in) famous IBM bias among end users seems to be diminishing, IBM's proposals are being closely scrutinized and other vendors are being evaluated seriously.

- Organizational efficiency: As IBM's business shifts from high margin proprietary products to the low-margin business of open systems, making the organization more efficient in responding to a fast-moving market is essential.

- Profit margins: Reducing corporate overhead is a key concern of John Akers. A number of major reorganizations announced during 1992 were related to allowing the LOBs to be more accountable for their business results and compete more effectively in the marketplace.

- Technology: IBM will invest in long-term research and use technology as a competitive advantage. See the corporate overview for some examples of recent partnerships that IBM has announced.

- Services: This is one of the means by which IBM maintains account control and influences information systems strategy. See the section on organization for the various groups within the company that provide various specific services.

### Major (overall corporate level) claims made by IBM include:

*Claim:*
IBM is a safe buy! It is the most stable vendor you can deal with.

*Counter:*
This may have been true years ago but not anymore. IBM has gone through a variety of reorganizations, posted a $2.8 billion loss in 1991, and is expected to post a loss for 1992 also. Their revenues for 1991 actually declined compared to the previous year.

Today HP has all the benefits of IBM with none of the baggage. HP has continued to be profitable despite the current tough market environment. HP is an extremely safe buy from a financial, technological, and service perspective.

*Claim:*
IBM can provide a solution to every possible information systems need and can provide a single-vendor solution to virtually any problem.

*Counter:*
It is true that IBM has a broad solution portfolio. However they are neither compatible nor are they necessarily the best-in-class hardware or software solutions. IBM is good at being a single-vendor provider because they are weak at integrating multivendor environments. In fact, the average IBM marketing representative seldom thinks in terms of multivendor solutions.

HP has an extensive array of compatible products and services that are second to none in the industry. Contrary to IBM, HP has taken the long-term strategic vision of being the leading supplier of open, easy-to-use client/server solutions and is equipped to fit into a multivendor environments far better than IBM.

*Claim:*
IBM has systems installed in most of the data centers and this gives IBM a superior knowledge about the existing MIS environments.

*Counter:*
IBM understands the complex environments that involve the multiple hardware and software environments that were created by IBM. The company does not have significant expertise when it comes to technologies from other vendors or even when it comes to industry standards. IBM's traditional environments are becoming a nightmare for MIS managers to manage.

There is now a significant and increasing trend toward open systems. HP is far better equipped than IBM to help MIS departments move to open systems solutions.

*Claim:*
With SAA, IBM offers one consistent strategy across all of its product lines unlike HP that offers HP-UX and MPE/iX.

*Counter:*
A strategy backed up by papers and presentation foils rather than products does not help end users very much. SAA has two major problems - it is still mostly a strategy and has not been implemented with products and it only includes IBM product lines with no provision for the many non-IBM products that are in use in the market today.

HP on the other hand has taken the long-term strategic vision of being the leading supplier of open, easy-to-use, client/server solutions based on PA-RISC with a choice of two open operating environments, HP-UX and MPE/iX, as appropriate for the specific solution.

*Claim:*
In today's climate of consolidation, IBM provides the best solution for maintaining centralized management control.

*Counter:*
The SNA solutions were designed to be hierarchical and centralized with an MVS mainframe at the top of the heap. This structure cannot support distributed or decentralized computing. On the other hand, a distributed architecture, such as HP's, can be converted into a centralized architecture by distributing control at only one point.

## Product family positioning

|  | RS/6000 | AS/400 | ES/9000 |
|---|---|---|---|
| 1991 Sales (Source: Gartner Group) | $1.7 B | $14 B | $40 B |
| Market segment | Technical workstations & servers; small to medium commercial hosts | Small to medium commercial accounts | Departmental and enterprise-wide systems; technical servers |
| Purchase Rationale | Openness, hot technology, graphics solutions | Complete solution, ease of operation, S/3x upgrades | Upgrades, large-scale centralized compute power |
| Competition | HP S800 servers S700 workstations | HP 3000 and S800 servers; | HP 3000 and S800 high-end; |
|  | Sun, SGI, and DEC (wkstns) | RS/6000, DEC | Hitachi, Amdahl, Fujitsu |

Note that the PS/2 line of personal computers is not addressed in this document; only the product lines that compete with the HP 9000 and HP 3000 product lines are discussed.
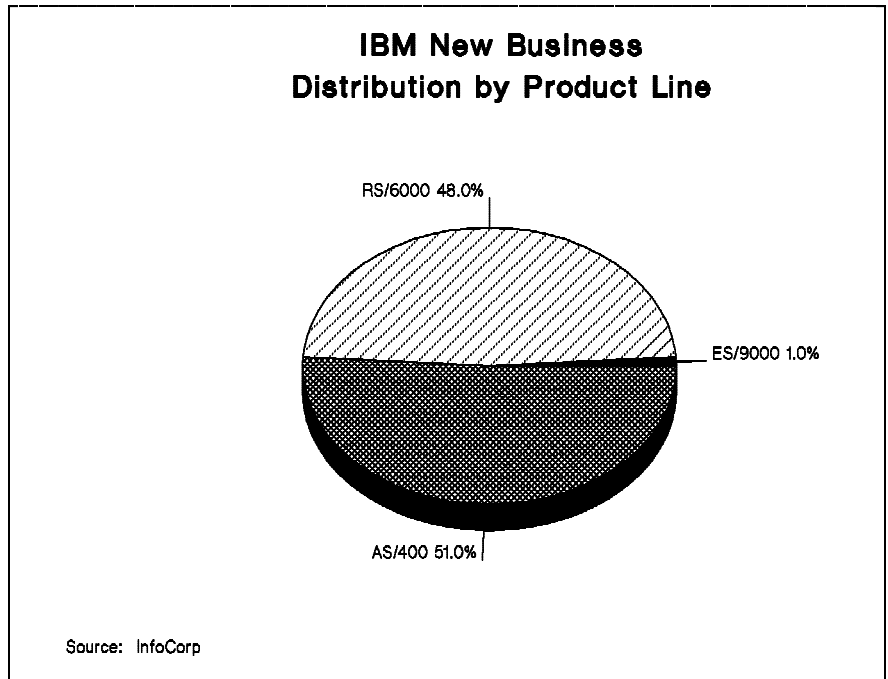
RS/6000: This product line was introduced in 1990 and was originally targeted at the engineering and scientific communities. It has been increasingly sold into commercial applications and currently about 50 percent of revenues are derived from commercial sales. In a press release in September, 1992 IBM claimed "over 6,000 applications" on the RS/6000.

AS/400: This is the follow-on to the S/36 and S/38. Although IBM tries to convert the S/3x installed base over to the AS/400, there are still approximately 160,000 customers that have not yet decided to migrate. S/36 applications can run on the AS/400 after recompilation. S/38 program can run without recompilation. IBM claims to have 15,000 solutions on the AS/400.
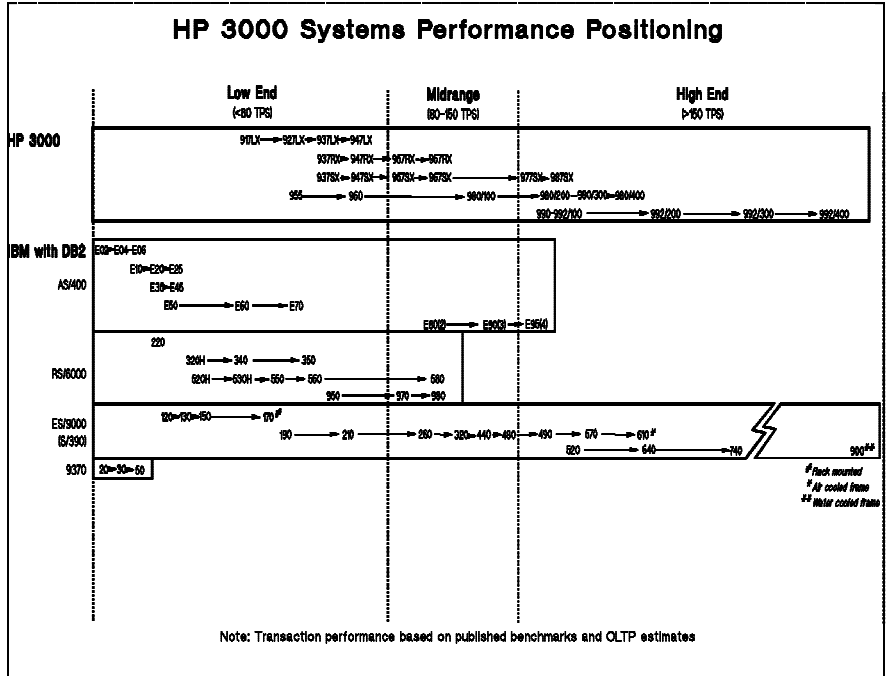
ES/9000: This is IBM's current generation of mainframes. It offers a large number of software solutions. Most software that runs on its predecessors, the 9370, 43xx, 308x, and 3090 will also run on the ES/9000.

