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## Storage

February 18, 2005

### Leading issues, opportunities in storage networking Part - II

**Geetanjali Wadhwa & Pradeep Chakraborty**

***Part two of storage networking looks at whether one size fits all and in which direction storage infrastructure is headed, successfully combining database and storage to prepare for future data growth; need for on-demand storage in an on-demand world; convergence in storage; how SATA can improve TCO; current state of the storage industry in India, and how some leading vendors perceive the way ahead.***

BANGALORE AND NEW DELHI -- 'One size fits all' isn't the theme song that can be successfully deployed in the IT space. However, B. Chandrasekar, country manager, India, Intransa Inc., said that having one pervasive technology for all the IT needs, such as IP for compute, storage and networking needs, made more sense for the storage infrastructure space.

#### **One size does not fit all**

P.K. Gupta, chairman, Storage Networking Industry Association (SNIA) India and director, strategic development-Asia Pacific, EMC Software noted: "One size does not fit all. The storage infrastructure requirements vary from small to large organizations although everyone is burdened with massive information growth. Customers are currently looking at cost reduction, reduced complexity and much better interoperability for storage infrastructure and all the vendors are working toward that goal." He added that in the next one year, data and storage networks would become easier to understand, simpler to implement and easier to manage, and would be recognized as valued assets to businesses. The Indian market was growing faster (>100 percent) than other countries (>60 percent), and there would be faster adoption to new technologies in the next one to two years.

Anand Bhalve, vice chairman, SNIA India and director, Engineering, Spartan Labs Pvt. Ltd., said that the storage infrastructure had to be modular and scalable as far as possible. This was vital to address some of the pain points. Phillippe Cazaubon, director-sales, Asia Pacific, Overland Storage, added that vendors such as they were offering scalable solutions that can fit many sizes, which protected long-term investment and allowed for growth.

Durga Prasad Allada, senior consultant-enterprise storage practice and deputy general manager, Satyam Computer Services Ltd. concurred that if returns on storage investments had to be gained, one size did not fit all. Though the growth of storage was moderate in most companies, faster growth was confined to very few large



**P. K. Gupta, Chairman, SNIA India and Director-Strategic Development-AP, EMC Software**



**Anand Bhalve, Vice Chairman, SNIA India & Director-Engineering, Spartan Labs**

companies. This was due to the various pain points discussed earlier.

He said: "The one-size-fits-all strategy would not help in scenarios where growth rates are not symmetrical. This is applicable to storage infrastructure, which needs to be designed and deployed as per the enterprise requirements; data protection, which needs to be policy based; and storage management, which needs to be addressed for each storage infrastructure setup separately. In this context of 'one size does not fit all,' the storage infrastructure in enterprises is heading toward a model that starts small and grows as the storage demands grow. The building blocks of this infrastructure, and the infrastructure itself are transforming into more flexible, scalable entities that can seamlessly integrate in heterogeneous operating and hardware environments. This situation is also opening up opportunities in storage resources outsourcing, common pools of storage available on demand and standard based storage management solutions."



**Arun Rawtani, Country  
Technology Solution Group  
Manager, EMC India**

Amod Manjrekar, CTO, Renaissance Softech, the master reseller of Brocade in India, noted: "Gone are the days when one size fits all, as different enterprises have different and unique requirements." According to him, storage solutions must be optimized for the business processes they support. Also, not all companies are the same size. The needs of the enterprise and mid-sized firms differ as well, as do IT budgets. Sharad Srivastava, country manager, Seagate India, said there was no right answer for everyone. "While one type of storage media is usually sufficient for smaller companies, large enterprises will often have a mixed storage environment, implementing different mediums for specific departments, workgroups and remote offices," he added. According to Srivastava, several criteria to consider included:



**Sharad Srivastava, Country  
Manager, Seagate India**

- Capacity: amount and type of data (file level or block level) that needs to be stored and shared;
- Performance: I/O and throughput requirements;
- Scalability: Long-term data growth;
- Availability and reliability: how mission-critical are your applications?
- Data protection: Backup and recovery requirements;
- IT staff and resources available; and
- Budget concerns.

