High Availability for Windows NT/2000

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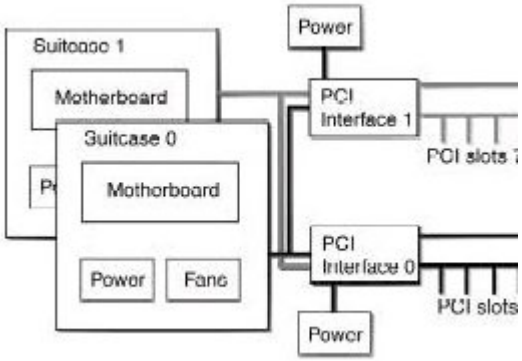
Defining Availability

Fault Tolerance

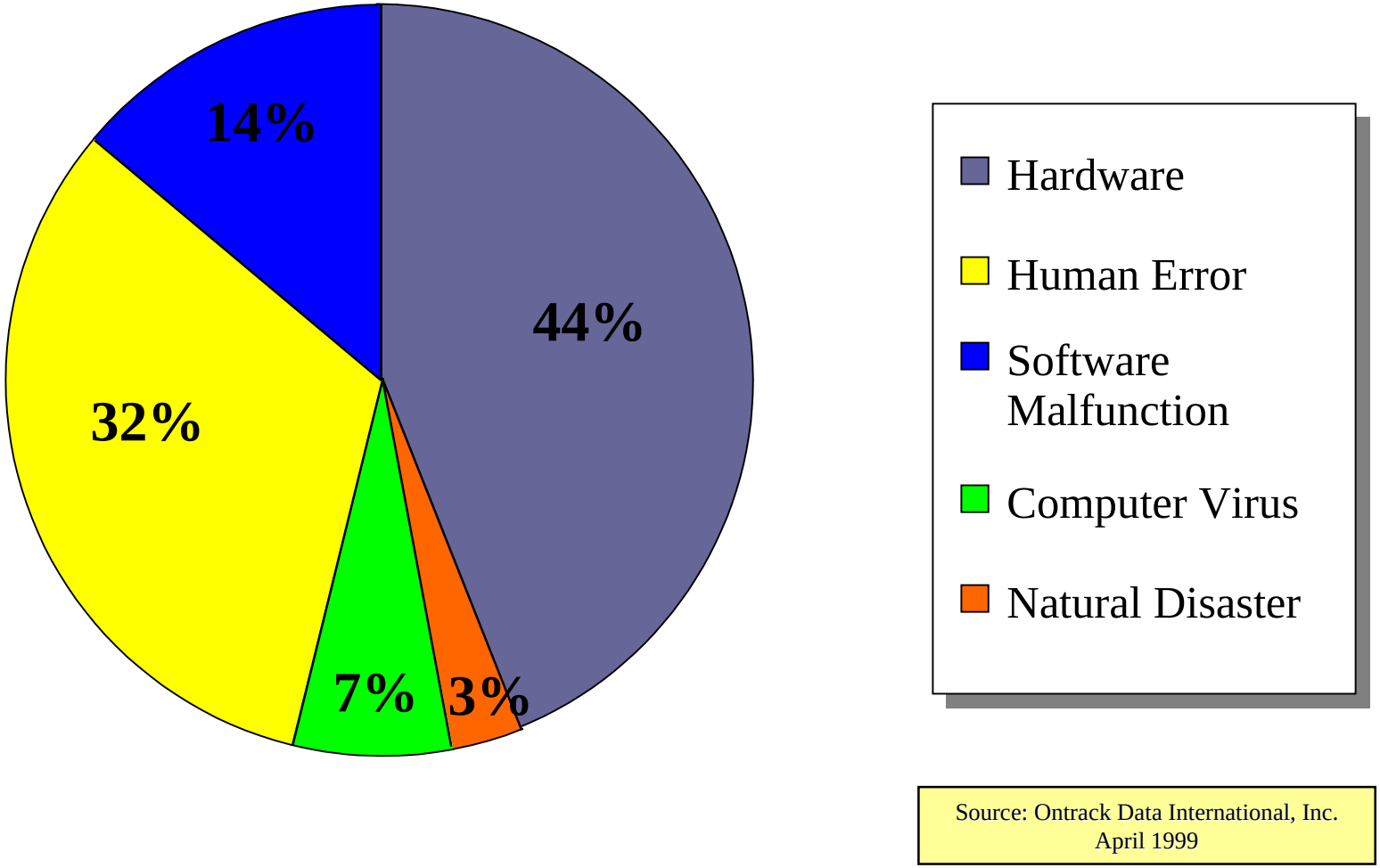


- Level deeper than HA
- Proprietary / Complex
- Utilize redundant system memory - cache
- 0 downtime = VERY costly

