A COMPARATIVE ANALYSIS OF ALLIANCES IN THE ENTERPRISE STORAGE MARKET

by

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Submitted to the Alfred P. Sloan School of Management in Partial Fulfillment of the Requirements for the Degree of Master of Science in the Management of Technology at the Massachusetts Institute of Technology

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ABSTRACT

Alliances have been increasingly used in many industries as a way of obtaining competitive advantage. The enterprise storage marketplace is one in which alliances have been frequently used by many big players. In this paper, a comprehensive list of storage-related alliances was compiled. The list covers a five-year period from 1995 to 1999, and the six leading domestic enterprise storage manufacturers including EMC, IBM, Hewlett-Packard, Sun Microsystems, Dell, and Compaq. Six forces that have led to the alliances in the enterprise storage space were identified. The alliances were broken down into three levels based on the strategic importance of an alliance and the amount of effort involved. With the data obtained from press and company news releases, we were able to categorize the alliances with regard to the six forces. However we were not able to determine the level of each alliance due to the lack of inside information regarding the true goals and processes of the alliances. Nevertheless we believe the evaluation methodology is worth presenting and the work can be completed once the information becomes available.

A comparative analysis of the storage-related alliances for each of the six leading storage vendors was conducted. The analysis touched upon the firms’ product positioning, competitive advantage/disadvantage, and the use of alliances. The thesis also discusses if and how the alliances were linked to business strategy.

Thesis Supervisor: Edward B. Roberts
Title: David Sarnoff Professor of Management of Technology
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Jennifer Zhu
Cambridge, MA
May 3, 2000
I. INTRODUCTION

The enterprise storage industry has gone through a boom stage. As the world entered the Internet age, firms began to recognize the need to catch the wave of e-business in order to stay competitive and in some cases to leapfrog ahead of the competition. As a result, large-scale IT infrastructure and new applications are rapidly deployed in many enterprises in addition to existing systems.

At the same time, the Internet’s move to the center stage of commerce and communication has led to enormous growth in the need for storage for large and small businesses. The flow of information is accelerating, and the amount of data is growing between 75 percent to 150 percent per year for large corporations, according to estimates by experts. [Red Herring, March 2000]

The arrival of broadband communication has further encouraged the storage explosion. Billions of bytes of digital video and graphical data beg for storage space. Fortunately, storage technologies have improved dramatically in the last decade so that the amount of data that can be squeezed into a square inch of a magnetic disk has grown 133 times. Yet this amazing technology has not slowed the demand for more and larger storage devices at many corporations.

IDC estimates that the worldwide storage hardware market for all operating systems in 1998 was almost $30 billion (IDC, 1998). Figure 1 shows the storage systems revenue growth since 1994, along with the predictions through 2002. Figure 2 shows the total terabytes shipped worldwide for the same period.
Source: IDC 1998, report 16903

Figure 1. Worldwide Storage Systems Revenue

Source: De la Motte, 1999

Figure 2. Total Terabytes Shipped Worldwide
For many computer makers, enterprise storage products were not central to their business until recent years. Storage devices were considered peripherals in the past. However, as storage technology improved, people began to realize that storage capacity and functionality has become an integral part of IT solutions. For computer manufacturers, storage is critical in their product portfolios, and the ability to offer the best-in-breed storage systems in addition to the PCs, workstations, servers, and peripherals can be a significant differentiating point.

From a financial standpoint, storage devices are not yet commoditized and therefore higher margins can be charged. More important, customers may not purchase computers every year, but they do add storage capacity every year. The annuity generated from storage devices plus the high margins are obviously attractive to anybody in the business.

Although the industry is still on a rising curve, it is coming closer to commodification. This is because more players have entered the arena, technologies are becoming open standard, network effects drive for less product differentiation, and price is rapidly falling.

Storage technologies have come a long way in the past ten years. Data storage structure has evolved from JBOD (just a bunch of disks) to RAID (redundant array of independent disks). Fibre Channel has been accepted as the dominant interconnection technology in the last two years. The idea of storage appliances such as Network Attached Storage (NAS) is being considered in many places. Storage area network (SAN) has emerged as a storage architecture standard fairly recently, while the fiber channel standards and network management software are still under development.
The number of alliances in the storage industry has increased significantly since 1995. This is true both at the industry level and the firm level for each of the six vendors studied in this paper. The trend indicates that alliances played an important role in the storage market competition.

This thesis provides a view of the industry from the perspective of alliance. Alliance has long been used in many industries as a way to compete through coordination. Alliance helps the partners involved achieve more than the sum of what they could have achieved independently within a given timeframe. It provides an opportunity to absorb and learn the skills of each partner to the alliance rather than racing in an effort to develop them in-house. It also combines the complementary assets of the partners, such as distribution capabilities or manufacturing skills, for better competition with the rest of the world. The trend toward disintegration in many industries increased the need for alliances among parties within the industry value chain. As economic boundaries in the world continue to vanish, the rise of intense global competition has spawned hundreds of cross-board alliances as part of firms' strategic approach to expanding their global presence.

An alliance can take a variety of forms, ranging from an arm’s-length contract to a joint venture. It can also have more or less strategic implications on firms’ overall competitiveness in the marketplace. A strategic alliance links specific parts of the businesses of two or more firms. This linkage forms an exchange partnership that enhances the effectiveness of the competitive strategies of the participating firms by providing mutually beneficial trade of technologies, skills, products, or distribution channels. Strategic alliances tend to be long-term with high risk but potential for a “big win”. In contrast, a tactical
alliance allows the partners to expand the operation incrementally by closing a technology gap, filling in a product hole, bundling products as a way to increase sales, etc.

Not only have firms used alliances for decades, but researchers in academia have also studied alliances extensively. Excellent research articles and books on alliances, covering topics such as alliance logic, partner selection, formation, process and governance, effect on performance, etc. can be found in the references at the end of this thesis.

For this study, I created a list of the major alliances formed in the enterprise storage industry from 1995 to 1999 involving the six major players in the industry: IBM, Hewlett-Packard, Sun Microsystems, Dell, Compaq, and EMC. My aim was to understand the driving forces behind alliances in this highly competitive arena, the linkages between the alliances and the partner firms’ business strategies, and the impact of the alliance on the firms’ overall competitiveness.
II. ENTERPRISE STORAGE INDUSTRY OVERVIEW

2.1 STORAGE DEVICES

Most enterprise computing networks consist of four parts: servers, storage devices, client side computers, and peripherals. These networks often combine several local area networks that are dispersed in many geographical locations. The Internet has enabled enterprises to establish this type of wide area network easily and at low cost.

Storage is an important need within a network. Storage devices need to store massive amounts of data that may be required by the business in a fast, efficient, and secure manner. Such devices are generally attached to servers, or to a Storage Area Network (SAN), a new storage architecture/technology. Data stored in a storage device that is attached to SAN architecture can be accessed by all servers or storage devices within the network.

There are several types of storage devices: optical, tape, disk, etc. In this study I focus only on storage systems that employ rigid media disk drives, as this has been the primary medium for enterprise storage devices.

Storage devices can be broken down by platforms, much like servers. Several years ago, enterprise storage devices were dominated by closed operating systems, and the devices were typically attached to proprietary mainframes such as IBM AS/400 or S/390. As open operating systems became more favored by the market, Unix and Windows NT have risen to the top as the two most popular platforms, accounting for 58% of storage sales in 1998. The market share of Unix and Window NT continues to grow while that of the closed operating
systems keeps falling. It is predicted that Window NT will become robust enough to dominate the market by 2002. Figure 3 shows revenues for storage systems by operating system since 1994.

![Worldwide Storage Systems Revenue by Operating System](image)

Source: IDC 1998, report 16903

**Figure 3. Worldwide Storage Systems Revenue by Operating System**

Storage products can be further segmented into entry-level storage, mid-range storage, and high-end storage. Products at the high end of the market, priced at or above $250,000, accounted for about 33% of the 1999 sales figure. The mid-range products, ranging from $25,000 to $250,000, accounted for 37%, and the low-end market under $25,000 accounted for the remaining 30%. [Red Herring, March 2000]

Storage devices have come a long way. Ten years ago, these devices were considered simply dumb peripherals. There was little or no processing power built into them, thus they had little intelligence to sort, move, and protect data. The picture changed when EMC
introduced a revolutionary product called Symmetrix, a mainframe storage device that has CPU chips and software intelligence.

Technology has so far kept up the pace with the data explosion. Not long ago, the standard unit of measurement for a computer disk drive was megabytes. Today we talk in gigabytes. It isn’t hard to see that storage units will soon move into the trillions of bytes, or terabytes. Simultaneously, the price per megabyte has fallen steadily, from $1.04 per megabyte in 1995 to $0.20 per megabyte in 1999. Figure 4 shows the microeconomics of the megabyte.

![Megabyte Microeconomics](image)

Source: Red Herring, March 2000

**Figure 4. Storage Megabyte Microeconomics**
2.2 KEY COMPETITORS

According to De la Motte (1999), the key competitors in 1998 were known as the "Big Six" storage vendors. These companies were Compaq (combined with Digital and Tandem by acquisition), EMC, Hewlett-Packard, Hitachi Data Systems, IBM, and Sun Microsystems. Dell entered the storage business in 1998 and quickly grew to become the seventh player in the arena.

Each of these vendors has positioned itself differently in its coverage of storage products. Figure 5 summarizes the vendors' positioning in the storage market. EMC is clearly the market leader at the high end, competing with IBM, Hitachi and Sun (HP resells Hitachi's high-end products, but this is excluded from the figure). The key competitors in the entry-level and mid-range markets include IBM, Hitachi, Sun, and Compaq for the mid-range, and IBM, Compaq, Dell and HP for the entry-level. Vendors all claim they offer a full range of products for marketing purpose. We see a trend where high-end vendors are moving down the range and low-end vendors are moving up.

Not only do the vendors take different positions, but their strengths and weaknesses in the storage business are also unique. This is reflected in different competing strategies. For example, EMC is the only "pure" player in the Big Six. This has enabled the company to focus entirely on storage product and technologies right from the beginning. Back in 1995, EMC took away market share from IBM at the high end with its high-value product and leading technology. To overcome the weakness of not having an installed (servers) customer base like the other players do, EMC has fought vigorously to develop a strong sales force and channel relationships, provide world-class service, and to forge strategic partnerships in order
to speedily penetrate the market. Dell is a latecomer to the market, entering the business by absorbing technologies from Data General’s CLARiiON Fibre Channel RAID in 1998. Although Dell does not lead in technology (and it has no intention to do so), its margin-cutting strategy is one that others will need to mimic.