Storage infrastructure was increasingly geared toward the concept of storage virtualization. It simplified storage management and maximized its utilization by pooling all physical storage subsystems together (i.e., DAS, NAS and SAN) and presented a single logical, or virtual view of storage to the host system. Srivastava said: "There has been much debate in recent times about choosing SAN or NAS, although both technologies are rather complementary. Today, SANs are increasingly implemented in conjunction with NAS. With SAN/NAS convergence, companies can consolidate block-level and file-level data on a common array."



**B. Chandrasekar, Country  
Manager, India, Intransa Inc.**

#### ***On-demand storage for an on-demand world***

Having ruled out the one-size-fits-all strategy, it would be interesting to see whether there is a trend toward on-demand storage in an on-demand world. Sanjay Kharade, principal consultant, Cisco Systems, India and SAARC, said: "The basic idea of on-demand storage is to offer storage as a service much the same way as you deal with your utilities. You use the service, pay for what you use, and leave the supplier to deal with the behind-the-scenes technology. If the service isn't there when you

need it, you simply change suppliers. Whether IT is outsourced or is available from an in-house IT department, storage and computing resources would be made available on an as needed basis, and billed accordingly. Such a vision, though, requires a complete rethink of business processes and a high degree of automation."

Bhalve noted: "I would say that 'technology is great if it is simple to work with' even if it is complex to implement. More and more complexity can be moved away from the end-users to provide them better user experience. On-demand storage is one way to move all the complexities from the users, including SAN, NAS consolidation, disk, tape, backup, clustering, disaster recovery, etc., to a service provider."

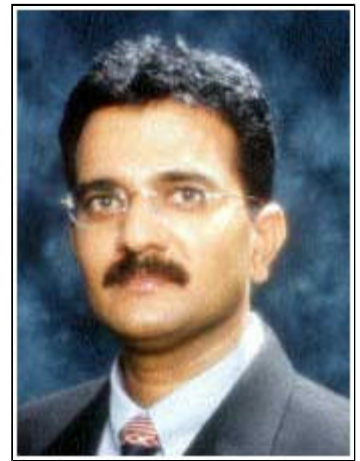
Cazaubon at Overland, and Intransa's Chandrasekar agree there is a need for on-demand storage in an on-demand world. However, Cazaubon said that neither customers nor vendors were ready for it yet. He said: "We believe it will take at least another five to ten years before on-demand storage becomes a reality. It could take the form of either large storage farms made available for a fee (vendors wish), or just existing storage (such as your desktop hard disk), seamlessly and transparently shared by any anonymous user at any time." Chandrasekar pointed out: "As we have already seen in the compute space with on-demand computing storage, we will see the next bastion of on-demand in the storage world. A precursor to all this is the growth in the number of storage service providers (SSPs)." Renaissance's Manjrekar said it would take time for Indian corporations to adopt such a trend.

Satyam's Allada added that today's on-demand world preferred and demanded on-demand storage. On-demand storage catered to storage needs of organizations effectively by providing the required storage resources on a network as and when required. It optimized investments and reduced the wasteful use of resources. "On-demand storage opens up avenues for a storage services provider market. The end-user community can forget the nightmares of technology issues. They just seek, and are provided storage as required from the storage infrastructure on demand. The lack of storage skills would no longer be an issue to contend with," he added.

According to Seagate's Srivastava, the concept behind on-demand storage (aka on-demand enterprise, utility computing, N1, autonomic storage, and the adaptive enterprise) was to offer storage as a service. Customers pay for storage services used and leave the supplier to deal with behind-the-scene technology. Companies save money by not having to retain poorly utilized systems. The need for on-demand storage was especially strong for small-sized companies, whose IT teams were generally understaffed. Paying for storage service could make more sense for such companies.

He added that managing and building a heterogeneous SAN posed a challenge in the implementation of on-demand storage. However, open standards in storage would drive automation, eliminate customization and reduce the number of elements to manage. Arun Rawtani, country technology solution group manager, EMC India & SAARC region, said organizations were looking for opportunities to get as much storage as they wanted, when they needed it and not pay for unused capacity. "EMC believes that the answer to this lies in virtualization and has announced its storage router as a solution to this pain point," he stressed.