InfoCorp estimates that new business is distributed among these product lines as follows:

**IBM New Business
Distribution by Product Line**

RS/6000 48.0%

ES/9000 1.0%

AS/400 51.0%

Source: InfoCorp

**Competitive performance positioning versus HP**

## HP 3000 Systems Performance Positioning

| | Low End (<80 TPS) | Midrange (80-150 TPS) | High End (>150 TPS) |
|---|---|---|---|

HP 3000

IBM with DB2 — AS/400

RS/6000

ES/9000 (S/390)

9370

Note: Transaction performance based on published benchmarks and OLTP estimates

# Low-End Systems Performance Positioning

Through 12-1-92

| | | | | | | |
|---|---|---|---|---|---|---|
| HP 9000 Series 800 | F10 | F20 H20 | F30,G30 H30,I30 | G40 I40 | G50 H50 I50 |
| IBM RS/6000 | 320 520 | 320H 520H | 340 530H 930 | 350 550 | 560 950 | 580 980 |
| IBM AS/400 | E50 | E60 | E70 | | E80(2) |

Note: Transaction performance based on published benchmarks and OLTP estimates

(#) = number of processors
* = not currently shipping

# High-End Systems Performance Positioning

Through 12-1-92

| | | | | |
|---|---|---|---|---|
| **HP 9000 Series 800** | 890(1) | 890(2) | 890(3) | 890(4) |
| **IBM AS/400** | E90(3)    E95(4) | | | |
| **IBM Mainframes** | 9121-440   9121-480<br>9021-500<br>3090-200J | 9121-570       9121-610<br>9021-580<br>3090-300J | 9021-620   9021-660<br>9021-400J     3090-500J | 9021-720<br>3090-600J |

Note: Transaction performance based on published benchmarks and OLTP estimates

(#) = number of processors
*=not currently shipping

**Application System/400 (AS/400)**

## Product line overview

The Application Business Systems (ABS) group is responsible for the AS/400 product line which is probably the most successful midrange product in IBM's history. Their 1991 revenues were about $14 billion, approximately 22 percent of IBM's total 1991 revenues. IBM expects 8 - 10 percent growth during 1992. A key strategy with the AS/400 product line has been what IBM calls "partnering" - targeting partners for application solutions in specific areas and vertical markets. ABS claims about 9,000 - 10,000 applications available in the U.S. and about 20,000 - 25,000 available in Europe.

The AS/400 was designed as a follow-on product to the IBM S/36 and S/38. The ABS group has stated that in all, it has shipped a total of 500,000 units comprising S/36, S/38 and AS/400 systems. In early December 1992, IBM announced the shipment of the 200,000th AS/400 system.

## AS/400 buyer behavior

Aberdeen Group reports that less than 10 percent of AS/400 sales came from customers who seriously considered alternative options. The breakdown is as follows:

- 70 percent do not even consider alternative options

- 20 percent consider alternatives for cosmetic reasons only - to satisfy internal politics

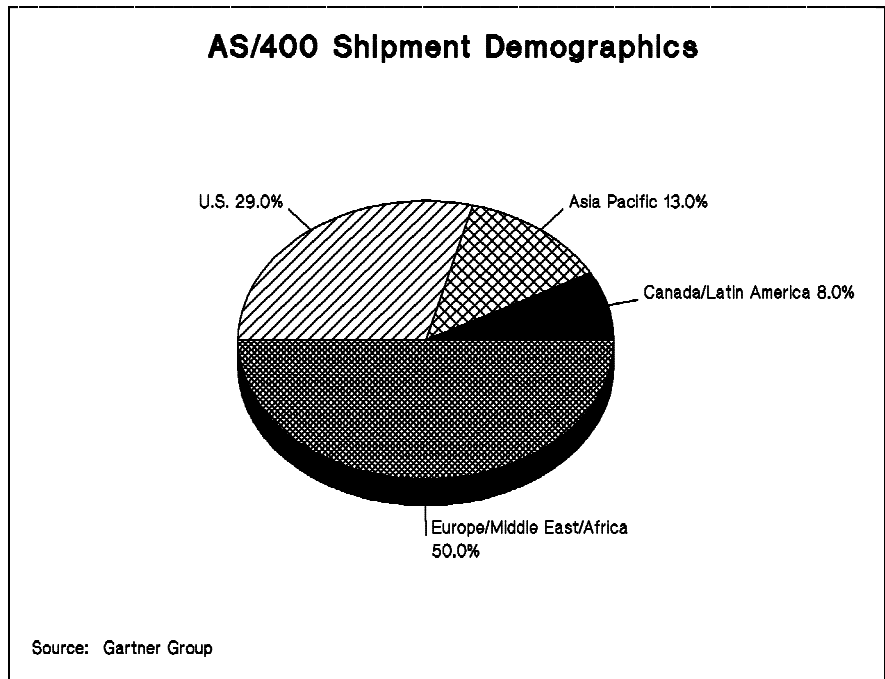- 10 percent seriously evaluate multiple suppliers
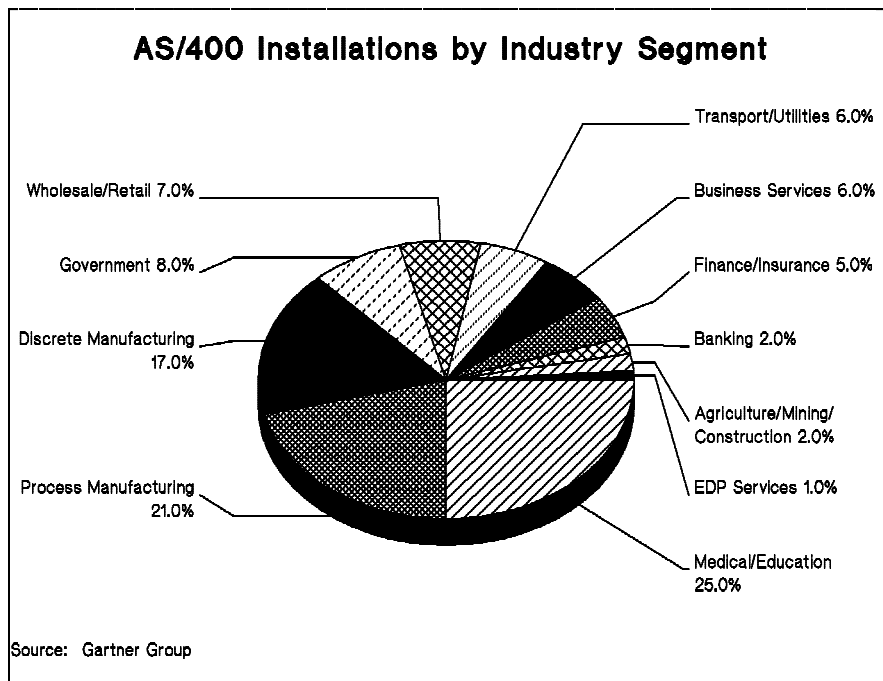
(Source: Aberdeen Group)

## AS/400 market segments

(The revenue share of various segments are in approximate numbers.)

- Migration from S/3x systems (30 percent): IBM is trying to convert their installed base of S/36 and S/38 customers over to the AS/400 product line. Analysts estimate that a small portion of the installed S/36s have been directly replaced, with an estimated 160,000 units still installed worldwide.

- Multiple purchases (30 percent): This relates to large accounts that purchase large quantities of systems. This segment includes migration from S/3x systems as well as new purchases.

- New installations (25 percent): This includes customers that are starting to automate their operations (creating a DP department) or those that are automating specific functional areas.

- Competitive replacement (10 percent): IBM targets the installed base of weak vendors such as Wang, Prime, Sperry, Honeywell for conversion to the AS/400.

- Mainframe replacement (5 percent): This is the set of customers that are moving off their S/370 and other older mainframes.