Storage used to function in the shadow of business operations but not any more. Companies like Yahoo and MSNBC know that storage capacity is critical to ensure that the largest possible audience can access their content and services. Meanwhile, companies worldwide are doubling their storage requirements every year.

The pie has grown favorably for storage vendors, but at the same time competition has also heated up. Companies like Compaq and Sun are more aggressive than in the past. Whereas in years past storage vendors benefited from fat margins, today those premiums are
under attack, with new players like Dell Computer entering the market and the technology becoming easier to set up and use. What's still missing are standards that make the products work together across a network. Even though companies like EMC may not wish to have such network standards in order to prevent commodification from coming too soon, they cannot push back customers who understand the benefit of Storage Area Networks. Some vendors try to introduce a standard of their own and hope the market will adopt it. EMC and Sun are not the only ones fighting over network standards.

In October 1998, a survey by Salomon Smith Barney of 400 CIOs was made to determine their perceptions of storage vendors in the marketplace. A major question in the survey was: "Which three storage hardware vendors would you rank in your list of the top 3?" The results are shown in Figure 6. To further compare performance, Figure 7 shows each vendor's storage systems revenue and growth.

![% of CIOs Mentioning Vendors in Their List of "Top" 3](chart)

Source: Salomon Smith Barney, 11/19/98.

**Figure 6. Percent of CIOs Mentioning Vendors**
2.3 STORAGE TECHNOLOGIES

Users today want a storage system that can store unlimited amounts of data, protect it so that even when the system crashes the data will not disappear, and move it anywhere quickly. They want a storage system that never goes down, and they want the system to be intelligent enough to automate management tasks for storage like IT professionals do today by hand.

Storage technologies have improved along all of those lines. The magnetic disk-drive technology continues to exceed the expectations. The capacity of a disk drive has now reached 50 gigabytes, and soon we will see 100 gigabytes. Data storage structures changed
radically when RAID (Redundant Array Independent Disks) technology was introduced in the late 1980s. A RAID array is a collection of drives that act collectively as a single storage system, can tolerate drive failure without losing data, and yet each drive can operate independently of the others.

SCSI (Small Computer System Interface) became obsolete when fibre channel was introduced as the next-generation storage interconnect technology in late 1990s. Fibre channel is faster than SCSI. It can span distances of hundreds of feet, allowing a server to be in a completely different room, floor, or even building than its external storage system. It runs at speeds of 100 Mbps or more, and allows many devices, whether servers, storage systems, or management consoles to communicate simultaneously over the same optical fibre.

Storage Area Networks (SANs) evolved out of a simple concept: sharing access to disk-based storage. Instead of having one server connected to an external storage box, now there are multiple servers on the enterprise network connected to a storage area network that consists of a number of storage devices. Users can share the data on the storage area network simultaneously. Network Attached Storage (NAS) is another valuable new architecture thanks to technology developments like thin-servers. NAS runs faster than traditional storage devices, plugs into the network, and can configure itself by finding the network server and identifying itself as a storage device. It is a dedicated file-server that resides on a Local Area Network (LAN) and can feed data to multiple users simultaneously. NAS costs less to manage and maintain than SAN.

Software is a critical component of the enterprise storage system. Burgeoning enterprise data stores, combined with increased demands that data be more accessible to
users, are leading to more centralized management of the corporate data. More data storage requires increasing management tasks, and automation is the answer to this troublesome problem. Storage management software can provide the solutions to these problems. Many software vendors are pursuing the opportunities along side with the storage system manufactures, but no complete solutions have yet been developed, and the biggest issue involves standards.

2.4 KEY CHARACTERISTICS

It is important to understand the key features that corporate IT managers look for in selecting storage vendors.

_interoperability_

Storage is an integral part of the corporate computing and data systems. Storage devices need to talk and work with other devices to which they are connected. Before SANs were implemented, storage devices only needed to work with the servers to which they are attached. With SAN, storage devices now need to work with heterogeneous components within the network, such as host bus adapters, hubs, switches, routers, servers and other storage devices. Interoperability is a critical issue for IT managers, both from hardware and software standpoints. The need to make data accessible to everyone in the organization means that storage vendors must offer products that can operate in a heterogeneous environment.
Interoperability includes the ability to operate on various platforms as well as the ability to work with servers or storage devices from different vendors. Large corporations tend to have one or a few strategic vendors on whom they rely for end-to-end solutions. However, that does not mean they do not sometimes mix and match systems from different vendors. They do, looking for the best product and price when interoperability is not an issue. Vendors like IBM and Compaq, who offer a full range of products for end-to-end solutions, used to sell storage systems as add-ons to their own servers, however, now they both are interested in capturing other vendors’ after-market business. For pure storage players like EMC, which does not have captive base customers from a server business, interoperability is even more critical.

**Functionality**

Storage systems are becoming smarter. They used to be considered dumb peripherals with limited functionality. Today they have their own microprocessors that can manage highly effective data access, move, protection, and backup. They also can communicate with each other directly within the storage network, and the server does not have to act as an intermediary. Functionality is something that differentiates an excellent storage product from an average product. Until storage becomes a true commodity, this will continue to be a key feature for IT managers. In fact, EMC’s success is largely dependent on the company’s commitment to offering the most functional products.
Availability

The demands placed on storage systems by mission-critical applications leave no room for error, especially when an Internet business's survival depends on the availability of data every hour of every day of the year. Without reliable storage, they could end up like eBay – the on-line auction site that was forced off-line several times last year, ultimately costing it millions of dollars. IT managers won't trade availability for anything. Vendors get the message, and they try hard to improve their systems to produce the best-ever reliability. Hewlett-Packard's 5nines:5minutes (99.999% availability, less than 5 minutes down time per event) alliance came about in response to the level of availability demanded by enterprises.

Scalability

Most enterprises add significant amounts of storage every year. Global 2000 companies are doubling their storage requirements every year. No one wants to spend several hundred thousand dollars for a piece of hardware that could quickly become obsolete. Scalability is required so the systems that can handle ever-growing needs for data and complex applications.

Price

Price as always is an important factor in corporate purchasing decision, especially when everything else is relatively equal. While vendors like EMC have enjoyed higher than average margins because of better performance, as storage systems are moving toward becoming commodities, price is becoming a key competitive weapon. Dell entered the storage business in 1998 with the clear intention of replicating the low-cost business and
distribution models that have made it the leading computer vendor in the country. Dell had little trouble acquiring and integrating the technologies that are necessary to compete as a top-notch storage vendor. The company's ability to quickly copy the technologies and turn them into low-cost products has significantly added to the competition along the price dimension.

Service

A total solution includes not only products but also service on an ongoing basis. The complexity of the systems, with possible mix-and-match products from different vendors, combined with the fact that most enterprises' IT infrastructures are global, pose a great challenge for vendors in meeting the tough demands of service. The ability in providing quality service whenever, wherever needed is highly important to IT managers.
III. ALLIANCES IN THE STORAGE INDUSTRY

As a result of an extensive search, primarily in the Dow Jones Database and each storage vendor’s Website, a comprehensive list was compiled of the storage-related alliances (all types) that occurred from 1995 to 1999 for the six firms studied in this thesis. The list of alliances can be found in Appendices at the end of this thesis. I also interviewed several industry insiders and storage market analysts to gain a deeper understanding of the nature of these alliances.

3.1 NUMBER OF ALLIANCES

![Total Number of Alliances for the 6 Firms]

<table>
<thead>
<tr>
<th>Year</th>
<th>HP</th>
<th>Compaq</th>
<th>Sun</th>
<th>Dell</th>
<th>EMC</th>
<th>IBM</th>
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<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
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<tr>
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<td>1</td>
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</tr>
<tr>
<td>1998</td>
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<td>1999</td>
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<td>3</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: author

Figure 8. Number of Alliances for the Six Firms
There has been an increasing number of alliances in the recently years. Figure 8 shows the total number of alliances (storage-related only) for the six firms studied. One can find that the trend of increasing number of alliances stands true for most individual firms.

It is not difficult to see why the storage business has become so attractive to many computer makers in the past few years. The demand for storage has exploded, profit margins is hefty, and offering the most advanced storage products is critical to a vendor's reputation as a full-solution vendor. During 1998 several companies made bold moves in an attempt to establish a clear focus on the storage business. Dell made its first offering of fibre channel storage systems based on Data General Corp's RAID technology in 1998. Dell's move into the enterprise storage business closed the gap on some of the performance issues that had kept Dell from competing at the high end of the corporate computer market. Sun Microsystems demonstrated its seriousness about storage when it established a separate storage business unit in 1998. Compaq announced its effort to move more heavily into the non-captive storage business also in 1998.

The total number of alliances for the six firms and total revenues of the storage market from 1995 to 1999 are plotted in Figure 9. One may speculate that the increase in the number of alliances was a direct result of the rapid growth of the storage market. Although we have limited data to prove the hypothesis, the speculation appears to be reasonable considering the following logic:
Figure 9. Total Number of Alliances vs. Worldwide Storage Market Revenue

1. The growth of the market has attracted new players. It also stimulated a focus on the storage business within many existing players. Alliances are often seen at times when changes occur in the industry structure.

2. Frequent technological changes are expected before an industry matures. Major efforts in new product development impose the need for alliances.

3.2 FORCES FOR ALLIANCES

After analyzing the rationale behind each alliance, I found there were generally six major reasons driving the decision to seek an alliance. These reasons are called the "six forces for alliances".
1) **Technology Transfer through OEM**

Most of the alliances in this category were formed as a component OEM or technology licensing agreement. Alliances in this category represent 17% of the alliances in total.

Michael Ruettgers, president and CEO of EMC, draws an analogy between a Patriot missile system and a storage system, and he uses the words *complexity* and *reliability*. His analogy describes the breadth and depth of advanced storage technologies. It is difficult for any vendor to try to develop all the technologies in-house, nor is it necessary when certain technologies can be acquired from the market.