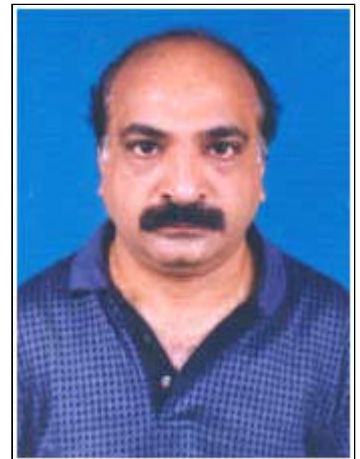
SNIA India's Gupta agreed there had been considerable debate



**Sanjay Kharade, Principal Consultant, Cisco Systems, India and SAARC**



**Phillipe Cazaubon, Director-Sales, Asia Pacific, Overland Storage**



**Durga Prasad Allada, Sr. Consultant - Enterprise Storage Practice / Dy. GM, Satyam Computer Services Ltd.**

on the topic. Some research data also showed that storage utilization was about 30-50 percent, and enterprises still kept demanding more storage everyday, even if they had to use it for a short time and then leave it unutilized for months. "In the on-demand world, you can ask for storage as and when required and pay for it, and release it when not required. This problem sometimes becomes more complex with the requirement for storage for test and development ventures undertaken by IT teams on an ad hoc basis. On-demand storage becomes absolutely necessary in such scenarios," he said.

### ***Combining database and storage for growth***

Having examined the need for on-demand storage, let us turn our attention to a smoldering issue - that of successfully combining database and storage to prepare for data growth. Satyam's Allada said database size grows due to four main reasons. These are: growth of data used in normal business applications; growth of data that was not used recently or inactive data; new application features; and multiple copies of production database. In the last few years, data has grown by leaps and bounds in every business. With new storage technologies deployed, growth has become uncontrollable in a way, as it is now easier and cost effective to deploy storage in a networked environment.

The consideration is that storage is made available to meet demands of data growth. However, while provisioning this storage infrastructure, it was not really evaluated how much the TCO was going up as infrastructure investments were made virtually to cater to inactive, unused data or obsolete data and for duplicate copies of data. Further, this fast and large database growth led to a performance degradation, and more and more investments in additional storage infrastructure resources like more storage arrays, storage controllers, data center space to deploy these arrays, more storage admin tasks, etc.

Allada said that a better Rol could be achieved if a combination of tools and technologies are used to address the above problems. Putting in place suitable ILM strategies, deploying and implementing right backup policies, and adopting policy-based data archival mechanisms would ensure that unused, inactive data was moved out of the storage infrastructure. This would bring about a higher availability of storage resources, increased database performance and ease of storage management and database administration. All this would lead to an optimized and controlled data growth environment, where an enterprise is geared to handle data growth.

Seagate's Srivastava notes that as volume of digital information continues to grow, adding new servers or expanding the capacity of the existing servers is expensive and time consuming. Considering the downsizing of IT budgets, a new concept, known as grid storage, has been developed to address the scaling storage needs of companies. "Currently, NAS storage can be scaled horizontally and vertically. Horizontal scaling means adding more NAS arrays to a LAN. This works until the number of NAS boxes becomes unmanageable. In a 'grid' topology, NAS heads are joined together using clustering technology to create one virtual head. NAS heads are the components containing a thin operating system optimized for Network File System (NFS) protocol support and storage device attachment," he said.

Conversely, the vertical scaling of NAS is accomplished by adding more disk drives to an array. And scalability is affected by NAS file system addressing limits (how many file names you can read and write), and by such physical features as the interconnect bandwidth between the NAS head and the backend disk. "In general, the more disk placed behind a NAS head, the greater the



**Amod Manjrekar, CTO,  
Renaissance Softech**

likelihood the system will become inefficient because of concentrated load or interconnect saturation. Grid storage, in theory, attacks these limits by joining NAS heads into highly scalable clusters and by alleviating the constraints of address space through the use of an extensible file system," added Srivastava.

EMC's Rawtani said that the easiest way to manage this was to check how much of the database information was actually contemporary and archival. The reality was that much of a database was not always being used, but it still took up a lot of storage. "EMC, particularly through its DatabaseExtender product, allows for archiving of database information on less expensive storage, while the contemporary data remains on high availability and on more expensive storage. This is an excellent example of ILM in a database environment," he said. Overland's Cazaubon noted that scalability was key to growth at both the database and storage infrastructure levels. Combining both did not make much sense as database was usually deployed for many years, whereas, storage needed to be upgraded on a regular basis to provide sufficient capacity, throughput and flexibility. Overland's scalable solutions addressed these issues, he added. Renaissance Softech's Manjrekar felt that it required a very thorough analysis from the team that was working toward the maintenance of storage, and a frequent review and analysis of the infrastructure was a must every fortnight or so.

