Re-Stor Online Backup

Whitepaper – Backup speed

Jan 2006

Table of Content

1 Introduction

This document contains results of the test on backup speeds for the backup operation between Re-Stor Offsite Backup Server (OBS) and Re-Stor Online Backup Manager (OBM). It serves as a reference for partners and customers in planning their hardware and network capacity.

2 Delta Generation

2.1 Hardware and Software Setup

The list of hardware and software is shown in the following table:

	Hardware	Software
Backup Server (Backup destination)	- Intel Xeon 2.8GHz CPU - 2GB ram	- RedHat Enterprise Linux AS4 - Re-Stor Offsite Backup Server
Client Workstation (Backup source)	- Intel Pentium Dual-Core CPU 3.2 GHz - 2GB ram	- Windows 2003 Server - Re-Stor Online Backup Manager

2.2 Test Scenarios

Overview

In the test, there are 4 file backup sets, each contains files of different numbers and sizes as described in the following table.

File Backup Set	Average file size	Total number of files	Number of folders	Total Size (GB)	Compressed Size (GB)
Small-files	**2Kb**	**1903685**	1007	2.45	1.96
Medium-files	**200Kb**	**10000**	1010	2.38	1.90
Large-files	**20Mb**	**100**	10	2.44	1.95
Huge-files	**200Mb**	**10**	1	2.44	1.95

Test Cases

All the 4 backup sets are with the following settings:

- Transfer block size is 128 Kb
- "In-File Delta" option is turned off
- Encryption is enabled (AES – CBC mode).

We have tested with different network bandwidths (uplink) for each of the backup set. The network constraint was achieved by limiting the bandwidth of the particular backup account with the following assumptions:

1. ADSL and SDSL have a down/up bandwidth up to 1.5Mbps/640Kbps and 2Mbps/2Mbps respectively. From trace route, they have gone through 12 routers/networks before reaching the Backup Server.
2. T1 has a bandwidth up to 1.544Mbps.
3. LAN has a bandwidth up to 100Mbps.
4. The average compression ratio of the files is only 80%.

And the results are outlined in the next section.

3 Results

3.1 Upload Time

The time required for the backup operations with different network bandwidth are summarized below:

Test Case	Network Bandwidth (down/up)	Actual / Compressed Size (GB)	Time taken (HH:MM:SS)	Transfer rate (MB/min)
Small-files (2Kb)	ADSL (1.5Mbps/640Kbps)	2.45 / 1.96	15:12:17	2.2
	SDSL (2Mbps/2Mbps)	2.45 / 1.96	05:22:41	6.22
	T1	2.45 / 1.96	05:22:09	6.23
	LAN	2.45 / 1.96	05:21:38	6.24
Medium-files (200Kb)	ADSL (1.5Mbps/640Kbps)	2.38 / 1.90	13:04:31	2.48
	SDSL (2Mbps/2Mbps)	2.38 / 1.90	04:23:38	7.38
	T1	2.38 / 1.90	03:10:22	10.22
	LAN	2.38 / 1.90	00:49:37	39.21
Large-files (20Mb)	ADSL (1.5Mbps/640Kbps)	2.44 / 1.95	13:12:23	2.52
	SDSL (2Mbps/2Mbps)	2.44 / 1.95	04:29:07	7.42
	T1	2.44 / 1.95	03:05:14	10.78
	LAN	2.44 / 1.95	00:31:24	63.6
Huge-files (200Mb)	ADSL (1.5Mbps/640Kbps)	2.44 / 1.95	13:38:22	2.44
	SDSL (2Mbps/2Mbps)	2.44 / 1.95	04:25:11	7.53
	T1	2.44 / 1.95	03:12:11	10.39
	LAN	2.44 / 1.95	00:59:57	33.31

3.2 Observations

For a backup set with a large number of small files, there is not much improvement in the backup speed even though the bandwidth has been increased. The bottleneck is thus on client workstation where the files are being processed and encrypted.

For a backup set with an average number of medium-sized files, increasing the uplink bandwidth does improve the backup speed by a significant amount. This reflects that, with lesser number of files, the bottleneck is switched to the network instead. In other words, the larger the number of files, the more processing is required on the OBM machine.

And for a backup set with smaller number of large files, similar patterns are observed. Namely, the backup speed is significantly improved when the uplink bandwidth is increased.

3.3 Conclusion

The time required for a backup (or backup speed) depends very much on the backup set's constitution. Other than uploading a large number of files (over 2 million files) in a single backup, network latency is the major constraint on the backup speed.

In general, for a large number of small files (e.g. File system backup), the uplink bandwidth is relatively less important as the stress would be on the CPU of the source machine. In this case, a more powerful OBM machine could improve the backup speed. On the other hand, with smaller number of big files (e.g. MS Exchange, MS SQL backups), the available uplink bandwidth would have bigger impact on the overall backup speed.

At the planning stage, system administrators should choose the most cost-effective bandwidth in their situations. Following are some of the factors that they might need to consider:

- Type of backups
- Anticipated data volume
- Backup frequency
- Performance criteria
- Budget constraints
- Trade off between performance and costs
- Expected growth in data volume