Speed to market is critical in a marketplace where rapid technological changes take place. Technology leaders like IBM and EMC spend heavily in R&D, but none of them has attempted to become a fully vertical-integrated storage vendor. Instead, they focus on certain areas where they have the most competitive advantage. EMC has the best software technology in the marketplace. It buys the most advanced hard disk drives from IBM, through a 1999 OEM deal in which EMC and IBM entered a five-year, $3 billion alliance. A similar deal was made between Dell and IBM also in 1999. The rationale for the hard disk drive OEM deals was IBM’s decision that instead of keeping the disk drive technology to itself and trying to sell more IBM storage systems, IBM would be better off selling the hard disk drives to competitors and making the most out of their investment in the disk drive technology.

Storage vendors differ in core capabilities and thus have unique competitive strategies. Dell’s core competence lies in its efficient business and direct-sale model,
therefore Dell does not focus on technology development. It tends to wait until customers settle on a specific technology, then almost overnight develop a product with many of the most recent technologies already incorporated. Dell relies heavily on partnerships with companies performing R&D, such as IBM and Data General (acquired by EMC in 1999). Dell still invests in technology, but much of the investment is focused on integrating the latest technologies rather than developing new technologies.

2) Joint R&D

Developing best-in-class products requires expertise in many areas, such as technology, product, functionality, customer knowledge, etc. Alliances for the purpose of R&D collaboration usually result in better-integrated solutions in the storage market. Storage vendors benefit from this type of alliance by gaining speed to market.

The 5nines:5minutes Alliance led by Hewlett-Packard is an example of such collaboration. The alliance included industry leaders – HP, Cisco, EMC, Oracle, SAP, and BEA – each of whom developed and delivered products that became the integral parts of an end-to-end customer solution. By implementing the 5nines:5minutes Alliance end-to-end solutions, customers benefit from a highly available, secure and scalable infrastructure, while at the same time maintaining the flexibility of an open system.

StorageTek and Compaq formed an alliance in April 1998 to work jointly on advanced R&D projects that would enhance the capabilities of emerging Storage Networks for Window NT enterprise computing. This effort combined StorageTek's strong perspective on the levels of performance, availability, and reliability that enterprise customers demanded,
and Compaq's expertise in open, industry-standard storage systems. The agreement allows both companies to co-market the resulting new products or technologies.

3) **Software/Hardware Validation**

One of the key issues IT managers consider in selecting a storage vendor is whether the devices have demonstrated the ability to work with the systems they have implemented or plan to implement. In order to demonstrate this capability, vendors tend to form alliances to jointly validate the integration of the products. Most of the alliances in this category involve storage hardware vendors forming alliances with software vendors.

There are two major types of software that the storage vendors focus on in validating integration with their own products. One type is the storage management software, a critical component in the enterprise storage system. Storage devices all come with basic level management software, but a great deal of additional management software is provided by the third-party vendors who specialize in storage management software. The other type of software is enterprise resource planning applications, such as SAP R/3, Informix database application, or Oracle e-business solutions.

IT managers will not risk buying a piece of hardware that may not work with their application software. They demand solid demonstration of seamless integration before they make a buying decision. Vendors all understand the rule of the game. It is for this reason that many alliances (35%) fall into this category. For example, Compaq and SAP had a strong alliance for certifying SAP R/3 for StorageWorks Enterprise Storage Array 12000, RAID Array 8000, Data Replication Manager, and Secure Path for Window NT and Compaq Proliant servers.
Same logic is true for hardware compatibility issue. Vendors who want to sell storage devices to non-captive customers, i.e., customers who bought servers from competitors, must demonstrate their hardware compatibility to potential buyers. For pure storage players like EMC, hardware compatibility is extremely important. EMC had an alliance with Bull in designing a storage system that was intended to work with Bull mainframe computers.

4) Standards

Standards allow users to enjoy the benefit of mix-and-match products from different vendors without worrying about interoperability. Unfortunately, vendors compete on standards in favor of their own market share. Some vendors pursue single-vendor standards, like Sun did with StoreX for storage management software, while others form alliances in pursuing vendor-partnership solutions.

SANs provide clear benefits in sharing data among the users across an enterprise. Currently, however, SANs work well only if the enterprises buy the network from a single vendor. One of the major factors holding up delivery of SAN management software—as with so many things in the IT industry—is the slow development of standards.

There are multiple standards bodies in the storage and fibre channel world. For example, in February 1999, EMC formed the Fibre Alliance, an organization of 12 companies for the purpose of creating the means of managing a heterogeneous fibre channel storage area network. The goal of the alliance is to develop and implement universally recognized methods to simplify the management of heterogeneous fibre channel-based networks of storage systems and services.
5) **Service**

Service is a key component of a product package. Despite the claims of many vendors, no hardware or software products are fail-proof. Even the best technologies can stumble: hardware goes down and software crashes. Customers are becoming increasingly demanding when it comes to service capability and availability. This is because more and more IT functions are considered mission critical (Internet is by nature 24x7). In addition, enterprise IT environment is becoming more and more global.

Providing satisfactory service is no easy task. Not all vendors have a strong service force that can match tough customer demands. On the other hand, enterprises prefer to rely on one service provider who can take care of all their problems, regardless who the manufacturers are.

Those vendors who lack service capability can outsource this function. IBM Global Services is the one that attracts many vendors who seek partnerships for service alliances. For example, Dell signed a multibillion-dollar agreement with IBM in 1999 in which IBM will install and maintain Dell equipment for government agencies, schools, and major corporate accounts. The alliance was valued at $6 billion for seven years. The agreement helped Dell move up the computer industry's "food chain", and brought IBM significant additional revenue. It seems to make sense; IBM has developed a world-class service force, so why not lend help to others to make full use of it while realizing additional profit?

6) **Marketing and Distribution**

In a disintegrated industrial value chain, such as the one for the storage industry, vendors from different parts of the chain sometimes form marketing alliances for the purpose
of jointly promoting or distributing products. For example, Sun Microsystems and Solarcom Inc., a leading independent business consulting, system integration, and financing solution company, announced a marketing and sales alliance in August 1999. Under the agreement Solarcom would create a Sun Microsystems Business Unit that is dedicated to providing value-added services, including consulting, design, implementation and technical support for Sun Microsystems products.

Reselling a competitor's product is not unusual in the storage business. I have already discussed how each vendor is positioned in the storage product range. Few vendors cover the entire range of the products. Reselling competitors' products is one way to fill out the product line, although one wonders whether such reliance on outsiders could last forever.

EMC and HP signed an agreement in 1995 under which HP resells EMC's high-end storage devices - Symmetrix, along with its own servers. EMC scooped up billions of dollars of revenue each year from HP's reselling of its product, and the deal helped EMC to penetrate into big corporate customers in the early days. The resale agreement was terminated in 1999 when HP teamed up with Hitachi for the high-end product.

Coding the Data

Based on the above discussion about the six forces for alliances, the following criteria were followed when coding the data that appears in the Appendices.

Technology Transfer through OEM

Source component or technology from outside through OEM or licensing agreements.

Joint R&D
Working jointly on new technology or new product development, the result can be a single product that benefits all parties directly or indirectly, or multiple products with specific products owned by specific parties.

**Software/Hardware Validation**

Working together to integrate existing products or improve products so they can be better integrated. Alliances with ERP vendors or storage software vendors are all considered to fall into this category.

**Standard**

Focused on establishing networking standards

**Service**

Outsourced service contract or service function integration to achieve improved customer satisfaction.

**Marketing and Distribution**

Product reselling, bundling, joint marketing and sales, establishing new channels.

Each of the alliances in the Appendices was coded using these criteria with regard to the six forces, and the resulting category was noted at the end of the description of each alliance in the Appendices.

The following two Figures (Figure 10, 11) provide demographic information about the alliances.
Figure 10. Number of Alliances in Types

Figure 11. Number of Alliances vs. Time for Each Type
Working jointly on new technology or new product development, the result can be a single product that benefits all parties directly or indirectly, or multiple products with specific products owned by specific parties.

Software/Hardware Validation

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The following two Figures (Figure 10, 11) provide demographic information about the alliances.
3.3 LEVEL OF ALLIANCES

Alliances, in some cases, aim to support the firms' near-term operations; in other cases they represent a long-term strategy. Alliances that were set for the same goals can also have more or less actual impact. To evaluate the effectiveness of an alliance, we use the term *level of alliance* to distinguish the alliances in the storage industry.

Two dimensions were used in determining the level of alliances:

- **Strategic or Tactical importance**
- **Amount of effort expended**

A strategic alliance serves the following purposes:

1. Entry into a new industry
2. Growth and/or diversification
3. Survival of the primary business

A tactical alliance improves the performance of the current business in the following ways:

1. Fills out a product line
2. Closes a technology gap
3. Opens new geographic market(s) with incremental sales

Measuring the amount of effort involved in implementing an alliance is subjective. However, one can be guided by the extremes in making such a judgment. For example, some vendors have long-term OEM relationships that involve frequent exchanges of information.
over multiple years. Another example is that when EMC forms an alliance with a hardware or software partner, it usually sets up a new lab and assigns a dedicated team of engineers to work specifically on the alliance for a period of time. Such a level of effort is considered to be at the high extreme. On the other hand, there have been some alliances that were merely announcements, with nothing happening afterward. These alliances are at the low extreme.

I divided the alliances in the storage business into three levels, from the point of view of the major storage systems company. The following framework was established to help determine the level of alliance.

<table>
<thead>
<tr>
<th>Amount of Effort Expended</th>
<th>High</th>
<th>Level 2</th>
<th>Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Level 3</td>
<td>Level 2</td>
<td></td>
</tr>
<tr>
<td>Tactical</td>
<td>Strategic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 12. Level of Alliance Framework**

Alliances at Level One have a deep impact on the firms' strategic positioning. This type of alliance has clear goals that help the firms obtain long-term competitive advantage. Such alliances involve deliberate planning and deep commitment of information exchange and mutual responsibility between the partners. They tend to last for a number of years.
Hewlett-Packard's alliance with Hitachi Data System is an example of a Level One alliance. HP relies on external sources for high-end enterprise storage systems. When HP broke away from EMC in May 1999, ending a four-year reselling agreement, it teamed up with Hitachi Data Systems as the source for its high-end storage product line. Through the alliance, HP gets access to Hitachi's excellent high-end storage technology. On the other hand, Hitachi benefits through the opportunity to break into the North American market.