#### ***SATA for improving TCO***

On the topic of provisioning the storage infrastructure, and subsequently evaluating the total cost of ownership or TCO, attention is immediately drawn toward the role of serial ATA (SATA) in improving the TCO. Cisco's Kharade said that shrinking IT budgets across the world meant that manufacturers of all IT products needed to cater to a more cost-conscious enterprise that demanded more for less. In this scenario, SATA was fast becoming an established enterprise standard as it was a far more cost-effective alternative to SCSI, required thinner and less expensive cables, and allowed for data transfer rates of up to 150MBps, with a performance roadmap extending to 600MBps.

Seagate's Srivastava noted that the emergence of SATA drives accompanied a profound advance in real density, to the extent that IT managers had begun to deploy SATA for near-line storage of non-critical data and backups/restores, where SATA drives offered vastly faster access (at appropriate capacities) compared to tape. The TCO was improved by storing nearline data (i.e., fixed-content information that was actively referenced, but changed infrequently, for example, medical records, videos, active data files, etc.) in SATA drives, rather than the relatively expensive SCSI drive.

According to Allada at Satyam, serial ATA drives would provide cost-effective capacity for reference data. He said: "The analysts site two reasons why SATA is catching on fast. The first reason is, of course, cost. SATA is a great low-cost alternative, primarily for secondary storage solutions. Other benefits of SATA include increasing the data transfer rates in the coming times. The availability of serial SCSI interconnect is going to boost the choice of SATA as a complimentary and interchangeable disk technology and in many storage requirements. Availability of SATA disk drives in volumes also decreases costs to the storage hardware product companies. The shift from fiber channel drives to SATA drives will certainly pick up."

The continuing demand for larger volumes of data, and the faster growth rates of storage demands for alternative and emerging technologies that ensured lower TCO, were important factors. The

increasing awareness and demand for cost-consciousness would make SATA the alternative choice for multi-terabyte storage option in all environments, including NAS and fiber channel (FC) storage arrays, with the fabric interface being FC and the drives being SATA. The increased reliability of SATA drives and providing solutions for high availability and data redundancy with SATA are likely to accelerate this trend, which would all lead to a better TCO.

Rawtani stressed that SATA was an advance replacement for the parallel ATA physical storage interface. "SATA is a low cost, high reliability, and scalable connectivity solution that will create a huge market for inexpensive, networked storage solutions. SATA is a solution that is compatible with today's software, which will run on the new architecture without modification. It provides for systems that are easier to design, with cables that are simple to route and install, smaller cable connectors, improved silicon design, and lower voltages, all of which alleviate the adoption of serial ATA by the industry. It will follow a phased transition path," he said. Customers would benefit as it offered much faster communication and easier configuration at about the same price as its parallel predecessor. It was easier to upgrade the storage devices. In addition, SATA and serial attached SCSI were highly compatible and offered companies the ability to plug in disk drives employing both technologies into the same system, giving IT managers, system integrators, and OEMs an 'unprecedented disk storage' and subsequently, a lower TCO.

Cazaubon highlighted Overland's REO Series, claimed to be the highest-performing, most flexible disk-based backup and recovery acceleration appliance. It helps in improving TCO with compelling features such as: up to 300 percent faster than other inexpensive disk-based products; reducing backup windows; providing near-instantaneous recovery; designed to complement existing SAN network infrastructures; providing a foundation for implementing low-cost IP-SANs; seamlessly moving data to tape for cost-effective, long-term storage; reducing operating expenses; improving overall reliability of the backup and recovery process; and being a critical element of a disk-to-disk-to-tape data protection strategy.

He further added that SATA disks greatly improved TCO by offering both high-capacity data storage with high performance and reliability. "SATA disks are low cost, inexpensive and easy to implement, and are commonly adopted as second-tier disk storage for backup staging, less critical data storage disk for snap shot or images. With these propositions, SATA lowers the cost of ownership," he said.

