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# Enterprise Server Fundamentals

Bulletin

## Compaq Bolsters Its Alpha-Based Product Line with the ES45 Server

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### IDC Opinion

*How will the marketplace receive Compaq's new ES45 server, and what does it offer to users of Compaq's AlphaServers?*

The ES45 joins the ES40 AlphaServer product family by providing a powerful four-way system that is targeted at OLTP and analytic computing. It is expected to be a popular machine among present AlphaServer customers for server consolidation. However, Compaq must focus on total line-of-business solutions, especially in vertical market segments, in order to broaden the ES45's appeal among non-Compaq users of RISC-based systems. The ES45 also can be clustered, providing a single system image that spans multiple server nodes and providing supercomputer performance when clustered for scientific/technical applications. This capability should also prove attractive to xSPs and to IT customer sites installing multitiered Internet infrastructure based on flexible server clusters.

## Announcement Highlights

On October 16, Compaq announced the ES45, a new RISC-based server that is designed to compete in the high-performance computing space for technical and commercial applications. The ES45 will complement Compaq's current ES40 server, which spans the entry server market (servers priced up to $100,000) and the midrange server market (servers priced from $100,000 to $1 million) Compaq will position the ES40 as the value-package offering and the ES45 as the high-performance product offering in this price range (spanning IDC price bands 5 and 6). The new ES45 system has been shipping to selected customers since June 2000, Compaq said.

Highlights of the new system include the following points:

- The ES45 server is based on the third-generation Alpha 21264 microprocessor, which is an EV68 Alpha chip running at 1.0GHz.
- The ES45 system utilizes a switch-based interconnect, which minimizes system degradation as the number of CPUs, memory, and I/O increases.
- The ES45 system is available in three configurations: a pedestal system with expanded storage capacity, a standalone tower, and a rack-mounted system.
- The system can be purchased with three operating-system options: Compaq Tru64 Unix or Compaq OpenVMS or it can be sold without an operating system so that users can run Linux.
- The ES45 supports up to four Alpha RISC processors, 32GB of memory and up to 10 PCI slots. The system has a 125MHz system bus along with hot-pluggable 66MHz PCI slots.
- Compaq is offering a 99.999% (5-9s) uptime service guarantee (supporting five minutes or less of downtime per year) for configurations that are running OpenVMS or Tru64 Unix.
- The ES45 is offered in clustered configurations that include dozens, hundreds, or even more than 1,000 CPUs when all the Alpha chips on all the individual server nodes are added together.

## Snapshot Analysis

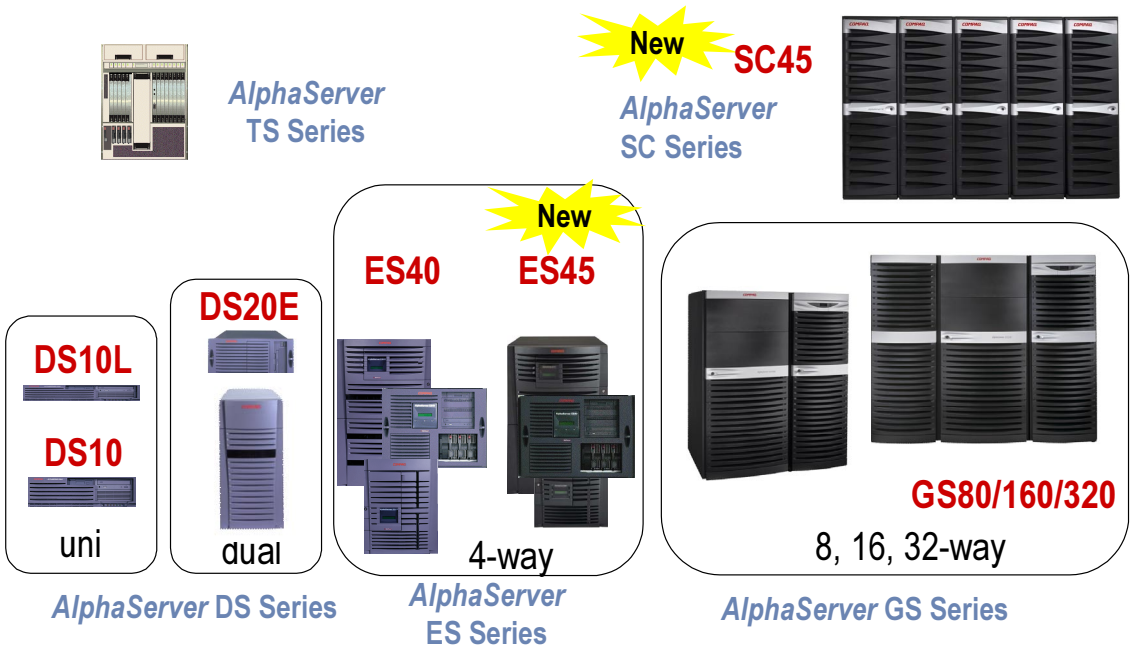
Compaq has extended its current server offerings in the entry server market (servers priced up to $100,000) and the midrange server market (servers priced from $100,000 to $1 million) with the ES45 server.