### AS/400 Shipment Demographics

U.S. 29.0%

Asia Pacific 13.0%

Canada/Latin America 8.0%

Europe/Middle East/Africa 50.0%

Source: Gartner Group

## AS/400 Installations by Industry Segment

Transport/Utilities 6.0%

Business Services 6.0%

Finance/Insurance 5.0%

Banking 2.0%

Agriculture/Mining/
Construction 2.0%

EDP Services 1.0%

Medical/Education
25.0%

Process Manufacturing
21.0%

Discrete Manufacturing
17.0%

Government 8.0%

Wholesale/Retail 7.0%

Source: Gartner Group

## AS/400 channel breakdown

Aberdeen Group estimates that IBM sells about 85 percent of all AS/400's directly to end users. Yet at the same time, distribution/business partners are involved in approximately 80 percent of sales.

## Hardware

The AS/400 systems are designed for commercial applications and are not optimized for numerically or graphically intensive applications.

In February 1992, IBM introduced the E models to replace the existing D models. The E models offer 30 percent to 60 percent more performance than the D models. The top of the line, Model E95, announced in September, 1992, is a four-way multiprocessing system. There are three sub-groups within the AS/400 E models, namely entry level (E02...E06), midrange (E10...E25) and high-end (E35...E95) with no upgrade paths or return credits between them. For more product details and specifications please refer to the IBM appendix.

*Hardware futures*

IBM is expected to increase uniprocessor performance by 30 percent and multiprocessor performance by up to 60 percent every year. New F models are expected in the first half of 1993; G models and clustering functionalities are expected in 1994; H models will follow in 1995 and by 1995 - 1996 the AS/400 product line is expected to move to a RISC architecture.

## Software

OS/400 is an integrated operating system with a built-in proprietary relational database and software for communication, networking, and online education. SQL/400 is used for database definition and manipulation. Though bundled with the system, OS/400 is separately priced. None of the third-party databases (such as Oracle, Informix) are supported on OS/400.

The AS/400 provides integration for DOS, Windows, and OS/2-based clients. IBM, in conjunction with Apple, has also announced a Data Access Language Server that enables Macintosh users to access AS/400 data.

*Software futures*

CICS on the AS/400 has been announced but is not expected to be available until sometime in 1993. This is not expected to be fully compatible with CICS/AIX. IBM also announced a statement of direction for POSIX and Motif on OS/400. This is not expected to be available until late 1994.

The AS/400 today is a very proprietary environment and open features or industry-standard databases are not expected to be available any time soon. The open features may be made available to satisfy purchase requirements in key market segments and will probably not be a mainstream product offering.

## Competitive sales strategies

The AS/400 sale is based the following salient points:

• Application solutions availability

• Commitment and stability of third-party solutions providers

• Ease of installation, use, operation, and maintenance

- Complete support (including "hand holding" as necessary)

- Price/performance (compared to the S/3x, S/370, and other older IBM product lines)

- Performance scalability

- Connectivity to the mainframes

    In addition, the following messages relate to larger accounts that have replicated sites:

- Development environment (for larger accounts)

- Globalized solutions

- Good networking to connect the various sites together

    Note that openness, RISC, client/server, windowing, and other leading-edge technologies may not be the most important issues to discuss with typical AS/400 buyers. The importance of proven solutions that minimize risk, stability of vendor and business partners, ease of operating and maintaining the system, and complete support ("hand holding" in many cases) from the system vendor are primary concerns of the typical AS/400 buyer.

    Competitive comparisons (AS/400 versus HP 3000 and Series 800)

| Parity | HP strengths (IBM's weaknesses) | AS/400 strengths (HP's perceived weaknesses) |
|---|---|---|
| -Connectivity to mainframes<br>-Committed and stable third-party partners<br>-PC integration | -Better price/performance and cost of ownership<br>-Better scalability of the product line<br>-Better upgrade paths<br>-Open systems<br>-Client/server solutions | -Quantity of applications<br>-System Integration capabilities<br>-Ease of installation/maint.<br>-Unparalleled support orgn. |

**HP's (HP 3000 and Series 800) strengths against the AS/400**

*HP advantage:*
Better price/performance and cost of ownership on both the HP 3000 and the HP 9000 series 800 product lines.

*Customer benefits:*
HP can provide the customer a superior or at least comparable solution to the AS/400 for a superior price. HP can also provide strong after sales support on a worldwide basis to help the customer with issues that may arise after installation. HP's support and maintenance charges are also more competitive than those on the AS/400.

*HP advantage:*
Better scalability of the product line.

*Customer benefits:*
The customer can choose the system that is the best fit for their current needs with the assurance of a growth path for future needs. HP's high-end system performance is multiples higher than that for the AS/400 (audited 578 TPC-A for the 890/4 and similar TPS performance estimated on the 992/4900, compared to an estimated 168 TPS for the model E95). With such a range in product lines existing today, the customer does not need to be uncertain in any way about a future growth path and its availability.

Note that HP's advantages in scalability and price/performance come from a fundamental difference in the technology being used. HP's systems are based on 1990s RISC technology while the AS/400 architecture is essentially a modified version of the 1960s - 70s architecture from the S/38 systems. It is interesting to note that the AS/400 high-end performance of an estimated 168 TPS is achieved with a 4 CPU system while HP achieves this comparable performance uniprocessor systems.

*HP advantage:*
Better upgrade paths.

*Customer benefits:*
HP's product lines not only have a broad range of performance points, but also offer upgrade paths to any point in the product family. IBM has three groups of systems in the AS/400 family: the 9202 low-end group consisting of the models E02, E04, and E06; the 9404 midrange group consisting of the models E10, E20, and E25; and the 9406 high-end group consisting of the models E35 through the E95. Upgrades between these groups are not available; only upgrades within each of these groups are available. This severely limits the customer's flexibility in making the right choice in purchasing the system.

*HP advantage:*
Open systems.

*Customer benefits:*
The AS/400 is a very proprietary environment that locks customers into IBM. HP's open systems not only offer the customer flexibility but also the scalability and price/performance of 1990s technology.

**AS/400's perceived strengths against HP (HP 3000 and Series 800)**

*Claim:*
IBM's support organization is the largest in the world and provides the best customer service.

*Counter:*
IBM certainly has a large support organization. HP also has a worldwide support organization backed by a very stable company. What would directly relate to customers is the quality of service they receive. Based on surveys of end users, resellers, and solution providers, *VARBUSINESS* magazine and Datapro publish rankings for quality of support and HP has been consistently ranked #1 in this area. These independently published rankings speak for themselves.

*Claim:*
There are 15,000 applications available on the AS/400, far more than HP can offer.

*Counter:*
There are only 9,000 distinct applications available on the AS/400. The Application Business Systems group itself states that ABS claims about 9,000 - 10,000 applications available in the U.S. and about 20,000 - 25,000 available in Europe. There may be some additional solutions available locally in other countries (localized solutions).

HP has taken the strategic approach of providing best-in-class solutions on MPE/iX and HP-UX and this number is growing every month. There are over 4,000 HP-UX based solutions available today. While the quantity may seem to be lower than on the AS/400, the solutions are premier open solutions and cover most of the needs that customers have.

*Claim:*
The AS/400 provides the best ease-of-use and has extensive online help and documentation.

*Counter:*
IBM has done a good job in this area. Interestingly, in their annual ratings of operating environments, Gartner Group (in the February 1992 report) rated MPE as well as HP-UX to be better at "ease of use" and "ease of operations" than the OS/400.

*Claim:*
The AS/400 is the best selling midrange system. It is technologically advanced and provides the best solution.

*Counter:*
Aberdeen Group and other industry analysts report that new business for the AS/400 represents only 25 - 30 percent of revenues while the rest comes primarily from installed base upgrades, conversions from S/36 and S/38, or mainframe "rightsizing". The AS/400 business is expected to grow by no more than 8 - 10 percent in 1992. Compared to this, HP's midrange systems revenues have been growing by over 30 percent per year, a significantly large portion from new customers. Clearly, HP offers a very competitive solution and that fact is being recognized by a large number of customers.

As for being technologically advanced, note that the AS/400 architecture is a modified version of the S/38 architecture from the 1970s compared to HP's RISC architecture of the 1990s. The high-end performance on the AS/400 using 4 CPUs is easily exceeded by HP's uniprocessor systems. In the light of these facts, "technologically advanced" is a phrase that seems completely unjustified.