Alliances at Level Two result in incremental change. They are stimulated by immediate operational needs rather than long-term strategic needs. Most are marketing tactics, and the resulting benefits are not sustainable. For example, Sun and Veritas Software announced an alliance in October 1998 after reaching a sales and marketing agreement to jointly deliver convenient purchasing options and integrated solutions for enterprise customers. The resulting product out of the alliance enabled customers to build storage networks with interchangeable building-block components, and therefore made Sun's storage products more favorable, all else being equal.

Level Three alliances refer to pure opportunistic alliances. They are not linked to business objectives, or there may be a benefit but the uncertainties are high. Usually there are minimal or no actions taken after the alliance is announced.

My initial attempt was to code all the alliances included in this study based on the six forces and three levels. The following matrix illustrates the two-dimensional coding concept. Each alliance event fits in one of the shaded rectangles in the matrix.
<table>
<thead>
<tr>
<th>Level</th>
<th>OEM/Licensing Agreement</th>
<th>Joint R&amp;D</th>
<th>Hardware/Software Validation</th>
<th>Standards</th>
<th>Service</th>
<th>Marketing and Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 13. Coding of Alliances Matrix

Coding the Data – LEVELS

I have already explained the criteria for and the results of coding the alliances based on the six alliance forces. I also wanted to code the data with regard to level, but unfortunately I was not able to do this owing to a lack of sufficient information. In order to code the data by level accurately, press releases alone were inadequate sources. Instead, I needed to get the inside stories from the companies. The best way to do this was to send out a survey and have the companies code the data themselves with criteria that I provided, or to use knowledgeable industry experts. However, since many of the alliances are still ongoing, most firms were reluctant to release information at this level of detail, as in most cases the information is treated as business secrets.

Thus, I hope the framework established here is useful, and the coding can be completed at a later time when all the alliances have reached an end point and the necessary information is available to public.
The following 2x2 matrix is a simple representation of vendor comparison from the perspective of the degree of involvement in alliances.

![Figure 14. Vendor Comparison – Degree of Involvement in Alliances](image)

The horizontal axis is the normalized total number of alliances for a given firm in a specified time period:

\[ X(I) = \frac{N(I)}{N_{\text{max}}} \]

where, \( N(I) \) is the total number of alliances for Firm I in a given time period, and \( N_{\text{max}} \) is the maximum among \( N(J) \), \( J \) being any firm included in the study.
The vertical axis is the average level of alliances for a given firm in a specified time period:

\[ Y(I) = \sum L(I, x) / N(I), \quad x = 1, 2, 3, \ldots N(I) \]

where, \( L(I, x) \) is the level of alliance \( x \) for firm \( I \).

Unfortunately, I am unable to present each of the studied firms in the 2x2 matrix due to the difficulties encountered in trying to code the level of alliances. Nevertheless, the methodology is worth mentioning. Further, I recommend that the two variables, \( X(I) \) and \( Y(I) \), be used as independent variables for any future statistical analyses of alliances.
4. VENDOR OBSERVATIONS

This chapter presents the author’s review of each of the major vendors, based upon observations made through the thesis data gathering.

4.1 EMC

EMC began at the mainframe end of the storage business. It had 44% of market share in the mainframe storage business in 1998. EMC then proceeded to enter the Unix market and recently the NT market as well. EMC is 100% focused on storage products.

EMC is the company most CIOs think of when they think of storage. It has a strong reputation for being a technology leader that provides best-in-class quality and service. It is also well-known for its aggressive sales and marketing. It has been said that EMC has become the IBM of the 1990s, and nobody ever got fired for buying EMC.

EMC’s great success started in the early 1990s with the birth of its revolutionary product, Symmetrix. This also defined a turning point for the company, because it introduced a significant new value proposition to mainframe storage. As was mentioned earlier, storage devices used to be considered dumb peripherals. They were attached to mainframe computers and could do nothing more than take in and put out data, with no processing. Symmetrix changed all that. By adding processing chips to the storage devices, and thus creating data management and protection functionalities within the storage devices, EMC introduced a new generation of storage systems that not only provide space but also have a brain. Symmetrix and the series of storage products thereafter from EMC were so successful that they took over the leading market share from IBM in the mid-1990s.
EMC is not in the mainframe computer business. In order for the company to design a product that ultimately needed to be compatible with the mainframe computers, such as the IBM AS/400, EMC bought and installed the mainframes in their own lab and brought in engineering personnel to perform reverse engineering. This is one way—the hard way—to find a solution for design compatibility. Later on, EMC learned to do it easier by forming alliances with the mainframe manufacturers, for example, Bull.

As EMC attempted to penetrate the open system market, it had to deal with software and hardware compatibility issues with a long list of vendors. Alliances became critical to product design, enabling the company to move quickly to capture emerging market opportunities. Figure 15 shows the number of alliances for EMC from 1995 to 1999. It is clear that the number has increased dramatically in the past two years, the time period during which demand surged to new levels, especially in the NT and UNIX markets, and competition became even fiercer. Figure 16 shows the number of alliances in each type in the five-year period. It is not surprising that 59% of the alliances were for product integration.

![EMC Alliances - Number of Alliances](chart)

Source: author

**Figure 15. Number of EMC Alliances, 1995-1999**
There is no doubt that the alliances have played an important role in EMC's success. The company has done a good job of leveraging alliances; it has the highest number of alliances among the six firms studied.

In 1996, EMC announced a new focus on strategic alliances to leverage its product and market leadership and accelerate growth in the open systems storage market. Neal Waddington was appointed Senior VP of Enterprise Alliances, responsible for driving EMC's relationship with other industry-leading companies to leverage the penetration of EMC's intelligent storage solutions into the market.

EMC is deeply committed to product excellence and customer satisfaction. This is reflected in the way the company carries out alliances. In most cases, the company assigns significant resources—including lab, equipment, and people—to work on extensive testing
and product integration after the alliances are formed. Most of EMC's alliances are at the first level.

Although EMC has a strong advantage because of its product excellence, it also has the disadvantage of no captive customers (e.g., Compaq server customers are captive customers for Compaq's storage units). As the company moved into the NT and UNIX markets, that disadvantage became even more obvious. This is probably why EMC has such an aggressive sales force. EMC also seems to have used alliances to overcome this disadvantage. The data show that 21% of EMC's alliances were formed for marketing and distribution purposes.

EMC has also been an active participant in the joint R&D and standards creation within the industry. The 1999 Fibre Alliance was led by EMC. EMC was closely involved with the HP's 5nines:5minutes Alliance. EMC was selected by HP because of its leading role in the storage industry.

4.2 DELL COMPUTER

Dell is well-known for its ability to plot a course and execute it so quickly that it leaves the competition reeling. They did this with PCs, then workstations and servers, and later with storage devices. Dell's core competencies are its direct sales model, efficient operations, and incredible focus.

Dell entered the storage market only in 1998, but it approached nearly one billion dollars in storage sales by the end of 1998. Although Dell's main focus in the storage market
is on the NT platform, the fact that NT is becoming more and more accepted as a mission-
critical operating system will help carry Dell into the high-end segment of the enterprise IT
environment. Dell’s success in storage has improved its image as a company whose product
line can support the enterprise at every level.

Dell is not a company focused on technological development in the typical sense of
the word. Dell invests in technology, but the investment is more toward integration of
technologies as opposed to invention of new technologies. One can also observe the same
theme in Dell’s hiring of engineers: Dell likes to hire generalists rather than specialists.

While companies like EMC and IBM try to be the first to introduce new technologies
to the market, Dell tends to wait until customers begin demanding a specific technology, then
almost overnight the company develops a product with many of the most recent technologies
already incorporated.

How does Dell do this? Dell relies heavily on partnerships with companies that
perform R&D, such as Data General, NetApp, or Adaptec. By combining the technology
acquired through alliances with its own ability to be a fast follower, Dell is able to minimize
R&D dollars spent on risky technologies, and take full advantage of its incredibly efficient
systems. So far Dell has had no difficulties in acquiring technologies through partnerships.
However, as it struggles to move up into more and more critical functions in the enterprise,
Dell’s products will begin to overlap with those made by technology leaders, such as EMC.
Success will depend upon the market’s choice of cost-focus or technology-focus.

Most of Dell’s alliances (40%) are aimed at acquiring technologies through OEM
deals. It had four major OEM deals within the past two years in the storage business. Dell
formed an alliance with Data General to obtain the advanced Fibre Channel RAID
technology in 1998—a significant step that resulted in the creation of the PowerVault product line which enabled Dell to enter the storage market. Dell’s 1999 OEM deal with IBM in hard disk drives assured the company access to the most advanced technology in disk drives. In addition, Dell also had OEM deals with Network Appliance and Brocade Communication Systems for the “filer” technology and the fibre channel fabric switch.

Like other players, Dell needs to validate the integration of its products to many ERP and storage management software, and it uses alliance to achieve the purpose. Another 40% of the alliances were related to product integration.

The other unique characteristic about Dell is that it offers service and support through alliances with independent third parties. The remaining 20% of the alliances were all service-related. For example, Dell had an alliance with IBM in 1999 for service contracts. Under the agreement, IBM installs and maintains Dell equipment for government agencies, schools, and major corporate accounts. So far Dell has done well with the service outsourcing method, however, it may not be a wise choice in the long run since Dell has basically given away to its competitors the opportunity to hear the customers’ voices.

Figure 17 shows Dell’s alliances in 1998 and 1999. Figure 18 shows the number of alliances in each type in the five-year period.
Source: author

Figure 17. Number of Dell Alliances, 1995–1999

Source: author

Figure 18. Dell Alliances, by Types
4.3 COMPAQ COMPUTER

IDC placed Compaq as the largest storage system supplier for 1998, with revenue of $5.5 billion [IDC Report 16903, 1998]. Compaq has built its reputation on its ability to deliver a full suite of products from entry-level to high-end. The majority of the company's storage system revenue is from its captive audience, either as add-ons to its sales of Compaq servers or as upgrades for Compaq servers. In 1998 Compaq announced it would make greater efforts to build its customer base to include more from the non-captive realm.