Bhalve pointed to studies from market researchers, according to whom, 87 percent of all the drives used ATA technology, and the cost of ownership per megabyte ranged from US 1-2 cents, whereas, with SCSI drives, the cost of ownership per megabyte ranged between US 3-5 cents. With SATA 1.0 specs, such as the RPM of 5.4k-10, and the transfer rate of 150MBps, that has been improved to 300MBps in SATA II, it is only expected to double with SATA III. Chandrasekar said: "A few years back, ATA (PATA and SATA) based disks were not seen as enterprise class. Today, due to the relentless innovation and large volumes driving down the cost of large capacity ATA based disk drives, ATA disk technology is well straddled in the enterprise. ATA (both PATA and new SATA) will dramatically improve the TCO in the IP-based SAN space of the storage industry."

#### ***Convergence ahead in storage***

Is convergence ahead in the storage networking industry as well? Srivastava at Seagate said that the storage industry was heading

toward consolidation of the storage infrastructure via storage virtualization, which involved pooling all the physical storage subsystems together and presenting a virtual view of storage to the host systems, i.e., customers need not be concerned with the exact location of the server where their information was stored. As all the storage devices could now be managed as if they were one device, storage management was a lot simpler. It had also become easier to provision storage from the pool of available storage, or add storage devices without requiring server or network reconfiguration or downtime. Storage utilization was also maximized, as unused storage allocated to a specific application or server could now be easily reallocated to other applications or servers.

He added: "At present, many companies have started consolidating DAS and NAS into a single SAN system. As SAN has no fine control over the resources that are allocated to the various applications, this creates the need for companies to have different SANs for different levels of needs, based on mission-criticality or departmental divide, leading to multiple tiers of SAN. In fact, some companies are now looking at SAN consolidation to further improve their storage utilization and reduce the numbers of the SAN implementations." Bhalve agreed that convergence was the way ahead in storage. However, the convergence of backbone technologies could remain restricted to bridge SAN islands. Kharade added that the storage world was just opening up from being vendor centric to open standards, whereas convergence in data, voice and video had already gone through that phase.

Allada recognized that convergence was the way ahead in the storage industry. "The trends and direction are toward convergence, not only in NAS and SAN areas, but also in storage management, etc. For storage companies today, the business is beyond just boxes. They have product offerings that combine the networked storage hardware, storage software and strategies like ILM. Convergence of NAS and SAN is happening, and a number of companies are giving storage equipped with both NAS and FC connectivity. Technology is now available that can take any kind of storage and create an integrated storage infrastructure," he added.

SAN and NAS are not competing, but complimentary technologies. Each one has its strengths. Their convergence provides for a storage infrastructure that offers the best of both. The iSCSI deployments are already happening and iSCSI itself is a convergent technology with storage and networking combined. "We are likely to see a convergence of NAS, SAN and iSCSI on a single backbone that offers high bandwidth and scalability in the years to come, while enabling ease of management and use of transparent physical resource. High-performance connectivity backbone, both file and block level data movement on the same path, increased use of networking protocols and technologies in storage infrastructures, virtualization and standards-based management environment are a few of the key factors that drive storage convergence."

SNIA India's Gupta estimated that convergence was happening in the storage industry in many directions. He said: "There is convergence of technologies like the merging of NAS and SAN; convergence of security and storage; storage and IP networking; convergence of different types of data: text, graphics, audio, video, mobile etc; and lastly, convergence of companies." However, Overland's Cazaubon felt that convergence was quite a long way away, whereas consolidation was already happening. He said: "With Symantec buying Veritas, Quantum acquiring Certance, and many other deals happening, the industry will become smaller in terms of the number of players, and will narrow

the focus allowing for more convergence."

***Indian storage industry to reach US \$435.8 million in 2005***

Having discussed several issues threadbare, how do these vendors perceive the storage industry in India? Satyam's Allada said that the storage industry's evolution has been fast, and is moving rapidly from one step to another. "This trend can be seen across all domains of storage -the users, vendors, and storage technology development environments. Large enterprises have already started storage consolidation and centralized storage managements. Investments in storage have gone up in the last few years, and the capacity of networked storage deployed in the last four years has been doubling every year.

"Enterprise and organizations have understood the need to bring in storage assets on to a networked environment. They very well know that they are using only half the data available in the organization and there is a constraint to use the remaining half because it is scattered all around the organization in islands. Companies today are more alert and highly aware of the value of business continuity and disaster recovery for their businesses and the critical needs of data protection and data availability with right backup, archival and ILM solutions. This increased awareness and the urgency to revamp is helping the growth of the storage industry in India," Allada said.