Compaq plans to present the ES40, which was introduced in the second quarter of 1999, as the value package. This means that the ES45 will be presented as a high-performance server that is based on a powerful 1GHz processor. The ES40 and ES45 servers are based on Compaq's Alpha RISC microprocessors, which are fully 64 bit and run OpenVMS, Tru64 Unix, or Linux.

It should be noted that the ES40 and ES45 have models that fall in the entry space and models that fall in the midrange server space, depending on purchase price. However, too further differentiate the ES40 from the ES45, Compaq announced a 20% price reduction for the ES40 on October 1, 2001.

Figure 1 presents the complete AlphaServer product line. It shows that the Alpha-based RISC servers start with the entry-level DS10 and DS20, scale up to the four-way ES40 and ES45, scale further into the GS Series, which starts at midrange prices, and scale up to high-end server configurations (priced at $1 million or more).

**Figure 1**
**Compaq AlphaServer Product Family**




Source: Compaq, 2001

Customers also have the option of clustering the ES45 into high-availability fail-over configurations that have up to 16 server nodes or into workload-balancing clusters for HPC and other demanding, compute-intensive applications.

When configured into an HPC cluster, leveraging Linux clustering software or workload-balancing clustering software, the ES45 can be a powerful building block for supercomputer-class cluster arrays. To date, Compaq has shipped more than 2,000 ES45s to customers. One early-support customer, the French Atomic Energy Commission, has clustered 625 ES45 machines for military purposes. Another customer, the Pittsburgh Supercomputing Center, has configured 760 ES45 nodes into one cluster that is a virtual supercomputer, thus becoming one of the largest research computing systems that is deployed outside the government sector. The machine is used as a computing service provider for the scientific community.

## Benefits for Longtime AlphaServer Customers

The ES45 will be a server-consolidation platform for longtime AlphaServer users who want to gather workloads that have been running on many separate systems, including the AlphaServer 4100, which dates from the mid-1990s.

IDC anticipates that the installed base of the AlphaServer 2100 and the AlphaServer 4100 will decrease substantially as these older machines are retired and as the computing workloads from these widely used systems are moved to the ES45.

Compaq's AlphaServer base faces a technology shift from RISC processors to Intel's Itanium processors in coming years. On June 25, 2001, Compaq announced that it had reached a technology and marketing agreement with Intel to consolidate all of the Compaq 64-bit server products on the Itanium Processor Family (IPF) architecture by 2005.

Under the terms of the agreement, Compaq and Intel will jointly work to adapt the server operating environments for Compaq's OpenVMS, NonStop Himalaya NSK, and Tru64 Unix for use on the Itanium processors that will take the place of Alpha microprocessors in Compaq's next-generation enterprise servers.

Within the AlphaServer base, interest in the ES45 will likely remain high as long as Compaq can demonstrate that it is willing to provide enhancements to its product line from now until CY05.

### *Focused Solutions to Attract New Customers*

Compaq's disclosure of its road map to end Alpha development with the EV7 generation (to be shipped during CY02) may act to limit new buyers outside the AlphaServer base. However, some ES45 models already have been sold outside the traditional AlphaServer base, Compaq has disclosed.

IDC believes that focused solution sets within specific vertical markets for the ES45 may bring new customers to the ES Series.