*Claim:*
The AS/400 is a very reliable product and it won the Malcolm Baldrige award for quality.

*Counter:*
HP has won the very prestigious Demming award in Japan, for product quality. Datapro surveys have consistently ranked HP number one for both systems and peripheral reliability. HP offers midrange systems that have an MTBF of over 4 years and disk drives with MTBF of over 10 years. IBM does not readily release the MTBF numbers for the AS/400. Does IBM have something to hide?

*Claim:*
IBM offers free software support.

*Counter:*
Nothing is for free. The customer eventually pays for everything through higher product, maintenance, and licensing charges. The customer should ask IBM to document this free offer on paper. In most cases IBM will not state this in writing. With HP's software support the customer has a clear set of expectations about the service being offered and at what cost.

A recent article in *Computerworld* (September 29, 1992) magazine reported that an Aberdeen Group study found users to be highly dissatisfied with AS/400 service. They reportedly were also frustrated by IBM's sales force under-configuring AS/400 solutions consequently requiring upgrades within months of installing the systems.

*Claim:*
The report titled "The AS/400 In An Open World" from ADM Consulting Inc. clearly shows that the AS/400 is superior to the HP 9000 systems.

*Counter:*
IBM has been using this report to create misconceptions about the HP 9000 systems. It depicts the AS/400 as a more open system than the HP 9000, and offering better price/performance! A detailed analysis shows that all the claims made in this report are totally incorrect. This analysis and a counter to this report are available on the Competitive Hotline under the subject IBMADM.
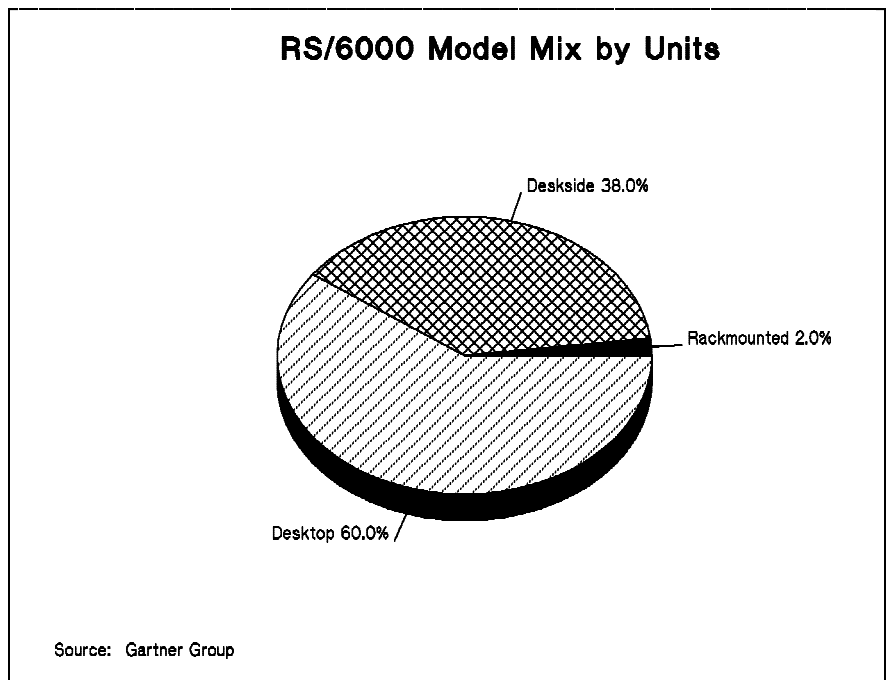
Note that ADM Consulting does projects related solely to the AS/400 market. Favorable comments about the AS/400 from such an organization is a clear example of self-preservation rather than objective reporting.
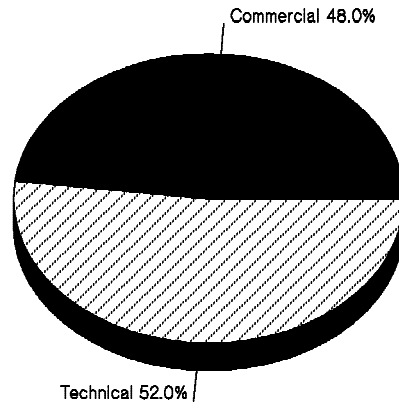
**RISC System/6000 (RS/6000)**

**Overview**

The RS/6000 was IBM's answer to the technical workstation wave that started a few years ago. IBM introduced the RS/6000 series of technical workstations and servers in 1990. As the commercial UNIX market started gorwing, IBM started bidding the RS/6000. Since then, IBM has been adding commercial functionality to the RS/6000 and now sells the same hardware platform either as a workstation or a server. Currently, about 50 percent of revenues come from sales into the commercial market. With the RS/6000 announcements in September, 1992 the company demonstrated its commitment to the commercial segment by renaming the Advanced Workstation Division to the Advanced Workstation and Systems Division and announcing software products specifically for the commercial market. This product line generates annual revenues of approximately $1.7 billion.

Currently the POWER architecture is heavily floating point biased, for example, more suited for the technical market. IBM will have to invest heavily to make necessary improvements in the hardware, to support their push into commercial markets. Analysts expect that RS/6000 systems will diverge into product lines optimized for the commercial market, technical market, and personal workstation market.
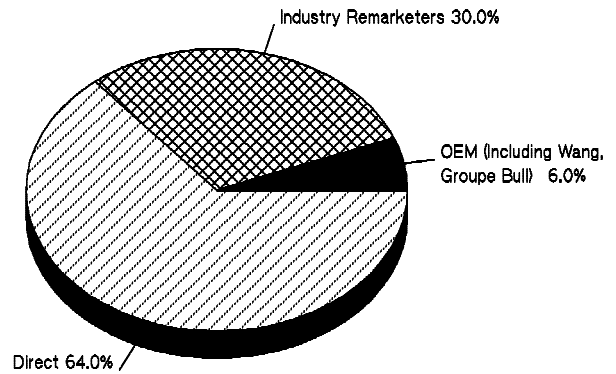
## RS/6000 Model Mix by Units

Deskside 38.0%

Rackmounted 2.0%

Desktop 60.0%

Source: Gartner Group

## RS/6000 Revenues by Market Segment

Commercial 48.0%

Technical 52.0%

Source: Gartner Group

## RS/6000 Revenues by Channel

Industry Remarketers 30.0%

OEM (Including Wang, Groupe Bull) 6.0%

Direct 64.0%

Source: InfoCorp

**RS/6000 Revenues by Industry Segment**

Service 20.0%

Education 11.0%

Federal 10.0%

General and Public 27.0%

Industrial 32.0%
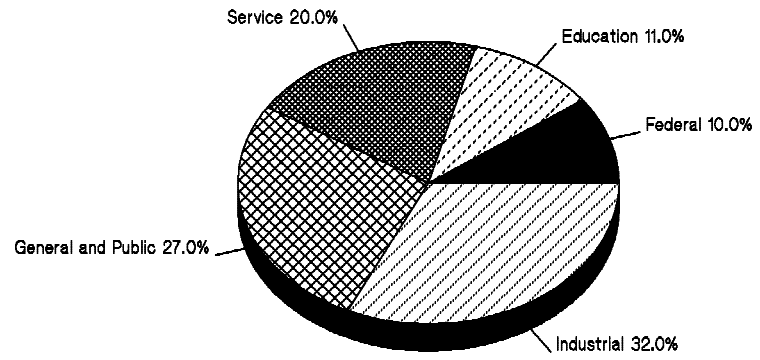
Source: InfoCorp

## Hardware

The RS/6000 systems are based on the Performance Optimization With Enhanced RISC (POWER) architecture. It is a superscalar architecture designed to meet the computing requirements of intensive numerical computing found in the engineering and scientific communities. For more details on IBM's POWER architecture refer to the HP white paper titled "Second-generation RISC CPUs" (publication number 5091-2594E).

The RS/6000 family contains four sub-product groups: low-end desktop with 2 I/O slots (2xx), desktop with 4 slots (3xx), deskside with 7 slots (5xx), and rackmount systems with total expansion up to 16 slots (9xx). The 9xx systems are only available as POWERservers; the others are available either as POWERstations or POWERservers.

In September, 1992 IBM announced a faster processor along with upgrades in the 5xx and 9xx categories. IBM's architecture while efficient, is very complex. This is the reason that the RS/6000 still uses 3-chip CPUs when the other leading vendors are shipping single-chip CPUs. It is also the reason that IBM has trouble scaling downward into low-end systems. See the architecture discussion in the IBM Claims section for further details.