He added that while large telecom and financial businesses organizations and banks had started on the road to networked storage deployments, the SMB segment was starting to get on to this bandwagon as well. Every established brand and product in the storage domain currently has a presence in India, and each product company has its operations in the country. They run sales and support operations, and have also set up large development centers in India to work on storage technologies.

He continued: "The track record India has for its large pool of technical professionals, and cost-effective solution development and delivery business models has made it a hub for storage related technology activities. The role of industry bodies and technology bodies like SNIA, and SNIA India are creating an image for India as an important and first preference player for storage technology development. The Indian storage industry is evolving into a valuable contributor for technology trends, best practices and standards, with participation from both storage companies and the end-user community.

"With the storage industry evolving into a robust and strong technology segment in India, the innovation and the entrepreneurship of India Inc., and the large successful community of Indian professionals in Silicon Valley coming out with new service offerings, outsourced storage services are going to make a major value difference to the storage industry's growth in the near future. I look forward to India becoming the preferred destination for enterprise storage services outsourcing like remote storage management services, and as a hub for storage infrastructure that can be used as a disaster recovery for global organizations."

SNIA India's Gupta agreed that the Indian storage market was experiencing rapid growth, and was likely to grow to US \$435.8 million during 2005. This would be fueled in part by new regulations, solutions and ways of doing business. "For example, real-time gross settlement, implemented this past year, is a large value funds transfer system that allows financial intermediaries to settle inter-bank transactions. Up to 120 banks are expected to participate in this operation, which will generate numerous electronic transactions that need to be stored. As we move toward

Internet-based banking and the Reserve Bank of India (RBI) implements check truncation as per the RBI guidelines, banks will have to keep records of financial transactions, including email related to the transactions for 10 years. The ISPs must keep email for three months, and mobile companies must keep SMS messages for three months, although in reality they are keeping such electronic records for much longer. During police investigations in cyber crime, these records are very helpful in tracking the culprits. We continue to see this type of growth worldwide," he said.

Intransa's Chandrasekar said verticals like telecom and banking had been deploying SAN. The mid-market segment was now getting ready to leverage the existing skills on TCP/IP to roll out IP-SAN as the effective way to have storage consolidation based data management, including disaster recovery and replication. Amod Manjrekar, CTO, Renaissance, compared the storage industry in India to a volcano, that would undertake a mammoth revolution once it erupted. "There are positive signs of growth. Storage is something you cannot escape, and security is something you cannot ignore," he said.

Srivastava at Seagate agreed that the Indian storage industry looked promising. Strong economic growth in India had resulted in companies beefing up their IT infrastructures in preparation for the expected explosive data growth. These companies are now looking for a cost-effective storage solution that would allow them to scale up the storage capacity easily without any additional cost. "Seagate is slated to meet the storage demands of the Indian community with its broadest product offerings in the market," he noted. Spartan Labs and SNIA India's vice chairman Bhalve said the Indian storage market was set to grow at 17 percent from US \$134 million to US \$425 million between 2000-2005. The Indian disk storage industry alone was likely to grow from 2,258TB in 2002 to 52,700TB in 2008. "For SNIA India, the challenge is to educate the storage community about storage technologies and to prepare the professionals who can manage this storage," he added.

Cisco's Kharade said that while DAS continued to dominate the Indian storage scene, slowly but surely, networked storage solutions were being preferred over it. Another key trend was that the market witnessed the merger of SAN and NAS, as devices featured both block and file handling capabilities. This resulted in increased cost efficiency and faster return on investment for customers. On the technology front, iSCSI and SAN would co-exist, with iSCSI likely to find a major market in the SMB segment due to its integration with NAS devices. "With the ratification of the iSCSI standard, the market is likely to witness a gradual adoption of IP-SANs, particularly with SMB customers who see IP-SAN as a cost effective alternative to deploy SAN into their environment," he estimated.

EMC's Rawtani commented that organizations in India were seeking to move away from application dependency to data independence. In order for this to happen, storage must become either application transparent, or accessible by any application according to hierarchical requirements. To help achieve this, two basic areas must be added into the network: virtualization and data mobility. Within a few years, storage systems currently deployed by most corporations, would be incapable of handling this growing load. Corporations were today looking at a system that would enable them to deploy information wherever they needed it, whenever they needed it, and in whichever format they needed it.