Examples include solutions for the telecommunications, government, and education vertical-market segments. This focused, line-of-business solutions approach is a winning one, IDC believes, because it emphasizes the power of the underlying RISC platform while stressing the overall business benefits, rather than the technology benefits alone. To the extent that Compaq goes to market with these solution sales for the ES45 server, the total available market (TAM) for these Compaq servers will outstrip the traditional AlphaServer customer base.

## Competitive Analysis

Based on IDC definitions of the entry-server and midrange server market, as described, the pricing for the ES45 falls in the high end of the entry-server space and in the low end of the midrange server space. A typical ES45 system is expected to be priced between $90,000 and $100,000, placing it at the leading edge of the midrange server marketplace and enhancing its appeal to longtime AlphaServer users concerned about moving to higher price points. By providing strong support for clustered configurations, Compaq is in step with the market trend toward n-tier Internet infrastructure that leverages multiple servers within a tier (in this case, the application tier or the database tier) to flexibly grow server capability as user-driven computing demands increase over time.

Compaq has positioned the ES45 machine to compete in the Unix/RISC server market, delivering one of the fastest four-way systems on the market today. Historically, Compaq often has had one of the fastest RISC-based systems in each server category (i.e., entry, midrange, and high end) by virtue of selling one of the fastest RISC chips available in the marketplace, IDC notes.

Although Alpha microprocessors have been among the top RISC chips, in terms of speed, they have been competing closely with HP's PA-RISC and IBM's POWER series as the fastest high-speed microprocessors. IDC believes that this leading-edge chip performance is a major benefit of Alpha RISC-chip technology, and it is one that helps to explain why AlphaServer customers have remained loyal over such a long period of time, even after Compaq acquired Digital Equipment in mid-1998.

The ES45 will face serious competition from several other RISC-based models. It will compete most closely against IBM's pSeries 660 6H1 server, Hewlett-Packard's L-Class server, and Sun's Sun Fire 3800 and 4800. However, when deployed in clustered configurations, the ES45 servers compete with a wider array of RISC-based entry and midrange servers. That means that the ease of deployment and manageability will become key differentiators for Compaq's servers, rather than just technical specifications.

Tables 1–4 show the competitive market share of vendors that compete in the RISC-based server market space. These tables show that Compaq and HP would have leading market share, in terms of unit shipments, in the RISC-based market for price bands 5 and 6. If HP and Compaq go forward with their proposed merger, the

combined company would be a strong competitor to Sun and IBM in the RISC-based server space. However, Compaq's revenue for its RISC-based servers trail those of Sun, HP, and IBM, showing that there is upside potential to improve the Compaq market share if high volumes of ES-Series servers are sold in CY02.

**Table 1**
**Worldwide Entry Server RISC Factory Revenue by Vendor for Price Band 5 ($50,000–99,999), 1998–1H01**

| | 1998 | | 1999 | | 2000 | | 1H01 | |
|---|---|---|---|---|---|---|---|---|
| | Revenue ($M) | Share (%) | Revenue ($M) | Share (%) | Revenue ($M) | Share (%) | Revenue ($M) | Share (%) |
| Hewlett-Packard | 599.7 | 15.9 | 779.2 | 21.7 | 1,042.2 | 33.9 | 501.9 | 38.0 |
| Compaq | 310.2 | 8.2 | 655.5 | 18.3 | 582.5 | 18.9 | 275.0 | 20.8 |
| Sun Microsystems | 830.9 | 22.0 | 959.3 | 26.7 | 677.3 | 22.0 | 231.4 | 17.5 |
| IBM | 994.0 | 26.3 | 553.5 | 15.4 | 307.5 | 10.0 | 112.6 | 8.5 |
| Fujitsu Siemens | – | – | 7.2 | 0.2 | 73.6 | 2.4 | 46.1 | 3.5 |
| Fujitsu | 40.2 | 1.1 | 67.9 | 1.9 | 74.3 | 2.4 | 35.1 | 2.7 |
| Groupe Bull | 93.6 | 2.5 | 88.7 | 2.5 | 42.5 | 1.4 | 27.2 | 2.1 |
| NEC | – | – | – | – | 43.1 | 1.4 | 15.8 | 1.2 |
| SGI | 3.7 | 0.1 | – | – | 15.2 | 0.5 | 9.9 | 0.7 |
| Mitsubishi | – | – | – | – | – | – | 4.2 | 0.3 |
| Other | 900.5 | 23.9 | 475.6 | 13.3 | 216.3 | 7.0 | 59.8 | 4.5 |
| Total | 3,772.8 | 100.0 | 3,586.9 | 100.0 | 3,074.4 | 100.0 | 1,319.1 | 100.0 |
| Merger, buyout, and name variations* | | | | | | | | |
| Compaq | 550.6 | 14.6 | 655.5 | 18.3 | 582.5 | 18.9 | 275.0 | 20.8 |
| Fujitsu Siemens | 81.2 | 2.2 | 37.4 | 1.0 | 73.6 | 2.4 | 46.1 | 3.5 |
| NEC | 102.8 | 2.7 | 42.1 | 1.2 | 43.1 | 1.4 | 15.8 | 1.2 |