Compaq has focused its efforts primarily on technological development of functional features, and the company claims to be concentrating more on storage software rather than on the hardware side. The company has a reputation for innovative technology in the NT/Unix market. However, compared to its competitors, Compaq has devoted less effort on interoperability. Vendors who can make products that work in more heterogeneous environments have a definite sales advantage, especially when they want to move beyond the captive-customer market. Compaq needs to bring itself up to date on the whole issue of interoperability if it is really serious about moving toward more non-captive customers.

Compaq has a broad distribution channel that could prove useful in selling complex products like storage, where different channels are a requirement in order to appeal to a majority of the market. Compaq added a 150-person storage-specific sales force to assist the company's direct and indirect channels. Compaq also has a strong service organization.

Figure 19 shows the number of storage-related alliances Compaq had from 1995 to 1999. Compaq was number one in storage sales in 1998 ($5.5 billion). It had only three
alliances that year, while EMC had $3 billion in sales but nine alliances in 1998. Figure 20 shows the number of alliances in each type in the five-year period.

**Figure 19. Number of Compaq Alliances, 1995-1999**

**Figure 20. Compaq Alliances, by Types**
Software validation or product integration counted for two-thirds of Compaq’s alliances. This is consistent with Compaq’s claim of technological focus in storage software. Here software included products developed in-house as well as products offered by other software vendors. Compaq had alliances with many leading storage management software vendors such as Computer Associates, Seagate Software, and Veritas. Compaq also had a close relationship with SAP, a leading ERP vendor, through an alliance.

Joint R&D accounted for 22% of Compaq’s total alliances. The company’s success in the desktop and server businesses probably made it the most wanted partner when it comes to Window NT computing technology and customer knowledge. StorageTek teamed up with Compaq to develop enhanced capabilities for the emerging Networks for Windows NT enterprise computing. HP chose to collaborate with Compaq to increase performance and interoperability in its next-generation fibre channel solutions.

Unlike Dell which often accesses external technologies through alliances, Compaq tends to do so by acquisitions. Compaq acquired high-availability server supplier Tandem as well as Digital Equipment Corporation in the late 1990s. Dell has successfully benefited from those kinds of alliances considering that a non-technology-focused company is able to compete with technology-focused companies even on the product performance dimension. On the other hand, Compaq has struggled to digest the acquired companies for reasons of culture, distractions, integration, etc. This may be a lesson Compaq needs to learn.

Compaq seems to have an opportunity to improve its effective use of alliances to enhance its competitiveness in the storage market. I say this based on my observations that the company has had a low number of alliances compared to other companies, and its use of
alliance has been for narrow purposes, and it could benefit from alliances for other purposes as well.

4.4 SUN MICROSYSTEMS

Sun demonstrated its seriousness about the storage market when it established a separate storage business unit in 1998. Sun limits its coverage to the Unix market, and it owns the highest-selling version of Unix: Solaris. It does well in selling storage to its captive server customers. It also intends to pursue the non-Sun after-market business, but has not demonstrated an effective way to capture the non-captive server customers.

Sun is proud of being a technology innovator and cutting-edge technology leader in the Unix world. Unfortunately, it does not follow anyone, and as a result is poorly positioned to catch the NT wave. Sun has announced NT operability on its StorEdge arrays in 1998, however with their historical focus on Solaris, it is hard to believe they can capture a significant share of the NT market. In a world where open standards are more a given than a choice, Sun suffers from a lack of multi-platform hardware solutions.

Sun's approach to the storage network solution is typical of its solo strategy. While many alliances were formed in the industry among the hardware, software, and network companies to collaborate on standards and R&D, Sun pushed for a hardware technology called Intelligent Storage Network (ISN), a proprietary SAN architecture that is supposed to enable plug-and-play features and ultimate scalability of its own products. So far no other significant competitors has accepted or used ISN or StoreX, a software development kit and
API (application program interface) collection that programmers can use to design storage management software.

It seems Sun's efforts in storage alliances are mostly geared toward marketing and OEM, each counting for one-third in the total number of alliances. Sun had three OEM deals—one with Unisys in 1996 for Open Storage Module implementation, one with Seagate for fibre channel-arbitrated loop disc drives in 1997, and the other with StorageTek for enterprise-tape automation systems in 1999. Sun did form partnerships with many ERP and software vendors, for example, Baan, Oracle, SAP, and Veritas. But most of these alliances were marketing tactics. The purpose of the 1998 alliance with Veritas was to offer convenient purchasing options to customers. The alliances with Baan, Oracle, and SAP in 1998 helped the resellers integrate and deploy customers' ERP applications quickly. While this type of marketing alliance may have helped Sun to sell more products at the time, the amount of increases were probably incremental, and the impact on the firm's long-term performance might be insignificant.

Sun also had two alliances to achieve product integration. In both cases, Sun teamed up with video imaging equipment suppliers (Network Imaging and Tektronix) to integrate Sun's computer and storage products with video hardware equipment. Those alliances seemed to be purely customer-driven, and the impact on sales was probably minimum since the applications were narrow.

Figure 21 shows Sun's total number of storage-related alliances in the past five years. Figure 22 shows the number of alliances in each type in the five-year period.
Figure 21. Number of Sun Alliances, 1995-1999

Figure 22. Sun Alliances, by Types
Most of Sun's alliances seem to be operational rather than strategic. I consider them to be at Level Two or Three. This pattern is linked to the fact that Sun chose to remain a closed standard, in which case alliances are less important.

4.5 IBM

About half of IBM's storage sales come from its captive mainframe business. IBM used to have a virtual stranglehold on market share in the mainframe storage business, until the mid-1990s when EMC took away IBM's dominant share. Today, IBM offers the widest range of products in the entire storage market, from entry-level NT storage devices to high-end mainframe closed system storage devices. IBM's storage sales have declined in both NT and Unix in recent years, despite the fact that the company has a strong reputation for technology innovation and excellent business-to-business direct sales capability. One explanation might be that IBM was not cost-competitive, and it was unable to get internally developed technologies publicly accepted.

IBM's hard disk drives have always been considered the most advanced technology on the market. The dilemma is whether to keep the technology to itself and therefore gain a technological advantage in the storage business, or to sell the disk drives to competitors and make money by selling that component. IBM has chosen the latter strategy. The late-breaking OEM deals with EMC and Dell demonstrated its strategic decision to specialize in the technology and sell it to more efficient vendors rather than try to bring it to market exclusively by itself. These two OEM deals counted for 12% of the total number of alliances for the five-year period.
Not only did IBM have a higher number of alliances, it also had alliances in each of the six categories (six forces). The biggest category is service, where 34% of the alliances (6 events) were formed for service purpose, and five of the six service alliances were done in 1999. IBM has a powerful and well-known global service force, probably the most effective among the computer manufacturers. Those six service alliances basically required IBM to provide worldwide service (including or relating to storage products) to the alliance partners’ customers in exchange for service revenue. For example, in July 1999 Cambex announced IBM’s support for its storage and fibre connectivity products. Cambex customers can use IBM Global Services for on-site support for the company’s Centurion 2000 Disk Arrays and FibreQuik fiber channel adapters.

It makes sense for IBM to cover service for other vendors. From a business standpoint IBM gains a wider range of customer knowledge, and from an economic standpoint IBM can realize better ROI in its service business. On the other hand, customer service has become more critical and demanding, especially for the growing mission-critical applications. In addition, building a world-class service infrastructure takes time and a significant investment, and those who have chosen to rely on IBM’s Global Services seemed to have decided that this is a better alternative.

IBM does not seem to focus on storage software. In fact, I did not see a single alliance formed with storage software vendors, nor was there any effort to partner with ERP application vendors for product validation. This may provide another explanation for the decline of IBM’s market share in both Unix and NT systems.
Figure 23 shows IBM's total number of storage-related alliances in the past five years. Figure 24 shows the number of alliances in each type in the five-year period.

**Figure 23. Number of IBM Alliances, 1995-1999**

**Figure 24. IBM Alliances, by Types**
4.6 HEWLETT PACKARD

HP focuses primarily on Unix. It has had strong growth in storage sales in recent years thanks to sales of its server, which in turn increased the size of its captive storage market. HP has focused its server sales on Internet-enabled applications and databases which should fuel further storage growth for the company, as these applications demand more storage capacity. Like its competitors, HP has in recent years recognized the importance of the storage business, and made some strategic adjustments in order to better capture the storage market opportunities.

HP has a good reputation in the enterprise software market (HP OpenView) and has successfully built a strong presence on the software side of storage, selling over $900M of its RAID software in 1998.

Most of HP’s alliances were strategic rather than operational. HP is not in favor of duplicating the technologies that already exist. Alliances were often used by HP for accessing external technologies and turning them into HP’s competitive advantage. HP has also been successfully in using alliances for pulling together complementary assets in order to create end-to-end solutions for its customers. Although leading a multi-firm collaboration can sometimes be a difficult task, HP has done well, and is dedicated in doing so since customer-focus is in HP’s culture.

For example, HP has been successful in relying on outsiders to provide some of the core technologies it needed in the storage business through alliances. Since 1995, HP has resold EMC’s Symmetrix products along with their own Unix servers, competing with Sun Microsystems which had a similar offering of the product suite. The deal was mutually
beneficial at the time, since EMC needed help to step into the enterprise Unix market. On the other hand, HP not only gained the best technology to fill a gap in its product line, but it also took a cut of the revenue for each Symmetrix system it sold.

The alliance ended in mid-1999 and HP replaced EMC with Hitachi Data Systems (HDS), forming a new alliance for Hitachi’s high-end multi-platform storage system. Hitachi saw the alliance as an opportunity to enter the North America market, something it had been eager to do.

Like IBM and EMC, HP has been active in seeking partnerships and the data show HP had alliances in all six categories. The top three categories are Joint R&D, OEM, and Standard. Most of these alliances seem to have strategic implications and can be considered Level One or Two alliances.

HP had four major joint R&D alliances in the last five years. Its 1995 alliance with Informix and EMC was formed for the Legacy Warehouse Migration Program designed to enable customers with proprietary, large-scale legacy data warehouse systems to easily and cost-effectively migrate to an open environment. In 1997 HP formed a strategic partnership with Compaq to support its entry into the fibre channel host adapter market. In 1998 HP also allied with Crossroads Systems, an industry leader and de facto standard for fibre channel storage routing, designing and executing solutions that enable companies to migrate quickly to fibre channel storage area networks.