IBM also introduced in November, 1992 a parallel architecture using RS/6000 processors, targeted at the technical market. This is not expected to be useful in the commercial market due to lack of software applications for this market segment that can use a parallel architecture effectively.

*Hardware futures*

A 70 MHz POWER chip is expected in the first half of 1993 that will initially be deployed in the 5xx and 9xx systems. In an effort to have better flexibility in introducing low-end systems, IBM is working on a PowerPC architecture in conjunction with Apple and Motorola. This is intended to be a single-chip architecture and is expected to be targeted for low-end desktop and laptop systems. An initial prototype of the 601 design was unveiled in October, 1992 and will appear in IBM's low-end workstation products in late 1993; it will also be used in Apple's Macintosh line (in 1994) and in machines from Cie. des Machines Bull and Thomson-CSF. Additional processors in the PowerPC family include the 603, 604, and the high-end 620; first silicon on these designs are expected in late 1993.

IBM still does not have symmetric multiprocessing capabilities in the RS/6000 family. It is working with Groupe Bull on this functionality which is expected to be available in mid 1993. In the meantime, IBM is expected to announce a clustering product to fill the performance gap at the high-end of the product line. Clusters and massively parallel processing systems will likely be targeted at the technical environments. Clustering may find its way into commercial accounts as software for these architectures becomes available.


**Software**

*Operating system*

Advanced Interactive Executive (AIX) is IBM's UNIX product. While the RS/6000 is the primary UNIX product line, AIX is also available on PS/2 and ES/9000 architectures (in native mode) but is far from being the operating environment of choice on these platforms. AIX is not binary compatible across the various product lines. In any case, AIX on these various architectures is expected to have more of a marketing impact than real value in offering solutions.

AIX Version 3.2 for the RS/6000 (announced in January 1992) is based on UNIX System V; conforms to POSIX 1003.1 and FIPS-151; has received the X/Open XPG3 Base brand; is compatible with BSD Version 4.3; and meets C2 levels of security. In addition to standard UNIX features AIX also provides real-time features, OSF's Logical

Volume Manager (LVM), file system journaling, and national language support. AIX also includes limited support for diskless workstations. AIX has been designed to be very modular and supports dynamic binding. The latter feature enables AIX to reconfigure the kernel without having to reboot. See the objection handling section for a discussion of these issues.

*Office applications*

IBM depends primarily on business partners to provide office solutions.

*PC integration*

The RS/6000 provides integration for DOS, Windows, and OS/2-based clients. IBM has also announced the availability of NetWare on AIX. The RS/6000 product line also support Macintosh integration using third-party software.

*System management*

IBM has licensed a number of software technologies from HP. These include SoftBench and OpenView upon which IBM's WorkBench and NetView products are based.

NetView/6000 provides network management. For system management of individual systems, IBM offers SystemView. HP's OpenView provides a single consistent tool for system as well as network management to provide a single tool for either situation.

For system administration, IBM offers the System Management Interface Tool (SMIT) which is comparable to the System Administration Manager (SAM) on HP-UX.

SoftDist/6000 enables software updates in a distributed environment. However, it only works in a homogeneous RS/6000 environment and can work with neither non-IBM UNIX systems nor PC clients.

IBM does not have performance monitoring and tuning tools such as GlancePlus and Laser/RX available today. Systems Monitor/6000 is scheduled for March 1993 delivery; it collects specific system management information and sends alerts to NetView/6000 regarding items that have exceeded administrator defined thresholds.

*High availability*

High Availability/6000 provides SPU switchover capability. There are three modes of operation:

mode 1: the backup is an idle standby and in case of failure, takes on the identity of the primary system;

mode 2: the backup can be an active system on a separate (non-critical) workload and in case of failure takes on the network identity of the primary in addition to retaining its own identity;

mode 3: the primary and the backup systems can share dual-ported disks and be active on a shared workload and in case of failure the backup takes on the identity of the primary in addition to retaining its own identity.

SwitchOver/UX offers the capability of having a backup system that is active on a separate (non-critical) workload and in case of failure, takes over the identity of the primary. However, it does not retain its own (secondary system) identity on the network. SwitchOver/UX also allows for connecting multiple systems to the same set of disks but only a single system can access the disks at any given time.
In addition, switchover with HP's product involves a system reboot which can take 20 minutes or longer, while HA/6000 accomplishes switchover in a shorter amount of time.

*Graphics*

IBM offers a range of graphics products for the RS/6000 from basic, low-cost grayscale and color to 3D solids rendering graphics capabilities. At the low-end, midrange as well as the high-end, HP offers better graphics performance for better cost.

Note that IBM's graphics adapters on the model 220 connect directly into the processor I/O bus and do not take up a Microchannel slot. On the other workstations, the graphics adapters take up between 1 and 3 MCA slots thus constraining I/O expansion. On HP workstations, graphics adapters use separate slots from the EISA slots and thus do not affect I/O expansion.

AIX supports X11R4, GKS, PHIGS, GL (licensed from Silicon Graphics), and PEX. HP-UX supports X11R5, GKS, PHIGS, and PEX.

*Software futures*

With the announcement in September, 1992, IBM made very clear the fact that the RS/6000 family would be focused on the commercial as much as on the technical market. DCE services and the Encina transaction monitor will be available in December, 1992. The DCE distributed file system and CICS/6000 will be available in June, 1993. In the second half of 1993, symmetric multiprocessing is expected to be available. DME is expected to be available in the 1994 time frame.

IBM is developing a proprietary database for the RS/6000 which is expected to be unveiled in late 1993. This database is expected to have a strong affinity for SAA environments and be DRDA (Distributed Relational Database Architecture) compliant. Not only will this provide IBM with a revenue opportunity but will also help with the "Blue UNIX" strategy of introducing IBM lock-in technology. It would prevent other vendors such as Oracle Corp. from getting entrenched in the AIX installed base and enable IBM to have better account control.

**Competitive sales strategies**

The RS/6000 sale focuses on the following:

- Leading implementation of commercial UNIX
- Based on industry standards
- Leading RISC technology
- Superior performance scalability
- Leading price/performance
- Worldwide support

Competitive comparisons

| Parity | HP strengths (IBM's weaknesses) | RS/6000 strengths (HP's perceived weaknesses) |
|---|---|---|
| -Based on standards<br>-RISC architecture<br>-Overall support infrastructure | -Entry level workstation<br>-Mainframe-class performance<br>-Desktop performance (desktop to data center)<br>-Graphics capabilities<br>-Symmetric multiprocessing<br>-UNIX expertise in the field<br>-Commercial functionality<br>-Broader vendor support for PA-RISC<br>-Better price/performance | -Dynamic kernel reconfiguration<br>-High availability (HA/6000)<br>-I/O bandwidth v/s S800 |

**HP strengths against the RS/6000**

*HP advantage:*
Broader product family from desktop to data center, with a comprehensive set of upgrade paths for workstation products as well as business servers.

*Customer benefit:*
HP gives the customers the most flexibility in choosing the best solution while allowing for growth as necessary in the future. HP's workstation and server products offer better performance at the high-end of the product line which consequently gives the customer better growth path for future needs.

The workstation products offer better performance at the high-end of the family while the business servers offer TPC-A performance that is multiples higher at the high-end than what the RS/6000 product line can offer at the high-end.

*HP advantage:*
Better performance in workstations as well as business servers; mainframe-class performance at the high-end of the server product family.

*Customer benefit:*
HP's workstation outperform the RS/6000 workstations in SPEC, X11, and graphics performance. Even for business servers, HP's products outperform the RS/6000 products. Customers can use HP's solutions even when they require mainframe-class performance. IBM's high-end performance is less than one-third the performance that HP's high-end can offer (160 TPC-A compared to 578 TPC-A).

IBM would have to resort to other product lines (such as ES/9000) in achieving high-end solutions. This not only introduces incompatibilities but also increases the overall cost by orders of magnitude.

*HP advantage:*
Excellent graphics capabilities.

*Customer benefit:*
From entry-level to advanced, high-performance graphics, HP can offer customers a solution that meets their requirements. The HP graphics architecture is designed for optimum performance at the lowest possible cost. HP graphics are tightly coupled with the PA-RISC architecture so that when processor performance is improved, graphics

performance likewise improves. This performance scaling protects customer investment. IBM's graphics solution does not offer performance scaling; a particular graphics subsystem will render the same graphics performance regardless of the CPU performance.