* If Compaq, Fujitsu Siemens, and NEC had been combined from the beginning of 1998, as described in the Key Assumptions, the results would have been those shown in this section of the table.

**Key Assumptions:**

- As of the fourth quarter of 1999, Siemens shipments are reported as Fujitsu Siemens shipments.
- Worldwide NEC shipments for 2000 are reported as NEC, NEC CI, and NEC/Groupe Bull shipments because of a worldwide branding effort by NEC.
- Compaq shipments are reported as shipments for the combined entities of Digital and Compaq, starting in the third quarter of 1998.

**Message in the Data:**

- Since 1998, Hewlett-Packard and Compaq have increased their market share in each consecutive year.

Source: IDC, 2001

**Table 2**
**Worldwide Entry Server RISC Shipments by Vendor for Price Band 5 ($50,000–99,999), 1998–1H01**

| | 1998 | | 1999 | | 2000 | | 1H01 | |
|---|---|---|---|---|---|---|---|---|
| | Shipments | Share (%) | Shipments | Share (%) | Shipments | Share (%) | Shipments | Share (%) |
| Hewlett-Packard | 10,619 | 17.0 | 15,810 | 24.8 | 22,576 | 38.4 | 9,458 | 38.8 |
| Compaq | 5,227 | 8.3 | 11,173 | 17.5 | 10,444 | 17.8 | 5,004 | 20.5 |
| Sun Microsystems | 15,750 | 25.2 | 17,530 | 27.5 | 12,407 | 21.1 | 4,818 | 19.8 |
| IBM | 15,711 | 25.1 | 9,690 | 15.2 | 5,936 | 10.1 | 2,070 | 8.5 |
| Fujitsu Siemens | – | – | 113 | 0.2 | 939 | 1.6 | 633 | 2.6 |
| Fujitsu | 580 | 0.9 | 953 | 1.5 | 1,313 | 2.2 | 616 | 2.5 |
| Groupe Bull | 1,115 | 1.8 | 1,319 | 2.1 | 543 | 0.9 | 284 | 1.2 |
| NEC | – | – | – | – | 680 | 1.2 | 256 | 1.0 |
| SGI | 84 | 0.1 | – | – | 214 | 0.4 | 168 | 0.7 |
| Mitsubishi | – | – | – | – | – | – | 55 | 0.2 |
| Other | 13,533 | 21.6 | 7,108 | 11.2 | 3,779 | 6.4 | 1,012 | 4.2 |
| Total | 62,619 | 100.0 | 63,695 | 100.0 | 58,830 | 100.0 | 24,374 | 100.0 |
| Merger, buyout, and name variations* | | | | | | | | |
| Compaq | 9,348 | 14.9 | 11,173 | 17.5 | 10,444 | 17.8 | 5,004 | 20.5 |
| Fujitsu Siemens | 1,151 | 1.8 | 542 | 0.9 | 939 | 1.6 | 633 | 2.6 |
| NEC | 1,477 | 2.4 | 605 | 0.9 | 680 | 1.2 | 256 | 1.0 |

* If Compaq, Fujitsu Siemens, and NEC had been combined from the beginning of 1998, as described in the Key Assumptions, the results would have been those shown in this section of the table.

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- Compaq shipments are reported as shipments for the combined entities of Digital and Compaq, starting in the third quarter of 1998.