He said: "EMC's expanded portfolio of end-to-end services is

designed to help customers reduce their operational costs, reduce risk, achieve compliance and improve availability by effectively managing information in a way that ties its varying usefulness to business goals and service levels."

Overland Storage's Cazaubon said they had gained market leadership by virtue of 41 percent market share in 2003. "Being a market leader in tape libraries, Overland understands users' requirements, and leads this new market in D2D2T, combining our domain expertise in tape with disk. The storage industry is vibrant in India. With the massive growth in data, and the need for more storage consolidation, Overland Storage NEO and REO series provide data backup and recovery solutions for the small business, the enterprise and everything in between. We are upbeat in gaining more market share for Overland Storage during 2005. Our installed base is constantly growing with various customers in the government, software development and banking sectors," he noted.

### ***The way forward***

Finally, let us take a look at the roles the various storage vendors are playing in India and the way forward. P.K. Gupta said: "I wear two hats: One as director strategic development for Asia Pacific for EMC Software and the other as chairman of SNIA India. In the first role, I understand customers' pains and help them, apart from developing future strategic planning. In the second role, I promote storage networking and education to vendors, end-users, channels, etc. I see a very bright future for storage networking technology as the world moves to more and more digital data in all walks of life."

Sharad Srivastava noted: "As country manager for SAARC, I have responsibilities to maintain and grow Seagate's valuable channel relationships in India, while also building new partnerships in this expanding market. We are also driving the increase in use of digital technology in various segments of life. Anything digital has to be stored somewhere. That is where the HDD plays an important role. Seagate's outlook is bright. We are seeing an increased growth in consumer electronics and retail markets, as HDD markets continue to grow in new areas. With our recent product announcements, we will address 97 percent of the available market for hard drives, which will give us even more market segments to participate."

Anand Bhalve said: "As vice chairman of SNIA India and director engineering of Spartan Labs, I am responsible to help the storage industry in India grow and addresses challenges that exist for the storage community. We have already initiated an education program to prepare the storage industry for tomorrow's needs today, to which we received an overwhelming response. The next immediate goal is to set up storage technology labs in India and ILM evangelism."

Arun Rawtani pointed out: "India is very strategic for EMC, and our goal is to be the leading storage player in this market. We have committed an investment of US \$100 million in the country and have very aggressive plans to grow and expand our presence in India." He spotlighted EMC's strategy for leadership, which is based on the following pillars:

*Market education:* EMC has been constantly educating the market on the need to move away from the stovepipe direct attached storage to server-agnostic, automated networked storage architecture. It is also working toward growing the networked storage market in India by educating customers that storage is not just about capacity and that servers do not equal storage (they have been created for running applications, which is processor

intensive, and not for information management, which is I/O intensive).

*Comprehensive products and solutions:* EMC has launched over 17 new products and software innovations for the Indian market. Eleven of these are specifically targeted at the mid-tier segment.

*Strengthen and build partnerships:* In the last six months, EMC has worked toward extending its reach through its partnership network. It has added two new SI partners and one distributor for the region to extend its reach geographically and across industry segments and verticals.

*Strengthened services portfolio:* At EMC, customer support is an investment center as the vendor has consistently invested resources - time, money and skills - to offer customers and partners, the most robust and intelligent service support network. It appointed Anil Zachariah as director, customer support, to be able to timely meet the service support needs of customers. In addition, EMC also invested in three logistic and spare parts depots in India in New Delhi, Mumbai and Bangalore to ensure the timely availability of spare parts to customers and engineers.

*Increased focus on NAS and CAS market:* EMC strategically appointed Manish Bapat as a new business manager for NAS and CAS to grow the market for these solutions.

B. Chandrasekar noted that Intransa, a leader in IP-SAN, was very active in India, and was in the forefront of making customers understand the virtues and benefits of quickly deploying IP-SAN. Intransa has been actively developing the channel. Amod Manjrekar at Renaissance Softech, the master reseller of Brocade in India, added that the company had been watching and exploring the storage industry for quite some time. It was set to grow exponentially and would be the next big thing in the IT industry.