*HP advantage:*
Extensive HP-UX expertise in the sales and support organization.

*Customer benefit:*
HP's field organization is trained on HP-UX and understands industry-standard technologies, client/server environments, and solutions based on commercial UNIX. IBM's sales force is trained to sell the high-margin mainframe products or the profitable AS/400 products. They generally are not well-trained on the RS/6000 product line and UNIX solutions. The customer should consider how much AIX expertise is available from the local IBM organization when considering RS/6000 solutions.

*HP advantage:*
Leading commercial functionality for running mission-critical applications on HP-UX.

*Customer benefit:*
HP-UX offers superior functions such as data center management, system and network management, performance monitoring and tuning, transaction monitors, remote backup, and remote spooling. IBM has only recently started focusing on the commercial market with the RS/6000 product line and does not offer the breadth of commercial functionalities that HP does. The RS/6000 product line also does not have mainframe alternative solutions that compare with what HP can offer.

*HP advantage:*
Broader support for PA-RISC from systems vendors in the industry.

*Customer benefit:*
HP's architecture is being used by a number of large vendors for their own systems; these vendors include Hitachi, Samsung, Matsushita, and Oki. The broad industry support assures customers that they can deploy PA-RISC based solutions for various application areas that HP may not be targeting. It also assures customers of the long-term viability and continued enhancement of the architecture.

In their rankings published in the December 1992 issue of *UNIX World* magazine indicates that UNIX represents only 5 percent of IBM's overall revenues. Thus, IBM's long-term commitment to the RS/6000 product line is questionable as the company goes through financial difficulties.

*HP advantage:*
HP offers SMP (symmetric multiprocessing) systems that IBM does not have.

*Customer benefit:*
HP already leads the industry in delivering high-performance processors. SMP systems allow HP to deliver high-end performance that compares to mainframe-class systems. This is a complicated technology to implement. HP's vision and leadership led to development of SMP a few years ago. The result is that HP's SMP systems are now stable and offer predictable increases in performance as processors are added into the system. Other vendors such as IBM and Sun have just started focusing on SMP technology and are still going through the learning process of implementing SMP systems.

## RS/6000 Perceived Strengths Against HP

*Claim:*
IBM's POWER architecture can deliver more SPECmark per MHz for any given clock speed compared to PA-RISC. All IBM has to do is to crank up the clock to get more performance.

*Counter:*
Increasing processor performance involves improvements along two parameters: clock speed and the number of instructions executed per clock cycle (superscalar design).

HP has focused on faster clock speeds while IBM has focused on superscalar design (currently using 4-way superscalar). The benefit in HP's approach is that faster clock speeds improve application performance without any recompiling. In the case of superscalar designs, a recompile may be necessary before the software can take full advantage of the new processor architecture.

Superscalar designs increase the complexity of the processor making it increasingly difficult to achieve higher clock speeds.

In September, 1992 IBM introduced a 62.5 MHz processor that delivers 126.2 SPECmarks89. The clock speed was not a significant increase from the previous processor running at 50 MHz and may be construed to be an inability to deliver higher clock speed. HP has implemented 2-way superscalar in the PA-7100 design. This processor runs at a clock speed of 99 MHz and delivers 147 SPECmark89, easily exceeding the performance of IBM's latest processor.

There is an excellent review of the PA-7100 chip by D.H. Brown Associates in their *Technology Trends* publication called "HP's 7100: Second-Generation RISC" (March 3, 1992).

*Claim:*
AIX has the capability of dynamic kernel reconfiguration which enables the customer to add peripherals without any downtime or reboots.

*Counter:*
AIX is designed in a very modular manner and features dynamic binding so as to facilitate reconfiguration without rebooting. However, note that once installed, the kernel needs to be reconfigured only in some limited cases that include adding new device drivers, changing the user limits on the system, or changing other kernel parameters such as process table sizes. Device drivers for disks, tapes, and printers are generally already part of the kernel and can be used for follow-on peripheral products. User limits are not changed very frequently and other kernel parameters are generally changed only when tuning the system for best performance - this does not occur frequently for run-time environments, but more so for development environments.

*Claim:*
IBM's high-availability (HA/6000) product allows system switchover to occur in minutes with no real downtime, but only a slight pause in system response time. This provides good protection against system failures for applications that require fault tolerance.

*Counter:*
The system switchover does in fact take minutes to accomplish but is far from true fault tolerance. True fault-tolerant capability is provided by IBM with OEM-ed Stratus systems. In comparison, HP's system switchover product goes through a reboot and can take 20 minutes or longer. For true fault-tolerant capability, HP offers the series 1200 servers running HP-UX which is source-code compatible with HP-UX. These systems have redundancies in all major system components such as CPU, memory, I/O bus, etc. and provide the capability to add or remove components such as memory boards and I/O boards while the system is online.

*Claim:*
Commercial functionality on AIX is superior to any other UNIX-based environment, especially with regard to system management.

*Counter:*
IBM's AIX has a limited set of commercial functionalities compared to HP-UX. IBM's system management is based on HP's OpenView technology, the Encina and CICS transaction monitors that IBM announced for AIX have also been announced for HP-UX. HP-UX offers tools that AIX does not offer - these include performance management, performance tuning, remote backup, and remote spooling.

*Claim:*
IBM has increased their Micro Channel Bus speed to 80 MB/s and now offers up to 16 I/O slots while HP's bus speed is only 32 MB/s with 12 I/O slots.

*Counter:*
Bus speed is only one aspect of achieving overall system throughput. Benchmarks such as TPC-A are designed to measure overall system throughput in a representative "real world" environment.

HP has achieved superior results in this and other benchmarks. IBM's high-end system, the POWERserver 980 delivers 160 TPC-A while the HP I50 delivers 184 TPS (this is the high-end among the uniprocessor systems). In addition, the 890 class of systems delivers up to 578 TPC-A of performance. The performance results show HP to be clearly ahead of IBM. This does not speak highly of IBM's perceived advantage of a faster I/O bus.

*Claim:*
IBM offers free software support.

*Counter:*
Nothing is for free. The customer eventually pays for everything. The customer should ask IBM to put in writing, what specifically will be provided for free. In most cases IBM will not do so. Also, IBM will not guarantee response times as they work on a "best case" basis. With HP's software support the customer has a clear set of expectations about the service and the response times they can expect.

Due to the current financial pressures there are fewer free system engineer resources being given away. Like HP, IBM will give away some system engineer time for large or strategic accounts.

*Claim:*
HP promotes proprietary or outmoded graphics standard APIs.

*Counter:*
This claim refers to HP Starbase, HP's proprietary API for local and remote (via X windows) 2D/3D graphics. However, HP's graphics strategy also includes two standard APIs: HP PHIGS, an ANSI/ISO-based API for local and remote (via X) 2D/3D, and HP PEXlib, the MIT X Consortium-based API for local 2D (X-lib)/3D and remote 2D/3D via X or PEX. For developers who require standards-based, distributed 3D graphics with excellent performance, HP PEXlib is the right solution.

*Claim:*
HP does not support OpenGL and is therefore at a performance disadvantage when running popular GL applications.

*Counter:*
The need to reduce development costs and increase portability is pressuring application developers to standardize on a single graphics programming tool. The industry choice has been PEX, the PHIGS-based extension to X. However, SGI is pushing OpenGL, their rewrite of the proprietary GL API. OpenGL is an immature, untested product which lacks functionality and industry support. For current GL users it requires a full application port. IBM is offering OpenGL on the RS/6000, however they have also started to work with PEX.

*Claim:*
HP graphics subsystems are very tightly coupled with the CPU. This takes away CPU power from other applications.

*Counter:*
It is true that the HP graphics architecture being tightly coupled with the CPU uses processor power for graphics performance. The advantage of this implementation is performance scaling, so that when processor performance is increased, graphics performance increases likewise. All of IBM's graphics adapters deliver the same performance independent of the processor involved. The IBM approach results in higher peak graphics performance, but the IBM graphics subsystem power cannot be used for computational purposes.

*Claim:*
HP's graphics solution is relatively expensive considering the fact that there is very little dedicated graphics hardware delivered.

*Counter:*
HP's repricing in the fall of 1992 and the introduction of the CRX-48Z put HP's graphics solutions far ahead of IBM in terms of functionality as well as price. Customers should compare the cost of the overall solution, rather than individual components.