**Message in the Data:**

- Since 1998, Hewlett-Packard and Compaq have increased their market share in each consecutive year.

Source: IDC, 2001

## Table 3
## Worldwide Midrange Server RISC Factory Revenue by Vendor for Price Band 6 ($100,000–249,999), 1998–1H01

| | 1998 | | 1999 | | 2000 | | 1H01 | |
|---|---|---|---|---|---|---|---|---|
| | Revenue ($M) | Share (%) | Revenue ($M) | Share (%) | Revenue ($M) | Share (%) | Revenue ($M) | Share (%) |
| Sun Microsystems | 1,460.1 | 22.5 | 1,866.5 | 27.9 | 2,253.7 | 37.2 | 876.2 | 42.0 |
| Hewlett-Packard | 1,660.8 | 25.6 | 1,566.5 | 23.4 | 1,763.6 | 29.1 | 414.7 | 19.9 |
| IBM | 1,679.2 | 25.9 | 1,278.9 | 19.1 | 853.9 | 14.1 | 337.7 | 16.2 |
| Compaq | 221.1 | 3.4 | 295.0 | 4.4 | 419.3 | 6.9 | 178.3 | 8.5 |
| Groupe Bull | 44.3 | 0.7 | 84.9 | 1.3 | 138.3 | 2.3 | 104.1 | 5.0 |
| SGI | 43.8 | 0.7 | 568.7 | 8.5 | 99.6 | 1.6 | 47.8 | 2.3 |
| Fujitsu Siemens | – | – | 83.0 | 1.2 | 128.5 | 2.1 | 47.8 | 2.3 |
| NEC | – | – | – | – | 25.4 | 0.4 | 19.6 | 0.9 |
| Stratus Computer | 80.6 | 1.2 | 22.4 | 0.3 | 25.5 | 0.4 | 12.1 | 0.6 |
| Hitachi Ltd. | 27.7 | 0.4 | 46.1 | 0.7 | 21.2 | 0.3 | 11.8 | 0.6 |
| Other | 1,267.9 | 19.5 | 870.4 | 13.0 | 334.3 | 5.5 | 36.5 | 1.7 |
| Total | 6,485.6 | 100.0 | 6,682.5 | 100.0 | 6,063.3 | 100.0 | 2,086.6 | 100.0 |
| Merger, buyout, and name variations* | | | | | | | | |
| Compaq | 408.0 | 6.3 | 295.0 | 4.4 | 419.3 | 6.9 | 178.3 | 8.5 |
| Fujitsu Siemens | 402.2 | 6.2 | 359.6 | 5.4 | 128.5 | 2.1 | 47.8 | 2.3 |
| NEC | 12.1 | 0.2 | 62.1 | 0.9 | 25.4 | 0.4 | 19.6 | 0.9 |

* If Compaq, Fujitsu Siemens, and NEC had been combined from the beginning of 1998, as described in the Key Assumptions, the results would have been those shown in this section of the table.

**Key Assumptions:**

- As of the fourth quarter of 1999, Siemens revenue is reported as Fujitsu Siemens revenue.
- Worldwide NEC revenue for 2000 is reported as NEC, NEC CI, and NEC/Groupe Bull revenue because of a worldwide branding effort by NEC.
- Compaq revenue is reported as revenue for the combined entities of Digital and Compaq, starting in the third quarter of 1998.

**Message in the Data:**

- Sun controlled more than twice the market share of its nearest competitor in the first half of 2001.