Phillipe Cazaubon of Overland Storage said that acquisition of Okapi Software in June 2003 gave Overland the foundation of the REO product set. With this acquisition, Overland brought key developers (including one of the co-inventors of iSCSI) and marketing/sales experience in disk-based backup. This paid off in the awards the REO series had received (Best New Product, Best of the Best, Best New Storage Product, etc.) from reviewers and committees.

Cazaubon added: "We are meeting our revenue targets as planned and are optimistic with our REO D2D2T solutions. With new features on REO MultiSitePAC, (MultiSitePAC document file as attached), Overland will lead in this new market. Adding a virtual tape library capability during Q1-05 will round out the product set. Overland is fully focused on developing and supplying smart and cost-effective disaster recovery/protection solutions. We have also increased our R&D budget in 2004 and plan on introducing several innovations in 2005. Overland pioneered the scalability in the tape library industry when we introduced our LibraryXpress in the early 90s. We are now pioneering D2D2T solutions to improve data protection processes."

Allada noted that, as a global IT services provider and SI, Satyam Computer Services had understood the value of networked storage, and related services and technologies quite some time ago. Since 2000, it has been an active member of SNIA in USA and recently became a member of SNIA India. Satyam contributed to the storage technology, and storage market growth locally and globally, with its initiatives inside its own organization, and to its global clients. Satyam focused on evangelizing the new

advantages and the need for consolidated storage infrastructure and educated its client organizations on the higher RoI from IT infrastructure with reduced TCO in an advisory role for networked storage, storage management and the ILM strategies to be adopted.

He said: "At Satyam, enterprise storage solutions and services is a four-year-old practice, and there are two distinct areas - storage engineering services, and storage system integration - where this practice focuses on. Satyam works closely, and in partnership with global storage companies to deliver consultancy and implementation services to markets across the globe. It has a successful track record of offering outsourced services in storage engineering, product qualification and testing, product module development and product integration in heterogeneous environments. It also provides storage product software and hardware maintenance to its clients. Satyam's Virtualization appliance, which is a result of 30+ people months of effort and work, is a showcase of its competency and skills in storage technology, up to and at the protocol stack level and its understanding of market needs."

Satyam is also setting up a center of excellence (CoE) for enterprise storage. The CoE would be used for:

- Showcasing storage solutions for identified business domains and markets;
- Demonstrating storage solutions integration for an enterprise and service offerings for the market in identified areas along with partners; and
- Developing standards-based solutions in storage infrastructure with special focus on SMI, ILM and business continuity.

Satyam is also bringing out a range of service offerings like storage management operations center, outsourced storage infrastructure operations, and storage audits and consultancy. These services address a range of business domains like telecom, data warehousing, media and entertainment industry, and SMBs. "The industry partnerships we currently have and the new partnerships that we are working on will provide us the additional momentum and the reach required to be a preferred player in the storage industry, he said.

Sanjay Kharade pointed out that Cisco's storage networking portfolio leveraged its expertise in data networking and management to provide a multi-protocol, highly scalable and highly manageable platform. "Upon this, Cisco integrates industry standards and leading storage industry partner solutions to enable customers to build and manage larger, consolidated storage networks more cost effectively and efficiently. Today, businesses are recognizing the benefits of moving from DAS to a networked storage environment that allow storage resources to be shared much more efficiently. By combining our broad portfolio of multilayer intelligent storage networking products with industry-leading storage systems, Cisco is able to deliver tested and proven storage networking solutions. By deploying these solutions, small, medium and large enterprises can realize the efficiencies that minimize the total cost of ownership for storage, he said.

Cisco's storage networking solutions provided a better way of accessing, managing, and protecting the growing information resources across a consolidated FC, IP, Gigabit Ethernet, and optical network infrastructure. It also provides a comprehensive line of storage networking products, ranging from small-scale

storage routers to medium-scale and high-end multi-protocol intelligent fabric switches and directors. Its solution set comprises a comprehensive IP-SAN solution offering, including the SN5428/SN5428-2 storage routers and MDS FC directors/fabric switches with the IP services module. The products address both small/medium-scale and enterprise-wide IP-SAN deployments.

Lastly, Cisco's Go-To-Market strategy in the storage space aimed at working in partnership with its OSM (original storage manufacturer) partner, which included all key players, such as HP, EMC, HDS, IBM, etc. Cisco's IP-based SAN solutions are interoperable with solutions offered by all vendors.

**Concluded.**

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