**Enterprise System/9000
(ES/9000)**

## Overview

The ES/9000 (also known as System/390) architecture was introduced in September 1990 and has evolved from the older S/360 and S/370 architectures over the past twenty years. This product line has increased performance, improved networking and new functionality such as ESCON and PR/SM. ESA/390 also extends the addressing capability up to 16 terabytes on certain MVS systems. Based on a 1960s design as a batch processor, the S/390 has multiple layers of system software that allow it to cope with the 1990s-style workload that includes OLTP, office automation, etc. This inherent complexity results in expensive systems and lower manpower productivity.

In addition to being used for commercial applications, these mainframes are sometimes used in the technical computing environment. Some ES/9000 systems have an option to add a vector facility feature to each processor. Fewer systems have been installed in each succeeding generation beginning with the 308X. About 8,000 308X systems have been shipped worldwide, about 6,000 3090s and by 1995 less than 5,000 ES/9000 will be delivered. Analysts believe that the ES/9000 generation is the last for traditional mainframes and all the major vendors of traditional mainframes will make the transition to the alternative mainframe paradigm by 1996.

In an analyst meeting on December 15, 1992, IBM Chairman John Akers said that the company will make a major shift away from its core business of mainframe computers.

This section on IBM mainframes should be supplemented with materials available through the Mainframe Alternative Program. HP Field Training has also published two good references on the mainframe environment: SR1801 (Mainframe Environment Solutions) and SR1803 (IT and the MIS Environment).

## Hardware

The ES/9000 offers an entire family of compatible processors, spanning up to a 120-fold growth in performance. Though this appears to be a very powerful statement, there are issues of cost and consistency that are explained in the objection handling section. The following table gives a snapshot for the entire ES/9000 family of processors. Specific details on individual processors may be found in the appendix at the end of the IBM competitive profile.

ES/9000 Family of Processors

|  | 9221 (Entry) | 9121 (Midrange) | 9021 (High-end) |
|---|---|---|---|
| Cooling | Air | Air | Water |
| IBM MIPS Range | 2 to 6.5 | 8.8 to 74 | 20 to 235 |
| # of processors | 1 | 1 to 4 | 1 to 6 |
| Storage (MB) | 16 to 256 | 64 to 2048 | 32 to 8192 |
| Channels | Up to 24 | Up to 96 | Up to 256 |
| Price | $60K to $245K | $575K to $5,700K | $2,300K to $22,810K |
| Highlights | -Departmental and remote-site system for companies using larger ES/9000s and wanting consistency<br>-Rackmountable<br>-Replacement systems for 9370 and smaller 3090 processors midrange and high-end processors | -Targeted at medium-size businesses or large divisions<br>-Design based on 3090S models with larger memory<br>-Replacement engines for 4381 and 3090 | -Targeted at medium to large orgn.<br>-Fault-tolerant features in memory, processors, and power units<br>-Replacement processors for 3090 3xx to 6xx mainframes |

Note: IBM MIPS are different from MIPS reported by other vendors. For commercial environments multiply IBM MIPS by 3.7 to obtain a ballpark estimate of tps performance of the mainframe (high-level approximation, use with caution). This factor was proposed by Gartner Group.


*Special hardware features*

PR/SM (Processor Resource/System Manager): provides for a logical division of processor resources and enables the coexistence of multiple operating environments on the same system. Potential uses of the PR/SM include isolating production environments from test or migration environments. The partitioning of the processor also provides for high availability, such as a hot stand-by feature. PR/SM is available only under the MVS/ESA operating environment.

Dynamic Reconfiguration Management: This allows for addition, deletion, and modification of hardware and software I/O configuration definitions without requiring a Power-On Reset of the hardware or an Initial Program Load (IPL) of MVS. This capability is offered only under the MVS/ESA operating environment.

*Hardware futures*

IBM is expected to grow the ES/9000 family by 40 percent in performance in 1993 and 20 percent in 1994. Eight-way multiprocessing "I" models will receive the highest priority and could begin shipping in the first half of 1993. Merchant CMOS and BiCMOS chips will be available by 1995 and may contain over 500,000 gates on a single chip v/s the 10,000 to 15,000 found in today's custom ECL technology. Overall, IBM may continue to provide continued enhancements for system performance for the next few years while the demand for large computer performance continues to increase.

Sysplex, will also provide a growth path. It is a collection of hardware and software features to couple up to 8 ES/9000 processors from a single site so that they behave, and can be managed, as a single system. The Sysplex implementation improves application availability through better recovery procedure across processors and may also allow for dynamic load balancing across processors. This is available only under the MVS/ESA operating environment. Similar functionality is now available on MPE/iX and HP-UX systems through the NetBase/Quest products.

**Software**

*Operating systems*

Among the following products, MVS and VSE are the operating systems used most often in commercial production environments. These are not compatible with each other.

VSE (Virtual Storage Extended) is IBM's principal operating system for small and medium-size mainframes. This operating system is also called DOS (Disk Operating System)/VSE. There are over 20,000 licensees of VSE which IBM has tried to convert to MVS.

MVS (Multiple Virtual Storage) is a resource hungry operating system designed primarily for IBM's large mainframes in the commercial environment. MVS has been continuously enhanced since 1974 with features such as PR/SM, Sysplex, and Dynamic Reconfiguration that were explained earlier.

MVS has a number of functionalities to increase availability of the system: if an application or a part of a subsystem fails, it does not usually bring down the associated subsystem; if a whole subsystem fails it will hardly ever bring down MVS. This undoubtedly increases availability but there is a price to pay in terms of the size of the code. It is estimated that the size of the recovery routines in MVS exceeds the total system code in VSE.

VM (Virtual Machine) runs on small, medium, and large mainframes. VM allows more than one operating system to run on the same machine. The performance of VM systems can degrade rapidly due to the overhead of managing multiple operating systems. IBM made enhancements to the microcode to alleviate these performance problems; these functionalities were later incorporated into PR/SM.

AIX (Advanced Interactive Executive) is IBM's UNIX offering and runs natively in a logical partition using PR/SM or as a guest under VM/ESA. AIX/ESA is targeted as a data server for large UNIX networks using NFS; as a compute server using the vector facility; or as a general purpose timesharing campus system. IBM's commitment to UNIX on the mainframe remains to be seen when compared to their existing proprietary environments.

*Other software areas*

MVS supports DB2 (relational) and IMS (hierarchical) database systems with CICS (Customer Information Control System) and IMS/DC as the transaction processing monitors. IMS/DC was designed for high-transaction environments with strong recoverability features. VSE supports the DL/1 (Data Language 1) database and CICS. SoftwareAG is also a popular DBMS on the IBM mainframes.

Detailed information on topics such as system management and development environment is available to you through the Mainframe Alternative (MFA) Hotline and your MFA peaked systems engineer. In particular, the Competitive Matrix, which was part of the MFA SE class is an excellent source for this information and will be available through the MFA systems engineers.

Competitive comparisons

| Parity | HP strengths (IBM's weaknesses) | IBM strengths (HP's perceived weaknesses) |
|---|---|---|
| -Financially stable<br>-Worldwide support and service<br>-Leasing/financing options | -Cost of ownership<br>-Open systems leadership<br>-RISC architecture<br>-Single scalable product line<br>-Return credits | -High-end OLTP performance<br>-High availability<br>-Data center tools/funcitonality<br>-Mainframe-class support |

Tactics to beat IBM in the high-end sale (Gartner Group & Aberdeen)

- Cover all bases, call high, call on the top decision makers.

- Focus on the financial benefits, put the numbers (cost justification, return on investment...) in black and white. Include hardware, software licensing, support, facilities, and manpower costs of the mainframe. Include the cost of re-engineering the application when migrating to HP systems or the AS/400. IBM has their own rightsizing program around the AS/400.

- Avoid the technical aspects and design features with the top decision makers. Use them with the technical buyers.

- Avoid the terms "replacement", "offloading", "downsizing" with the MIS managers as it may make them insecure.

- Target strategic applications that have a high probability of success and visibility, and those that the customer is already considering for re-engineering.

- Be prepared for a long sales cycle and very aggressive competition from IBM if you are going into their installed base.

## HP strengths against the ES/9000

*HP advantage:*
HP offers a substantial difference in cost of ownership when compared with the ES/9000 systems.

*Customer benefit:*
HP can provide a comparable solution for significantly lower cost (usually 10 - 20 percent of IBM). This includes not only hardware and software purchase cost but also maintenance costs, operational costs, and cost of upgrading to higher performance systems in the future.