Source: IDC, 2001

**Table 4**
**Worldwide Midrange RISC Server Shipments by Vendor for Price Band 6 ($100,000–249,999), 1998–1H01**

| | 1998 | | 1999 | | 2000 | | 1H01 | |
|---|---|---|---|---|---|---|---|---|
| | Shipments | Share (%) | Shipments | Share (%) | Shipments | Share (%) | Shipments | Share (%) |
| Sun Microsystems | 15,676 | 27.8 | 20,205 | 32.5 | 22,990 | 40.6 | 8,496 | 44.7 |
| IBM | 13,725 | 24.4 | 10,404 | 16.7 | 7,982 | 14.1 | 3,472 | 18.3 |
| Hewlett-Packard | 15,108 | 26.8 | 15,063 | 24.2 | 15,022 | 26.5 | 3,403 | 17.9 |
| Compaq | 1,678 | 3.0 | 4,039 | 6.5 | 4,988 | 8.8 | 1,810 | 9.5 |
| Groupe Bull | 324 | 0.6 | 730 | 1.2 | 1,002 | 1.8 | 586 | 3.1 |
| SGI | 338 | 0.6 | 4,858 | 7.8 | 820 | 1.4 | 409 | 2.2 |
| Fujitsu Siemens | – | – | 606 | 1.0 | 884 | 1.6 | 310 | 1.6 |
| NEC | – | – | – | – | 300 | 0.5 | 141 | 0.7 |
| Hitachi Ltd | 191 | 0.3 | 384 | 0.6 | 153 | 0.3 | 75 | 0.4 |
| Fujitsu | 630 | 1.1 | 332 | 0.5 | 799 | 1.4 | 69 | 0.4 |
| Other | 8,669 | 15.4 | 5,513 | 8.9 | 1,719 | 3.0 | 232 | 1.2 |
| Total | 56,339 | 100.0 | 62,133 | 100.0 | 56,659 | 100.0 | 19,003 | 100.0 |
| Merger, buyout, and name variations* | | | | | | | | |
| Compaq | 3,603 | 6.4 | 4,039 | 6.5 | 4,988 | 8.8 | 1,810 | 9.5 |
| Fujitsu Siemens | 2,496 | 4.4 | 2,413 | 3.9 | 884 | 1.6 | 310 | 1.6 |
| NEC | 101 | 0.2 | 357 | 0.6 | 300 | 0.5 | 141 | 0.7 |

* If Compaq, Fujitsu Siemens, and NEC had been combined from the beginning of 1998, as described in the Key Assumptions, the results would have been those shown in this section of the table.

**Key Assumptions:**

- As of the fourth quarter of 1999, Siemens shipments are reported as Fujitsu Siemens shipments.
- Worldwide NEC shipments for 2000 are reported as NEC, NEC CI, and NEC/Groupe Bull shipments because of a worldwide branding effort by NEC.
- Compaq shipments are reported as shipments for the combined entities of Digital and Compaq, starting in the third quarter of 1998.

**Message in the Data:**

- After losing market share for the past two years, IBM improved its position in the first half of 2001.

Source: IDC, 2001

## Delivery of Preconfigured Systems

Several server vendors are offering systems that are turnkey-on-delivery, and Compaq is one of them. Compaq is offering the ES45 in a preconfigured and pretested running Oracle*9i* RAC database. The system is up and running within nine days after the order is placed. By using Oracle*9i* RAC, the customers will avoid the need to create many custom scripts that make their applications cluster aware. The Oracle*9i* RAC package has done much of that work for them, reducing the time to deployment for these servers.

The ES45 can be ordered using one part number for the preconfigured system. The user can start with a small configuration and then can grow the ES45 server by scaling up the individual server or by scaling out with a clustered configuration of multiple ES45 servers. This ability to flexibly grow the system can result in a lower total cost of ownership (TCO) for customers compared with that of midrange RISC-based servers that must be replaced through forklift upgrades rather than using a scaled up strategy through Compaq's capacity-on-demand (COD) program or by using scale out clustered-server solutions.

### *Looking Forward*

Compaq is committed to providing its customers with enhanced AlphaServers that will be based on the next-generation EV7 microprocessors. Compaq has said that it will continue to introduce new hardware and software based on Alpha RISC technology through 2006, with continued support for installed AlphaServers until 2013. In addition, Compaq stated that it will continue to sell hardware upgrades as long as customers request them.