HP has demonstrated a strong leadership role in these technology collaborations. The 1999 5nines:5minutes Alliance is a good example. HP began to use availability as a differentiating factor in 1999. From a customer’s standpoint, availability means an end-to-end solution. For instance, imagine your system is down; it makes no difference if the
server, the storage unit, or any part of the system still works. HP went one step further in providing the highest availability systems by creating the 5nines:5minutes alliance with the industry leaders in storage, ERP application, and network equipment to jointly develop and deliver the highest availability end-to-end solution for the Internet age.

Figure 25 shows HP's total number of storage-related alliances in the past five years. Figure 26 shows the number of alliances in each type in the five-year period.

![HP Alliances - Number of Alliances](image)

Source: author

**Figure 25. Number of HP Alliances, 1995–1999**
Source: author

Figure 26. HP Alliances, by Types
V. CONCLUSIONS

Alliances have been increasingly used in the enterprise storage industry in the last five years. In this study I provided a comparative analysis of the six leading storage vendors from the perspective of alliance.

First I conducted an extensive search in databases and compiled a comprehensive list of storage-related alliances that have occurred during the last five years for six major storage vendors, including: EMC, IBM, Hewlett-Packard, Dell Computer, Sun Microsystems, and Compaq Computer.

Rapid changes in the enterprise storage industry seem to have resulted in an increasing number of alliances. First, the demand for storage devices has exploded in recent years. Many companies are beginning to understand how to compete with more and better-processed information. Second, storage devices have evolved from dumb peripherals to intelligent sub-systems. Advances in technology have stimulated many alliances in technology transfer and joint R&D. Third, interoperability became critical for storage devices to work in a heterogeneous storage network environment. The increasing need for standards has pushed for more alliances as well. Fourth, as ERP and storage management software become more widely adopted, storage vendors must demonstrate seamless hardware and software integration to IT managers, and to meet this demand, vendors are cooperating to validate the product integration through alliance.
Six forces driving the alliances in the storage business were identified after a careful study of the data from six firms. These forces are:

- Technology transfer through OEM or licensing agreements
- R&D collaboration
- Product validation / integration
- Standard
- Service
- Marketing and distribution

I observed three levels of alliance in the storage space. The concept of "level of alliance" is useful in analyzing the strategic importance of an alliance. Unfortunately, I was unable to code the data by level because the data are relatively new and the available information was not sufficient to enable accurate or meaningful coding.

Finally, I discussed individually each of the six firms included in this study. The discussions centered the firms’ strategy and competitiveness, their involvement in alliance, the purposes, and effectiveness. Even though most of the firms have used alliances for multiple purposes, some like EMC or Dell seemed to have better focus and execution.
REFERENCES


IDC (1998), "Storage Market Analysis", report 16903
References
(continued)


References (continued)


APPENDICES

ENTERPRISE STORAGE INDUSTRY ALLIANCES

1995 – 1999

COMPANIES

1. IBM
2. EMC CORPORATION
3. DELL COMPUTER
4. SUN MICROSYSTEMS
5. COMPAQ COMPUTER
6. HEWLETT-PACKARD
APPENDIX 1

IBM ALLIANCES
IBM ALLIANCES

11/95

IBM – Arbor Software Corp.
   Business Objects Inc.
   Information Advantage Inc.
   Pilot Software Inc.
   Vality Technology Inc.

As data warehousing grabs attention from users who want to glean business information from disparate data sources, IBM is trumpeting its own solutions by forming integration alliances with key developers. The first cut at an industry alliance has IBM joining forces with Arbor Software Corp., Business Objects Inc., Information Advantage Inc., Pilot Software Inc., and Vality Technology Inc. The company promises more relationships in the future.

Joint R&D

9/95

IBM - Novell

IBM and Novell, a world’s leading network software provider, formed alliance to provide Novell and IBM customers with best-of-breed solutions for connecting NetWare LAN’s and host systems using Systems Network Architecture (SNA). Through this alliance, customers gain access to advanced products and technologies directly from the originators of NetWare, SNA, and the AS/400.

Product integration (software)

6/96

IBM – Storage Technology Corp. (StorageTek)

Two storage rivals announced an unexpected alliance that involves the computer giant reselling the storage supplier’s high-end disk controllers alongside its own. IBM says it needs the StorageTek disk arrays to fill out its already highly successful, market leading Ramac line of mainframe RAID systems. In 1999 IBM announced its own SHARK, re-entered the high-end storage market with vigor and has downplayed its deal with StorageTek.

Distribution (resell)

4/97

IBM – Premenos

Premenos, a leading provider of electronic commerce solutions for established and emerging trading communities, formed a marketing alliance with IBM Global Services to jointly sell and support Premenos PowerDox over the IBM Global Network in US. IBM will offer Premenos PowerDox as an electronic-forms alternative to traditional EDI for its clients and their trading partners.

Distribution (resell)
IBM – CrossRoads Software

CrossRoads Software signed an agreement with IBM to use its new Component Broker technology. This agreement will provide CrossRoads' customers with the ability to incorporate existing enterprise applications into CrossRoads application collaboration solutions. By teaming with IBM, CrossRoads gains the benefit of IBM's expertise in legacy systems, allowing it to focus on its core business. CrossRoads' application collaboration software and IBM's Component Broker Solution complement each other by delivering the infrastructure and the application-to-application connection.

Joint R&D

IBM – HP

Seagate

IBM, HP, and Seagate will work to develop a common computer-data storage format for tape drives used in big companies. The firms hope to offer the format as an alternative to the current array of incompatible technologies in the storage industry. The companies will also jointly develop the next-generation tape technologies that could significantly eliminate the time devoted to daily backup and restore operations.

Standard

IBM – Storage Solution Specialists, Inc. (SSSI)

IBM and SSSI formed an alliance to provide for integrated products which bring IBM's powerful distributed storage management solution ADSTAR Distributed Storage Manager (ADSM) to installed users of Digital Equipment Corp. computing platform. IBM and SSSI plan to work together to pursue solutions to help Digital-platform customers solve specific storage management problems.

Joint R&D.

IBM – Stac

Stac announced the execution of a marketing alliance with IBM to improve access management and disaster protection of critical enterprise data. IBM will jointly market Stac's information recovery software Replica3 for Netware and Windows NT, which can be used with IBM's powerful distributed storage management solution ADSTAR Distributed Storage Manager (ADSM). ADSM customers will find Replica3 is an excellent complement to ADSM for backup and disaster recovery on NT and Netware Servers.

Marketing
IBM – Vicom Systems

IBM Global Services will provide Vicom storage network customers with Call Center support for all equipment on the storage network, regardless of manufacturer. This agreement will be combined with an existing service agreement with IBM to provide on-site repair for Vicom products.

Service

IBM – Compaq
  HP
  Adaptec

Compaq, HP, IBM and Adaptec announced the formation of an open industry alliance to set the direction of Future I/O technology development and implementation. The Future I/O alliance is creating a new input/output standard to maximize data transfer between high-performance servers and peripheral subsystems for the next generation of high-performance systems.

Standard

IBM – Dell

IBM will sell an estimated $16 billion worth of computer parts to Dell Computer during the next seven years. The agreement also involves broad patent cross-licensing. The companies also will jointly develop new technology, which Dell could put in its products and IBM could sell to other customers. The alliance could lead to new products that give Dell a leg up in the market for PCs, network servers and computer storage systems.

OEM

IBM – EMC

EMC and IBM entered a five-year alliance under which EMC will purchase $3 billion in disk drives from IBM. In the future the agreement is likely to include other IBM technologies. EMC’s engineers will cooperate with their counterparts at IBM, sharing technical details on storage technology to ensure IBM parts run smoothly within EMC systems. EMC will also gain access to 30,000 IBM patents. IBM benefits from the agreement not only by selling the components but also by attracting orders for mainframe computers from current EMC customers.

OEM
IBM – OpenTech Systems Inc.

IBM has signed an agreement which permits the use of Tape/Copy for IBM in providing services to its customers. IBM will use Tape/Copy within its Migration Services for Virtual Tape Server to assist data centers in moving existing tape volumes to the Virtual Tape Server (VTS).

Service

7/99

IBM – Cambex

Cambex announces IBM support for its storage and fiber channel connectivity products. Cambex customers can use IBM Global Services to provide on-site support for the company’s Centurion 2000 Disk Arrays and FibreQuik fiber channel adapters.

Service

9/99

IBM - Dell

Dell and IBM signed another multibillion-dollar agreement that will help Dell move up the computer industry’s food chain. Under the agreement IBM will install and maintain Dell equipment for government agencies, schools and major corporate accounts in an alliance valued at $6 billion over seven years.

Service

11/99

IBM – Crossroads System Inc.

Crossroads Systems Inc., the leading developer and manufacturer of storage routers for use in Fiber Channel Storage Area Network (SANs), announced IBM Global Services can now sell and provide maintenance services to customers who have purchased Crossroads’ fiber channel storage routers.

Service

12/99

IBM – LSI Logic Storage Systems

LSI Logic Storage Systems signed an agreement with IBM Global Services. IBM becomes the worldwide service provider for the MetaStor line of network-and server-attached enterprise storage systems.

Service
APPENDIX 2

EMC ALLIANCES
EMC ALLIANCES

6/95

EMC – HP

EMC and HP signed an agreement under which HP will resell EMC’s high-end storage devices, such as Symmetrix. HP gets a cut of EMC devices sold to customers that use HP computers. EMC looks for partners to help it sell its computer storage to big corporation customers. This alliance ended in 1999 when HP signed an OEM and joint technology development agreement with Hitachi Data Systems in place of EMC.

Distribution (resell)

6/95

EMC – Oracle

EMC and Oracle signed a technology exchange, and EMC is a member of Oracle’s Business Alliance Program.

Product integration (software validation)

6/95

EMC – Sybase

Sybase has EMC’s Symmetrix installed in its Emeryville Open Solutions Labs. EMC and Sybase have worked together in addressing the business needs of large-scale UNIX storage solutions that attach to multiple platforms.

Product integration (software validation)

6/95

EMC – Informix

EMC and Informix signed a letter of understanding to collaborate on testing and tuning their mutual products for performance and scalability for the VLDB market, and said the companies agreed to a mutual technology exchange.

