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Storage Area Networks: Transmission Requirements and Usage

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“A storage area network (SAN) is a high-speed special-purpose network (or Subnetwork) that interconnects different kinds of data storage devices with associated data servers on behalf of a larger network of users” (Brennan & Olanie, 2008). Also, “A SAN consists of a communication infrastructure, which provides physical connections; and a management layer, which organizes the connections, storage elements, and computer systems so that data transfer is secure and robust” (Tate, Lucchese, & Moore, 2006, p. 24). Essentially, a SAN is a network of storage mediums, whereby the interconnections of those mediums determine the overall speed and capacity of the SAN.

In a network architecture scheme, a SAN is expressed in three separate ways. The first is server to storage, which allows multiple connections to a single storage device from separate servers. Secondly, there is server to server. This allows connections between two or more servers which need to share data. Finally, storage to storage allows two or more storage devices to share data without the intervention of an independent server (Tate, Lucchese, & Moore, 2006, p. 25).

One needs to keep in mind that a SAN and a NAS are two separate things. While a SAN is a network of storage devices, a NAS (network attached storage) is a single storage device used on a network. Where the two part ways is that, a SAN was originally the best way to obtain a large amount of storage overhead at the least cost. This was done by connecting multiple storage devices via SAN and pooling their resources. However, in recent years, storage capacity of NAS has seen this cost effectiveness decrease, and as such, a convergence of NAS/SAN hybrids can be seen in many networks (Mitchell, 2012).

It is recommended that the current SAN generation use a fibre channel of 20 gigabit per second. Mind you, this is for top end SANs as of 2011. Previous versions required as low as 1 Gb, but could only incorporate 10s of ports, whereas, current generations can incorporate 100,000s of ports (Kipp, 2007). There is also the possibility of using iSCSI (Internet Small Computer Systems Interface), which offers slower speeds than fibre channel.

Latency is a relative concept when it comes to storage and their uses. The Rolls-Royce of latency would be <=1ms (e.g. a direct connection or a few hops via fibre channel). However, this is not always possible. For instance, cloud SANs, where data is stored remotely overseas (think Gmail), has a higher latency than a corporate SAN. Never-the-less, latency is only a factor when the data contained in the SAN has a requirement for near instant I/O. This is usually seen in transactional databases, where input/output is happening from multiple locations, at high volumes, and at random intervals. With that said, a latency of <300 ms is still feasible, so long as buffer capacity and jitter is taken into account.

Reliability in a SAN is a must. The entire reason for operating and maintaining a SAN is to have access to storage throughout a network. This is accomplished via redundant mirrored nodes, just as in a LAN there are redundant router/switch connections, so that node failures do not see a SAN come to a halt. For instance, creating two storage servers each mirroring the other via raid over SAN so that if one is unavailable the data is still accessible via the backup.

Data packet sequence delivery is another relative concept when it comes to SANs. In most cases, SANs follow along the same path as IP packets, first out-first in (and vice versa). Nevertheless, out of order delivery (OOD) is possible. So long as the order of delivery is not detrimental to the application in question (OOD can be seen in torrent packet transfers) (Brocade, 2009).

Jitter is connected to latency, reliability, sequence delivery, and in essence, QoS (quality of service). The type of data being transferred on the SAN determines the overall amount of acceptable jitter within the packet transfers themselves. Essentially, a SAN with a low mean latency should not have to worry about jitter as the transfer of packets is near instantaneous via fibre channel. However, a large spread out SAN will have ISPs between the separate nodes which will put into effect QoS rules which will introduce or decrease jitter as required for the data being transmitted (Chadda, 2004).

Keeping in mind that higher latency means a possible increase in higher jitter, there is an argument of using an iSCSI array rather than a fibre channel array for the SAN. The overhead cost savings of iSCSI is the most apparent factor. That being said, if cost is the primary concern, perhaps a setup of NAS via IP would be the better solution. Remember that iSCSI is slower than fibre exponentially, and therefore brings with it an exponential increase in latency.

The point being, SANs are generally a performance enhancer of medium to large enterprise sectors. If you are any smaller, than a SAN is probably not even a concern yet. As such, a slow iSCSI connection is not a viable option when dealing with a SAN setup. Therefore, in terms of implementing a SAN, the intrepid network administrator needs to first develop a forward forecasting network plan for their fibre infrastructure. In essence, develop their network not for today’s needs, but for what they will need three to four years down the track. While this will increase the costs in the present, it will decrease the costs of rebuilding their network down the track when infrastructure demands increase (Thilmany, 2009).

The next thing to determine is how the SAN should behave. Is it going to act as one enormous virtual disk, is it going to be split up into separate storage areas, or is it going to be a combination of the two? Depending on any of these options, the network administrator can choose to go a hybrid SAN/NAS route, whereby, some of the SAN nodes (identified by their LUNs (logical unit numbers)) are in actuality NASs.

In terms of conflict, if the SAN is initially being created, there may be some applications which, for whatever reason, cannot support a SAN setup. Although, this should not be an issue as the SAN can be configured to look like any form of medium to the application interface. After all, SANs are a form of storage. A correctly configured SAN should not interfere with the presentation layer of the OSI model.

Storage Area Networks are a way to increase storage capacity for enterprise use. They offer an alternative way of maintaining large volumes of data beyond a NAS. Whether this is for software support, virtualization (think VMWare or Citrix), or simply massive amounts of file share (although a NAS would probably be good enough unless you’re Google). It is all about data.

Reference

Brennan, L. L., & Olanie, M. (2008, September). *Storage Area Network (SAN).* Retrieved April 24, 2012, from SearchStorage: http://searchstorage.techtarget.com/definition/storage-area-network-SAN

Brocade. (2009). *Fibre Channel In-Order Delivery: What IOD Really Means in the Context of FC Storage Area Networks.* Retrieved April 24, 2012, from Brocade: http://www.brocade.com/downloads/documents/videos/Performance/Fibre\_Channel\_In-Order\_Delivery\_v1.0.pdf

Chadda, A. (2004, December). *Quality of Service Testing Methodology.* Retrieved April 24, 2012, from University of New Hampshire: ftp://ftp.iol.unh.edu/pub/mplsServices/other/QoS\_Testing\_Methodology.pdf

Kipp, S. (2007, July). *SAN and NAS Bandwidth Requirements.* Retrieved 2012 24, April, from IEEE 802 LAN/MAN Standards Committee: http://www.ieee802.org/3/hssg/public/july07/kipp\_01\_0707.pdf

Mitchell, B. (2012). *SAN vs NAS - What is the Difference?* Retrieved April 24, 2012, from About.com: http://compnetworking.about.com/od/networkstorage/f/san-vs-nas.htm

Tate, J., Lucchese, F., & Moore, R. (2006, July). *Introduction to Storage Area Networks.* Retrieved April 24, 2012, from IBM Redbooks: http://www.redbooks.ibm.com/redbooks/pdfs/sg245470.pdf

Thilmany, J. (2009, February 27). *Set Up a Basic SAN.* Retrieved April 24, 2012, from Processor: http://www.processor.com/editorial/article.asp?article=articles%2Fp3109%2F15ap09%2F15ap09.asp