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NETAPP FAQ

50% Virtualization Guarantee*

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September, 2008

PROGRAM DETAILS AND REQUIREMENTS

1 GENERAL PROGRAM QUESTIONS

WHAT DOES THIS PROGRAM PROVIDE?

You will use 50% less storage with NetApp or we will provide additional capacity at no additional charge.

50% LESS STORAGE COMPARED TO WHAT?

50% less storage compared to a baseline of traditional storage. The baseline is determined from the amount of data to be stored and the amount of storage overhead that a system of similar protection and performance levels typically requires. For example, suppose that you need a system to accommodate 10TB of data. Here's how we calculate the baseline:

- Add on 100% overhead for RAID 10 protection; 2.6% overhead for rightsizing and formatting; and two spare drives.
- Total raw capacity required for 10TB of data on a traditional storage system is roughly 21.75TB.
- 50% less storage means that the customer will need to purchase only 10.75TB of raw space with NetApp.

ARE THERE ANY OTHER ELIGIBILITY REQUIREMENTS TO PARTICIPATE IN THE PROGRAM?

- New FAS systems must be purchased for primary storage only. V-Series, S line, and VTL are excluded.
- The program is not applicable to N series from IBM.
- Can be using any one or more of the following protocols: FC, iSCSI, and NFS.
- Must be running Data ONTAP® 7.3 or later. Data ONTAP 10 is excluded.
- Capacity on the system supporting the virtual environment must be at least 14 drives.
- Must agree to have the following features enabled:
 - AutoSupport
 - RAID-DP®
 - Thin provisioning without LUN reservation
 - Deduplication
 - NetApp Snapshot™
- Must follow the NetApp best practices described in the following technical reports:
 - TR 3428: NetApp and VMware VI3 Storage Best Practices
 - TR 3505: Deduplication Implementation and Best Practices
 - Whitepaper: 50% Virtualization Guarantee Program Technical Guide
- The following services are required to help with the implementation. Must purchase a minimum level of Professional Services deployment and implementation services as follows:
 - NetApp Installation and Deployment
 - NetApp VMware Implementation Service
- No more than 10% of the following data types under the Program: images and graphics, XML, database data, exchange data, and encrypted data. This also means that large database.

exchange deployments are excluded from this Program. These data types are deduplicated at a lower rate

- Must have at least 10 similar virtual machines per flexible volume, so that deduplication can work properly to realize the capacity savings.
- Excludes workloads with high performance requirements that require spindles; to be determined by SE/PS during sizing.

WHEN WILL THE PROGRAM BE EFFECTIVE?

The program will start on September 30, 2008, and continue through March 31, 2009.

HOW LONG WILL THE PROGRAM BE VALID? WHEN DOES THE CLOCK START?

You will have 6 months during which to request recourse if you feel that the savings guarantee is not met. The clock starts when your system is shipped.

HOW DO YOU DEFINE A VIRTUAL INFRASTRUCTURE ENVIRONMENT?

Servers running virtual machines using VMware® ESX and the data accessed by these VMs, such as a home directory.

WHY IS NETAPP PROFESSIONAL SERVICE DEPLOYMENT REQUIRED?

We are 100% confident that you will use 50% less storage if the environment is configured properly based on NetApp best practices. NetApp Professional Services makes sure that your environment is optimally configured to meet your VMware storage requirements.

HOW DO I SIGN UP FOR THE PROGRAM?

Contact your NetApp account team or NetApp value-added partner.

WHAT IF I SUSPECT THAT THE STORAGE TARGET IS NOT MET?

If the system is more than 80% full, you can initiate a request by completing a checklist that walks you through common problems. If use does not improve, you can submit the form with all the required information. A NetApp representative will investigate the claim. If the claim is valid, NetApp will determine the capacity shortfall and process delivery of the additional storage.

I HAVE SOME QUESTIONS ABOUT THE PROGRAM. WHO SHOULD I CONTACT?

Existing customers should contact their account team or channel partner.

Prospective customers in the United States and Canada can contact the local sales rep or channel partner. Call 1-866-237-8987 (reference message 500); or have us contact you (go to <http://www.netapp.com/us/forms/sales-contact.html>).

Prospective customers in Europe, Asia, and Pacific should request us to contact you. Go to http://communications.netapp.com/p/Network_Appliance/Contact_Me?REF_SOURCE=virtguarantee.

2 ADDITIONAL QUESTIONS

THE BASELINE ASSUMES RAID 10, BUT MY ENVIRONMENT IS CURRENTLY USING RAID 5. MY BASELINE DOESN'T QUITE MATCH WHAT NETAPP IS ASSUMING. WHY IS THIS?

The Program is intended for comparison with traditional systems that are using the same protection level and with the same performance level. NetApp's best practice is double disk failure protection, which is why all of our systems come standard with RAID-DP.

RAID 5 offers inadequate protection and performance and does not measure up to the realities of today's virtualization environment, because the likelihood of a double disk failure and the cost of a failure have both increased dramatically:

- Increase in SATA drive size and storage system capacity increases the risk of a double disk failure.
- RAID 5 technology offers no protection at all during the rebuild period after a drive failure. Rebuild time with RAID 5 is also significantly longer than with RAID 10.
- The high consolidation ratio with VMware ESX deployments exacerbates the impact of data loss and long downtime.