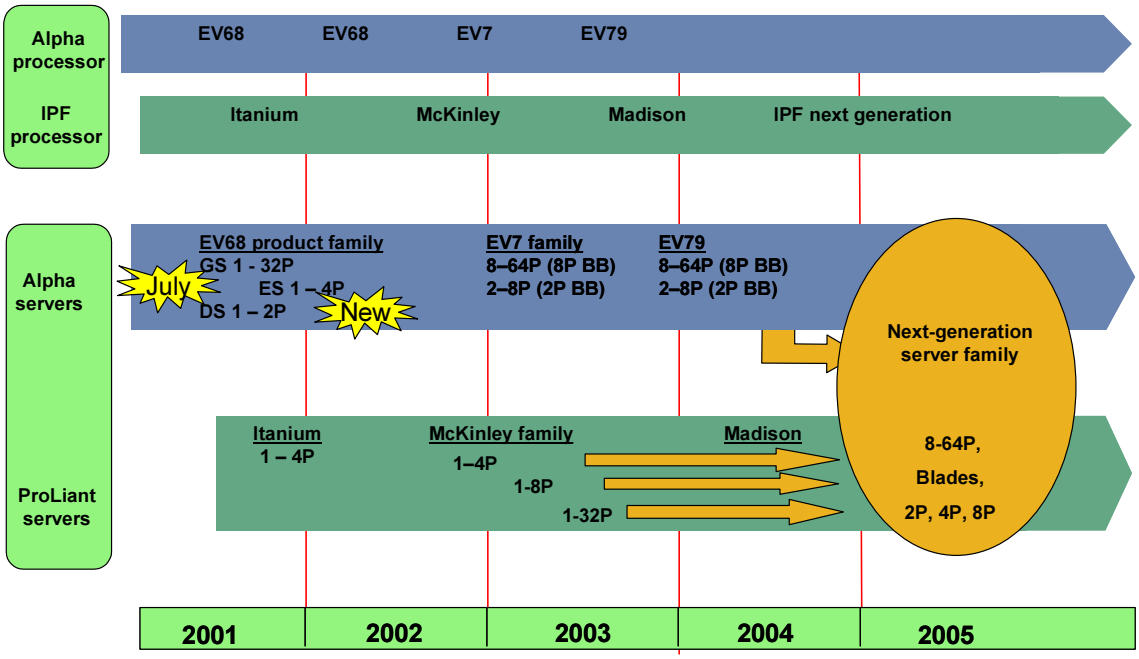
As Compaq and HP continue to press ahead with their proposed merger, Compaq wants to ensure that its longtime AlphaServer customers stay on board and do not defect to other vendors of RISC-based server systems, including Sun and IBM.

Compaq has done an excellent job of laying out a road map to minimize customers' concerns about how they will move forward in Compaq's enterprise server line (see Figure 2).

There will be improvements in processor technology with the introduction of the EV7 and EV79 generations of Alpha chips in 2002 and 2003. After that, Compaq will turn its focus to moving AlphaServer customers' applications to servers based on the McKinley and Madison microprocessors within the Itanium Processor Family. Further, Compaq intends to enhance the Tru64 Unix operating system running on the Alpha platform through 2006, and it plans to support the Alpha and Tru64 technologies until 2013. Development work to port OpenVMS to the Itanium processor family already has been started, providing a way forward for longtime VMS and OpenVMS customer sites. Compaq has been clear in stating that it will bring OpenVMS forward to Itanium because of its importance to many of Compaq's largest accounts.

IDC believes that it is imperative for Compaq to assist its loyal AlphaServer customers in their migration to next-generation Compaq or HP-Compaq enterprise server architectures. Otherwise, these customers might decide to move to competing RISC server systems, even if that means a change in the Unix operating-system environment or a step away from the Compaq road map. Compaq instituted a customer assurance program to aid customers with their platform migrations from Alpha systems to Itanium-based systems.

**Figure 2**
**Compaq System Roadmap**




Source: Compaq, 2001

## Conclusion

The ES45 is a powerful four-processor system that will compete in the entry and the midrange server spaces, and it is a strong building block for supercomputer-class clustered-server configurations.

The Compaq AlphaServer line will continue to be purchased by many longtime Alpha customers as a server-consolidation platform. At the same time, non-Compaq customers shopping for a powerful engine for high-performance computing can also purchase the AlphaServer systems. However, to attract the new customers, Compaq must make a strong effort to wrap vertically oriented line-of-business (LOB) solutions around the ES45 platform and to market that total solution outside the traditional Compaq AlphaServer installed base.

Compaq is intent on leveraging its strengths in clustering and in high-performance computing to launch a new round of competition with other vendors' RISC-based servers. The ES45 offers a solid foundation for high-performance computing and clustering, and it is one that can appeal to a broader audience if the right solution sets are provided for sale with this newest AlphaServer system.

Compaq Project #: 15ZB-1201A-WWEN