*HP advantage:*
HP is a leader in open systems based on UNIX.

*Customer benefit:*
First, customers are not locked in to a single vendor solution. Second, commercial solutions are being developed and enhanced by independent software providers in response to changing operational and organizational needs; these are being made available in the open systems environment. A significant number of commercial software providers have chosen HP as their initial open systems platform for availability of their solutions. With an ES/9000 solution, the customer would have to depend on IBM for any enhancements.

*HP advantage:*
HP's systems are based on RISC architecture.

*Customer benefit:*
RISC systems offer better performance scalability and better price/performance than older CISC technology. The scalability should ensure customers that PA-RISC will continue to provide leading platforms into the future while maintaining compatibility with existing applications.


## ES/9000 perceived strengths against HP

*Claim:*
The ES/9000 family of systems offers a single compatible family with a 120-fold growth path that will ensure long-term investment protection.

*Counter:*
The ES/9000 is made up of three distinct sub-product groups. IBM has even given them different product numbers (9221 and 9121 air cooled, and 9021 water cooled). When upgrading from an air cooled to water cooled system, IBM customers have to pay a premium as there are no upgrade paths and return credits.

From a strictly performance-oriented view, this may be an attractive story. When considered along with the price premiums, lack of upgrade paths, and significant maintenance/operational costs, the ES/9000 is not a very attractive solution.

HP solutions offer better upgrade paths, superior maintenance costs, and cost 10 - 20 percent as much as the ES/9000. Relative to performance, HP system performance extends well into the performance of the high-end 9021 systems.

*Claim:*
The software conversion from IBM to HP will be chaotic and expensive; it is best to stay in the IBM environment where your investment is protected.

*Counter:*
IBM has taken its customers through a large number of hardware and software platforms, and most of these have involved costly conversions. Even today, small organizations with the VSE proprietary operating system may have to spend over $1 million to convert their application to another proprietary operating system, MVS, when they want to move to a larger ES/9000 processor and then pay substantially higher software licensing fees.

Instead, it would be a prudent strategy to convert once to open systems that will ensure long-term investment protection in software and manpower. Not only will the cost of upgrades, software, operation, and maintenance be substantially lower than on the mainframes, but customers will also have their choice of vendors in selecting the best overall solution.

HP is working with a large number of experienced partners such as Integris and InfoSoft who provide conversion products and services from IBM mainframes to HP systems.

*Claim:*
AIX/ESA is now available on the ES/9000 systems making them the broadest open systems platform.

*Counter:*
There are less than 200 licensees of AIX on the ES/9000. Although IBM talks about providing many of today's industry standards such as DCE, DME, POSIX, and Motif on AIX/ESA, it is not clear if IBM will have all the application and data center solutions available in this environment. MVS and AIX coexistence is difficult as there is no data interchange between the two operating systems due to file system incompatibilities.

The cost of being on the ES/9000 platform would still be an issue. In addition to the expensive operational and maintenance costs, AIX/ESA promises to be an expensive proposition. The AIX/ESA license fee on the ES/9000 ranges from $63,000 to $1.3 million.

AIX/ESA does not really address two key markets, the mainstream UNIX market (due to price/performance) or the mainstream ES/9000 market (due to functionality). It does fulfill IBM's promise of the Open Enterprise and is therefore more of a marketing strategy.

*Claim:*
Extensive hardware and software reliability and recovery has been built into the ES/9000 mainframes. Customers cannot trust mission-critical operations to midrange systems.

*Counter:*
There are many levels of availability that a customer may require. It is important that the customer needs be understood carefully. For the top end of the high-availability spectrum, the ES/9000 does offer some extra functionality as described in the hardware and software sections, but the cost associated with these features is extremely high. In addition to the hardware costs, there are additional programming costs to utilize the MVS recovery features.

On the hardware side, HP's Corporate Business Systems offer error correcting features in memory, I/O channels, and the processor-memory bus. With the series 1200, automatic system recovery and deconfiguration of failed processors, memory, and interface modules leads to a maximum hardware uptime of 99.97 percent.

Regarding software environments, MPE/iX 4.0 incorporates new resiliency features such as additional Try/Recover routines, a Table Monitor, and Aggregate Parallel Recovery (APR). HP-UX is the most mature commercial UNIX environment in the industry. Existing products such as SwitchOver and DataPair provide processor and data availability. HP-UX will feature SCSI three-way disk mirroring through the Logical Volume Manager (LVM). Disaster Recovery solutions are also available on MPE/iX and HP-UX systems. Additional details on HP's offering may be found in the Corporate Business Systems sales kit.

*Claim:*
The ES/9000 has the most extensive set of system management, performance, and load balancing tools.

*Counter:*
The first question to ask in response to any such sweeping statement is which operating system IBM is referring to. VSE and AIX do not qualify for such claims at all. MVS does have a rich set of software tools, but some of them are necessary due to the complexity of the hardware and software platform. HP's systems may not require some of the esoteric tuning tools due to the inherent simplicity of the design. In any case, there are in fact good load balancing tools on MVS and it is important to qualify the customer needs before countering this claim.

HP has a very strong system management offering with OpenView, PerfView, HP OpenView Console, NetBase, CA-Unicenter, and Unison. Additional details on HP's offering may be found in the Corporate Business Systems sales kit.

**Quotes**

"John Akers, Chairman of IBM, stunned the computer industry by disclosing that IBM's business continues to deteriorate much faster than expected, with no end in sight.

'He said IBM will break even on an operating basis in the fourth quarter and said there's no sign of improvement in early 1993.'

'IBM announced $2.1 billion in pretax charges for slicing more than 40,000 employees from its work force during 1992, which would bring the total pretax charges to $11.4 billion this year. The new charge will plunge IBM into its second annual loss in a row.'

'IBM said it will slash development spending next year by $1 billion. An additional 25,000 workers are expected to be shed next year.'

'Mr. Akers said IBM's mainframe revenue will drop 10 percent this year and keep dropping next year.'

'He said IBM will make a major shift away from its core business, the mainframe computers ... and into the newer software and services market."

Wall Street Journal
December 16, 1992


"Howard Anderson, managing director of Yankee Group in Boston, predicted that IBM will announce further job cuts over the next few years - possibly as many as 20,000 a year for the next five years."

San Jose Mercury News
December 6, 1992

*"Just as IBM is attempting to make its mark as a premier services organization, a customer has filed a $150 million lawsuit alleging that IBM did not provide adequate staffing to finish a project on schedule."* According to First Financial Management Corp in Atlanta, *"IBM caused the project to fall behind schedule almost immediately by failing to assign adequate numbers and quality of personnel to the project."* Further, *"IBM now insists that FFMC must purchase additional hardware from IBM beyond the equipment specified in the contract,"* the suit said.

> Computerworld
> November 2, 1992

*"IBM formed a new Client/Server Computing Group to do custom work in the client/server arena. Amy Wohl, president of Wohl Associates in Pennsylvania said, "IBM isn't what most customers have in mind when they talk client/server." Doug Underhill, VP at CSX Technologies in Florida said, "We hadn't thought of IBM in this context."*

> Computerworld
> November 30, 1992

*"Undersizing problems are common, according to a recent survey of 300 AS/400 users conducted by Aberdeen Group, a research firm in Boston. Forty percent of the 240 people who received estimates from IBM said they were wrong - too small - 94 percent of the time. The Aberdeen survey unearthed many users who do not fully trust IBM for an upgrade, according to John Logan, executive VP of Aberdeen."*

> Computerworld
> September 28, 1992

*"Aberdeen Group queried 300 MIS professionals about their experiences with the AS/400. The users uniformly reported that the AS/400 meets their needs in terms of ease of use, programming and running their operations. Most complaints center around IBM product and support limitations that were detrimental to the AS/400's ease of use and operations strengths.'*

*'The major weaknesses are in the area of cost. Many users report that the high cost of upgrading systems is slowing their expansion plans.'*

*'IBM presales efforts to size the AS/400 resulted in recommendations that either were too small in terms of processor power or did not have the amount of disk capacity or memory required to run the users' applications.'*

*'Users consistently report that they want more and better local IBM support in their geographic location."*

Midrange Systems (editorial)
October 13, 1992


*"More customers must make do with telephone support instead of the free on-site technicians who used to be part of most big-iron deals. Some users must now pay an hourly rate of $200 for an expert's time."*

Computerworld
September 14, 1992