Product integration (software validation)
EMC, HP and Informix announced a comprehensive Legacy Warehouse Migration Program. The program is designed to enable customer with proprietary, large-scale legacy data warehouse systems, such as IBM DB2/MVS, AT&T Teradata and others, to easily and cost-effectively migrate to an open environment.

Joint R&D

EMC – Siemens Nixdorff

Siemens Nixdorff and EMC entered a worldwide strategic alliance. Siemens Nixdorff will use EMC storage sub-system in its servers. Siemens said the deal with EMC means Siemens can further focus on its core activities.

OEM

EMC – BMC Software

EMC and BMC signed a strategic alliance under which the two companies will provide joint sales and marketing of EMC DataReach software, and joint development of future DataReach enhancements.

Marketing (and joint R&D)

EMC – Intelliguard Software

Intelliguard Software, a pioneer in standards-based network-attached storage management solutions, announced the availability of local data backup and retrieval support for EMC’s Celerra File Server. This is the result of an alliance between Intelliguard and EMC.

Product Integration (software validation)

EMC – BAAN

Baan has formed a strategic alliance with storage specialist EMC for technical co-operation to provide systems that offer secure storage for Baan applications.

Product Integration (software validation)
Sutmyn Storage Corporation announced an alliance with EMC Corporation that includes certification of EMC Symmetrix Enterprise Storage systems for use with the Sutmyn Scimitar Virtual Tape Server solution.

Product Integration (hardware)

EMC - PeopleSoft
Sequent Computer Systems, Inc.

EMC, PeopleSoft and Sequent Computer Systems recently completed a large-scale PeopleSoft Payroll demonstration project that featured a million-person payroll database. The companies designed and optimized the system in PeopleSoft’s labs and worked with a joint customer to validate the configuration in a real world environment.

Product integration (software validation)

EMC - PeopleSoft

EMC formed a technical alliance with PeopleSoft, Inc. The alliance will involve a variety of joint technical projects that validate and showcase the advanced capabilities of EMC and PeopleSoft solutions in enterprise environment.

Product integration (software validation)

EMC - Comdisco, Inc.

Comdisco signed an enhanced alliance agreement with EMC under which the two companies will work together to provide customers an integrated solution including EMC Enterprise Storage systems and SRDF FarPoint software combined with Comdisco’s IT infrastructure, communications, contingency planning and business continuity expertise. EMC and Comdisco will team in joint marketing and sales activities, and share technical knowledge and future directions to ensure rapid delivery of the world’s most robust business continuity services.

Product integration
EMC – Lucent Digital Video

Lucent Digital Video announced an alliance with EMC for digital video server solutions that will serve broadcast, cable, and direct broadcast satellite customers. The joint technology and marketing alliance, which combines Lucent Digital Video’s industry-leading MPEG-2 encoder with EMC’s Celerra Media Server, offers the industry’s only high-definition scalable system.

Product integration

EMC – NEC

NEC and EMC reached an agreement for NEC to resell EMC’s Symmetrix Enterprise Storage systems for NEC’s Windows NT and UNIX based computer systems Express 5800, NX 7000.

Distribution (resell)

EMC -  Abchor Communications, Inc.
         Emulex Corporation
         Gadzoox Networks
         Q2 Networks, Inc.
         Hewlett-Packard
         JNI
         McData Corporation
         Qlogic Corporation
         Veritas Software Corporation
         Vixel Corporation
         Siemens AG

EMC Corp. announced the formation of the FibreAlliance, an organization of 12 companies for creating means of managing heterogeneous Fibre Channel storage area networks (SANs). The goal of the Alliance is to develop and implement universally recognized methods to simplify the management of heterogeneous fiber channel based networks of storage systems and services.

Standard
EMC – SunGard Recovery Services Inc.

EMC and SunGard have built a multi-year track record of success in helping customers manage planned and unplanned outages. SunGard announced MetroStor, a new business continuity solution resulting from the alliance between SunGard and EMC, under which the two companies team in joint marketing and sales activities, and share technical knowledge and future directions to help ensure rapid delivery of the world’s most robust electronic vaulting and business continuity services.

Marketing

EMC – IBM

EMC and IBM entered a five-year alliance under which EMC will purchase $3 billion in disk drives from IBM. In the future the agreement is likely to include other IBM technologies. EMC’s engineers will cooperate with their counterparts at IBM, sharing technical details on storage technology to ensure IBM parts run smoothly within EMC systems. EMC will also gain access to 30,000 IBM patents. IBM benefits from the agreement not only by selling the components but also by attracting orders for mainframe computers from current EMC customers.

OEM

EMC – Computer Network Technology (CNT)

EMC and WAN technology experts CNT formed a strategic alliance to provide a total solution for instantly and cost effectively mirroring EMC Enterprise Storage system-based information over long distances. The alliance involves the combination of EMC’s Symmetrix Remote Data Facility (SRDF) and CNT’s UltraNet and Channelink products. Customers will further gain from the combination of professional services, including the sales and customer support departments.

Product Integration

EMC – Microsoft

EMC formed alliance with Microsoft for expanding its footprint in the Window NT storage market through new products and cooperative development with Microsoft. EMC is working with Microsoft to make Windows better suited for the enterprise by extending Microsoft Cluster Server with its own SRDF (Symmetrix Remote Data Facility) file replication software.

Product integration (software validation)
8/99

EMC – Forsythe

Forsythe Solutions Group, Inc., a leading IT integrator, announced they have extended their strategic marketing, reseller and professional services alliance. As part of the alliance, Forsythe offers EMC’s industry leading Symmetrix Enterprise Storage systems, software and integration consulting. EMC and Forsythe have worked together for over seven years.

Marketing

9/99

EMC – HP (5nines:5minutes Alliance)
    Oracle
    Cisco
    SAP
    BEA

EMC joined HP’s 5nines:5minutes Alliance along with Oracle and Cisco. SAP and BEA later joined the Alliance as well. The 5nines:5minutes Alliance comprises industry leaders that are developing and delivering the highest availability for the Internet age. By implementing 5nines:5minutes alliance end-to-end solutions, customers benefit from a highly available, secure and scalable infrastructure, while at the same time maintaining the flexibility of an open system.

Joint R&D

10/99

EMC – BullSoft

EMC unveiled its ControlCenter Software, which is designed to give companies the ability to manage computerized information from remote locations and over Internet. The software has been integrated with enterprise management software from BullSoft, an information technology company.

Product integration (software validation)

10/99

EMC – Oracle

EMC expands E-Business Alliance with Oracle to further integrate the companies’ technology. Oracle will form an EMC Strategic Business unit and a Joint Development Center, where each company will invest in engineering and relevant resources to optimize and integrate Oracle and EMC enterprise storage systems. This is a major expansion of a four-year alliance.

Product integration (software validation)
DELL ALLIANCES

4/98

Dell – Data General

Dell Computer and Data General formed an alliance that will allow Dell to sell enterprise storage products based on DG’s Clarion Fibre Channel RAID technology. Dell launched its first offering of fibre channel storage systems, PowerVault, in 7/98. Dell says the alliance will allow Dell to be a player at the high end of the business computer market, where it is not possible to compete without such products.

OEM

4/98

Dell – Wang Global
Unisys Corp.
NCR Corp.

Dell announced three service programs to give greater levels of support for businesses and government agencies with complex computer systems, centered on its recent alliances with Wang Global and Unisys Corp.

Service

10/98

Dell – Ventas

Veritas Software and Dell Computer signed a storage management software agreement to jointly develop and market storage products combining Veritas storage management software and Dell storage systems.

Product integration (software validation)

11/98

Dell – Network Appliance Inc.

Dell and Network Appliance announced their alliance and planned OEM relationship. Dell will incorporate Network Appliance’s storage appliance or “filer” technology into its new line of PowerVault storage products designed to speed access to information on a computer network.

OEM
Dell – Seagate Software

Seagate Software, the leading provider of network storage management solutions for Microsoft Windows NT Server and Windows NT Workstation operating systems, announced the expansion of its strategic storage management alliance with Dell and its support of Dell’s new storage area network (SAN) products for Windows NT environments.

Product integration (software validation)

Dell – Brocade Communications Systems, Inc.

Brocade Communications Systems, a leading supplier of Fibre Channel Fabric switches for Storage Area Networking (SAN) formed a technology and OEM alliance with Dell Computer. Under the terms of the alliance, Dell has signed an OEM agreement with BROCADE to use its SilkWorm family of switches as part of Dell’s new PowerVault SAN solutions.

OEM

Dell – IBM

IBM will sell an estimated $16 billion worth of computer parts to Dell Computer during the next seven years. The agreement will also involve broad patent cross-licensing. The companies also will jointly develop new technology, which Dell could put in its products and IBM could sell to other customers. The alliance could lead to new products that give Dell a leg up in the market for PCs, network servers and computer storage systems.

OEM

Dell – NuView

Dell and NuView Inc., a leading developer of software designed to improve the management and uptime of clustered computers running Microsoft Windows NT, entered a technology alliance. This alliance is an important step in the ongoing development of Dell’s server and storage clustered solutions.

Product integration (software validation)
Dell – SAP

Dell announced several key initiatives that broaden its relationship with SAP AG and make it easier for customers to order, configure and install SAP inter-enterprise business solutions on Dell PowerEdge servers and PowerVault storage systems.

Product integration (software validation)

Dell – IBM

Dell and IBM signed another multibillion-dollar agreement that will help Dell move up the computer industry’s food chain. Under the agreement IBM will install and maintain Dell equipment for government agencies, schools and major corporate accounts in an alliance valued at $6 billion over seven years.

Service
APPENDIX 4

SUN MICROSYSTEMS ALLIANCES
SUN MICROSYSTEMS ALLIANCES

4/96

Sun - Unisys
Seagate Technology

Sun implemented an OEM alliance with Unisys under which Sun will use the Unisys Open Storage Module (OSM), which was jointly developed by Sun, the Unisys Storage System Division and Seagate Technology.

OEM

6/96

Sun – Network Imaging Corporation

Sun and Network Imaging Corporation announced an alliance to establish a new generation of systems management technology designed to store, access, and protect multimedia-based applications throughout corporate Internet and intranet environment. The collaborative effort integrates Sun’s security technologies with Network Imaging’s Web multimedia object manager (MOM) product line. The agreement allows integrators to offer their customers a highly secured storage management infrastructure for deploying mission-critical applications.