Key storage vendors and application vendors have recognized the importance of double disk failure protection and performance and have made it into their best practice. Here are some quotations from documents published by Microsoft, HDS, IBM, and EMC:

- The Microsoft Exchange storage planning guide, outlined on Microsoft® TechNet ([http://technet.microsoft.com/en-us/library/bb738146\(EXCHG.80\).aspx](http://technet.microsoft.com/en-us/library/bb738146(EXCHG.80).aspx)), recognizes RAID 10 as their best practice for protection, performance, and rebuild time:
- "The type of RAID to select also depends on the data being stored and the controller being used. Transaction logs are the most important data set, and good write latency is critical for server performance. When using a storage controller that is RAID agnostic, transaction logs should be placed on RAID-1 or RAID-1/0 arrays with battery-backed write cache.... Likewise, when using a storage controller that is RAID agnostic, RAID-1/0 is the ideal configuration for databases, and it works well with large capacity disks."
- "For both RAID-5 and RAID-6, rebuild performance can have a significant effect on storage throughput. Depending upon the storage array and configuration, this effect could cut storage throughput in half. Scheduling rebuilds outside of production hours can offset this performance drop, but doing so sacrifices reliability."
- Similarly, the Microsoft technical article, SQL Server 2005 Physical Database Storage Design," compares RAID 10 and RAID 5 for SQL environments:
- "For excellent performance and high reliability of both read and write data patterns, use RAID10. For read-only data patterns, use RAID5."
- "RAID5 can have much lower write performance than any other configuration because it requires extra reading and writing activities for the parity blocks in addition to reading and writing the data."

- The HDS white paper, "Why Growing Business Need RAID 6 Storage," emphasizes that double disk failure protection is critical for all enterprises and explains why:
- "Storage administrators in large and enterprise-sized organizations understand these issues and concepts. That is why they seek out the best, most cost-effective protection for their RAID groups. That often means RAID-6. Most FORTUNE 1000® companies now use RAID-6, or a comparable level of RAID protection, in their high-end disk systems. Even Seagate Technology and Microsoft Corporation are now recommending the use of RAID-6 (or full mirroring) with the use of large SATA drives, due to the inherent SATA bit error rate. And increasingly, small and medium businesses are coming to the same conclusion: they need RAID-6 to protect their data in a cost-effective manner."
- "Using calculations by Adaptec... With a typical RAID-5 configuration using 1TB SATA drives in an 11 drive RAID group, the probability of data loss due to the combination of a disk failure and the bit error rate is 7.7 percent. With a RAID-6 system of the same size, the probability of data loss from the combination of a disk failure and the bit error rate is virtually 0 percent."
- "With larger drives, it takes more time to rebuild a RAID group after a drive fails. The process of rebuilding a 1TB drive in an 11 drive RAID group takes at least 24 hours in an idle storage system. The same drive rebuild can take in excess of a week to complete in a busy system. During this time, your data is at a heightened risk if you are using RAID-5 or some other single-parity disk system."
- The IBM technical report, "Microsoft Exchange Server 2007 and IBM System Storage N series with RAID-DP Best Practices," presents an extensive mathematical proof of why RAID-DP is required:
- "This paper compares four RAID types from three different angles: protection, performance and price. Based on test results, internal expertise and data in the public domain, it is clear that the IBM System Storage N series RAID 6 implementation, RAID-DP, is the best and most reliable technology for enterprise Exchange Server 2007 environments."
- "Probability of data loss with RAID-DP is 0.002% in five years for RAID groups with seven data disks. For RAID 10, with only one data disk, the probability of data loss in five years is 0.33%, or 163 times as likely as RAID-DP, even though the RAID-DP group has seven times the capacity of the RAID 10 group. With RAID 5, the probability of data loss is approximately 6% in five years for seven data disks, approximately 4,000 times as likely to occur as in RAID-DP. Only RAID-DP and RAID 6 can best protect against data loss for large configurations."
- The EMC best practice guide, "VMware ESX Server Using EMC Clariion Storage Systems Solution Guide," recommends a complicated mixture of RAID 5 and RAID 10 protection, depending on the data type being protected and the I/O requirements:
- "Virtual machines that are anticipated to have a write-intensive workload should use RAID10 protected devices on medium size, fast Fiber Channel drives... The log devices of databases should be on RAID10 protected devices... The virtual machines that

generate high small block random I/O read workload, such as Microsoft Exchange, should be allocated RAID 10 protected volumes.”

WHY DON'T YOU COMPARE TO RAID 6 IN YOUR BASELINE?

Although RAID 6 offers a level of protection that is comparable to RAID-DP, it is widely known in the industry that there's a performance hit on write and also during rebuild time. More spindles are needed to compensate for additional I/O required, which increases the up-front capital cost as well as ongoing operational costs in the form of data center space, power consumption, and cooling cost.

* The Guarantee is limited to the terms set forth in this document. The Guarantee is dependent upon your compliance with the terms and conditions set forth in this document and any of the instruction sets and specifications set forth in the referenced documents. NetApp's sole and exclusive liability and your sole and exclusive remedy for a breach of this Guarantee is the provision by NetApp free of charge of the additional storage capacity as set forth in this Guarantee.

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