Product integration

10/97

Sun – Seagate

Seagate Technology has been chosen by Sun to supply Fibre Channel-Arbitrated Loop (FC-AL) disc drives for use in Sun’s second-generation Fibre Channel storage subsystem.

OEM

1/98

Sun – Comdisco

Sun and Comdisco formed an alliance to offer business continuity planning services targeted to the requirements of Sun users. The two companies will collaborate to provide comprehensive recovery capabilities to companies utilizing Sun enterprise servers and Sun StorEdge systems in heterogeneous environment.

Service
4/98

Sun - Baan
Oracle
SAP

Sun intends to continue its aggressive growth with key ERP vendors through increased investments in global competency centers. Sun is working closely with key ERP vendors on three new programs that will help resellers integrate and deploy customers' ERP applications quickly. The US programs are from Baan and Oracle and offer pre-packaged solutions that simplify the technical planning, sizing, and implementation of Baan and Oracle applications. Same program is offered from SAP in Germany.

Marketing

10/98

Sun – Veritas

Veritas and Sun announced new alliance to provide enhanced comprehensive storage solutions for enterprise customers. They reached a sales and marketing agreement to deliver convenient purchasing option, integrated customer solutions.

Marketing

4/99

Sun – Tektronix

Sun announced a strategic video relationship with Tektronix Inc., a leader in broadcast-quality digital video solutions, to jointly deliver an optimized solution targeted at broadcasters, cable operators and other network services providers. The joint effort will integrate the Tektronix' broadcast-quality M2Trillium encoder board with Sun Microsystems' Sun Enterprise server products running Sun's Solaris operating environment and new Sun StorEdge Media Central software platform.

Product Integration

8/99

Sun – Storage Technology

Sun and Storage Technology reached an OEM deal. Under the agreement Sun will help market StorageTek's enterprise-tape automation systems. In exchange StorageTek, the leader in the tape-storage market, will sell under its name Sun's open-enterprise disk technology.

OEM
Sun - Solarcom

Solarcom Inc., a leading independent business consulting, system integration, and financing solution company, announced it has created a Sun Microsystems Business Unit. The Sun Microsystems Unit is dedicated to providing value-added services, including consulting, design, implementation and technical support for Sun Microsystems products.

Distribution
COMPAQ ALLIANCES

12/96

Compaq – Cheyenne Division (Computer Associates)

Compaq and Cheyenne division of Computer Associates signed enterprise storage management alliance to jointly develop, market, and support enterprise-class storage management solutions. The activities enabled by this strategic alliance will provide value to customers through the power of seamlessly integrated and optimized enterprise storage and storage management solutions designed to facilitate the access, protection, and management of their enterprise data.

Product integration (software validation)

9/97

Compaq – HP

In support of HP’s entry into the Fibre Channel host bus adapter (HBA) market, and to facilitate HP’s move into this market, the company has formed a strategic agreement with Compaq Computer Corporation. Through this relationship, HP and Compaq will collaborate on increasing performance and interoperability levels of next-generation Fibre Channel solutions.

Joint R&D

9/97

Compaq – Seagate Software

Compaq announced a storage management development agreement with Seagate Software, the leading provider of storage management solutions for Microsoft Windows NT Server and Windows NT Workstation. The new alliance calls for the coordinated development, marketing and delivery of enterprise storage management technology.

Product integration (software validation)

4/98

Compaq – StorageTek

StorageTek and Compaq signed an agreement under which the companies will work together on advanced research and development projects to enhance the capabilities of emerging Storage Networks for Windows NT enterprise computing. The resulting products and technologies are part of the open storage architecture being defined by customer requirements and industry consortia.

Joint R&D
Compaq – NovaStor

NovaStor today announced an alliance with Compaq Computer Corporation in offering online backup, one of an exciting new suite of Internet services for small and medium businesses. The online backup service incorporates NovaStor’s NovaNet-WEB software and technology giving business users the ability to backup their critical data over the Internet to a Compaq-managed data center.

Product integration

Compaq – Veritas Software

Veritas and Compaq signed a storage management software agreement that provides a foundation and first step for joint development and marketing of storage solutions employing Veritas storage management software and Compaq’s enterprise-class storage systems. The companies will develop tools customers can use for continuous data availability, ease-of-use, and data protection for their enterprises.

Product integration (software validation)

Compaq – HP
IBM
Adaptec

Compaq, HP, IBM and Adaptec announced the formation of an open industry alliance to set the direction of Future I/O technology development and implementation. The Future I/O alliance is creating a new input/output standard to maximize data transfer between high-performance servers and peripheral subsystems for the next generation of high-performance systems.

Standard

Compaq – SAP

Compaq announced that the StorageWorks Data Replication Manager has been tested for SAP R/3 for Windows NT 4.0 by the Compaq International SAP Competence Center. The certification is the result of a strong alliance between Compaq and SAP to deliver high-quality client/server solutions for the enterprise and included the StorageWorks Enterprise Storage Array 12000, RAID Array 8000, Data Replication Manager, and Secure Path for Windows NT and Compaq Proliant servers.

Product integration (software validation)
Compaq – HighGround Systems

Compaq and HighGround Systems partner to address e-business storage needs. As part of the alliance, Compaq will invest USD20m in HighGround. Compaq will also use HighGround’s technology in its storage management systems and HighGround’s Storage Resource Manager product family will be integrated with Compaq’s system and storage management products. In addition the partners will collaborate on storage area network management appliances.

Product integration
HP ALLIANCES

6/95

HP - EMC

EMC and HP signed an agreement under which HP will resell EMC’s high-end storage devices, such as Symmetrix. HP gets a cut of EMC devices sold to customers that use HP computers. EMC looks for partners to help it sell its computer storage to big corporation customers. The alliance ended in 1999 when HP replaced EMC with Hitachi Data Systems for offering the high-end storage systems.

Distribution (resell)

12/95

HP – Informix

EMC

EMC, HP and Informix announced a comprehensive Legacy Warehouse Migration Program. The program is designed to enable customer with proprietary, large-scale legacy data warehouse systems, such as IBM DB2/MVS, AT&T Teradata and others, to easily and cost-effectively migrate to an open environment.

Joint R&D

9/97

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In support of HP’s entry into the Fibre Channel host bus adapter (HBA) market, and to facilitate HP’s move into this market, the company has formed a strategic agreement with Compaq Computer Corporation. Through this relationship, HP and Compaq will collaborate on increasing performance and interoperability levels of next-generation Fibre Channel solutions.

Joint R&D

11/97

HP - IBM

Seagate

IBM, HP, and Seagate will work to develop a common computer-data storage format for tape drives used in big companies. The firms hope to offer the format as an alternative to the current array of incompatible technologies in the storage industry. The companies will also jointly develop the next-generation tape technologies that could significantly eliminate the time devoted to daily backup and restore operations.

Standard
12/97

HP - Stac

HP and Stac Inc. formed a strategic data-protection alliance. HP will use Stac's information recovery software, Replica, and HP's tape storage devices to develop a data-protection solution.

Product integration (software validation)

9/98

HP – Crossroads Systems Inc.

Crossroads Systems, industry leader and de facto standard for Fibre Channel storage routing, announced the completion of its third round of financing. HP led this round of financing. Crossroads and HP are designing and executing solutions, allowing companies to migrate quickly and cost effectively to Fibre Channel Storage Area Networks.

Joint R&D

11/98

HP – LSI

HP announced that LSI Logic Storage Systems, a leading supplier of world-class, high-performance RAID storage subsystems, has selected HP's TACHYON TL Fibre Channel controller for future generation storage controllers. LSI and HP are pioneers in the development of Fibre Channel solutions, and the OEM deal is an extension of the alliance between HP and LSI.

OEM

1/99

HP – Compaq
    IBM
    Adaptec

Compaq, HP, IBM and Adaptec announced the formation of an open industry alliance to set the direction of Future I/O technology development and implementation. The Future I/O alliance is creating a new input/output standard to maximize data transfer between high-performance servers and peripheral subsystems for the next generation of high-performance systems.

Standard
2/99

HP - Abchor Communications, Inc.
Emulex Corporation
Gadzoox Networks
G2 Networks, Inc.
EMC
JNI
McData Corporation
Qlogic Corporation
Veritas Software Corporation
Vixel Corporation
Siemens AG

EMC Corp. announced the formation of the FibreAlliance, an organization of 12 companies for creating means of managing heterogeneous Fibre Channel storage area networks (SANs). The goal of the Alliance is to develop and implement universally recognized methods to simplify the management of heterogeneous fiber channel based networks of storage systems and services.

Standard

5/99

HP - Informix

HP and Informix announced a cooperative support agreement that builds on the previously announced HP and Informix certification program to deliver streamlined support for data-warehousing and online transaction processing implementation. By combining support efforts, Informix and HP have developed a process for faster, more cost-effective problem resolution for joint customers.

Service

5/99

HP - Hitachi, Ltd. / Hitachi Data Systems

HP and Hitachi signed joint technology and OEM agreements for high-end, multiplatform storage system. Under the agreement the companies will cooperate on the design, development and enhancement of enterprise-storage projects. Initial results of the agreement are incorporated into the HP SureStore E Disk Array MC 256. Future efforts will cover a broad range of storage, SAN and storage-management products.

OEM
9/99

HP – EMC (5nines:5minutes Alliance)
Oracle
Cisco
SAP
BEA

HP formed 5nines:5minutes Alliance with Oracle and Cisco, and EMC. SAP and BEA later joined the Alliance as well. The 5nines:5minutes Alliance comprises industry leaders that are developing and delivering the highest availability for the Internet age. By implementing 5nines:5minutes alliance end-to-end solutions, customers benefit from a highly available, secure and scalable infrastructure, while at the same time maintaining the flexibility of an open system.

Joint R&D

9/99

HP – SAP

HP and SAP AG announced that they have entered a strategic service-development alliance, under which the two companies will deliver complementary service offerings to joint customers. Customers will benefit by gaining one-step access to integrated end-to-end support throughout the entire solution life cycle.

Service

12/99

HP – Procom Technology

Procom Technology announced that it is providing a hardware platform and thin OS software for incorporation into HP's products. Procom's technology will be a component of a NAS solution from HP that serves the Windows NT and UNIX markets. The solution will be part of HP's strategy to significantly extend its presence in the rapidly growing NAS appliance market.

OEM