High Availability

- Take advantage of software and hardware
- Open Systems
- 99.999% uptime at reasonable costs

How we lose information



Source: Ontrack Data International, Inc.
April 1999

Costs of Information Loss

Lost Revenue Associated With Application Outages

Application	Cost Per Min
Call location	$27,000
Number portability	$14,000
Enterprise resource planning	$13,000
Supply chain mgmt	$11,000
Electronic commerce	$10,000
Internet banking	$7,000
Universal phone services	$6,000
Customer service center	$3,700
POS/EFT	$3,500
Messaging	$1,000

IDC April '99

Cost of downtime is the easiest way to justify purchases

Target HA Customers:

- WEB / E-Commerce
- Firewall
- Financials Database
- Telco
- MFG

96.5% Uptime = 306.6 hours of downtime - Can your afford this?

*** 96.5% uptime is average uptime w/o HA software.**

NT Downtime Report

Source and Methods Required to remedy NT Downtime

Downtime Source	Recovery Method	Average Outage Time
Scheduled maintenance	Restart	60-180 minutes (typically)
Application failure	Reboot / Reload	15-60+ minutes
Operator error	Reboot	15-60 minutes
OS failure	Reload	30-90 minutes
Blue Screen of Death	Restart / Reload	30-120 minutes
Hardware failure	Diagnose / repair	1-3 hours
Power / environmental	Third party repair	1-5 days
Natural disaster	Relocate / Restart	1-3- days

Pub. Windows NT MSCS
- Richard Lee

Enterprise Storage Needs on Windows / NT

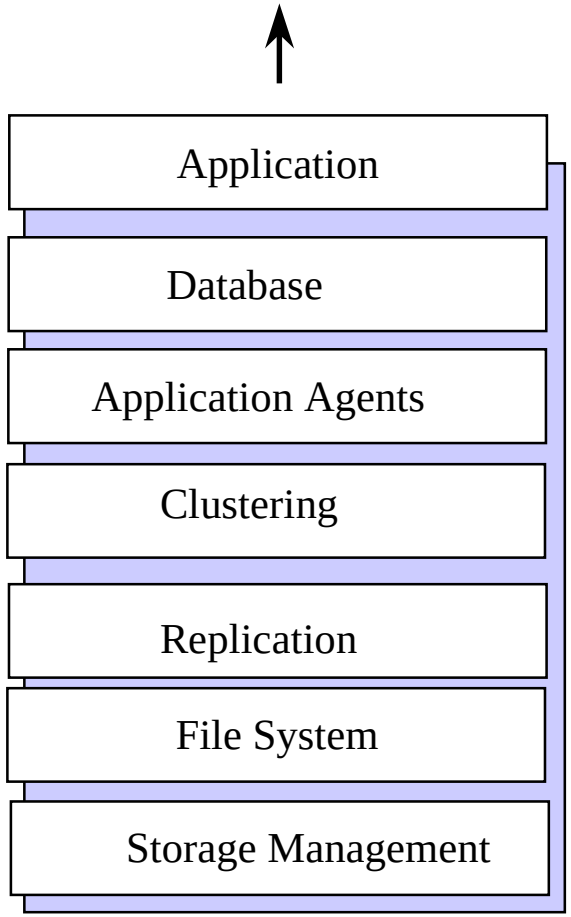
“Mission-Critical” on Windows / NT

Application	Deployed	Mission-Critical
Internet/Web	**80%**	**47%**
MS SQL Server	**69%**	**55%**
Exchange	**59%**	**77%**
Lotus Notes	**43%**	**70%**
ERP	**16%**	**72%**

Source: Dataquest 1999

Comprehensive Availability

HIGHLY AVAILABLE APPLICATION SERVICE



Sample Configuration

Application Agents

- Application recognized API
- Integrated for higher availability service

Replication

- Replicate multiple data sets
- Disaster Recovery
- Replicate up to many sites
- Synchronous or Asynchronous replication

Clustering

- High Availability software
- Automated fault management
- Simple to deploy and manage
- Flexible and comprehensive
- Proven reliable

File System

- Fastest commercial file system available
- Data integrity
- Fast recovery
- On-line management

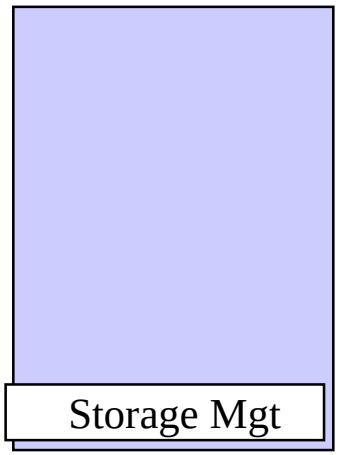
Storage Management

- Data availability (RAID)
- Performance tuning
- On-line management
- GUI for ease of use

Storage Management

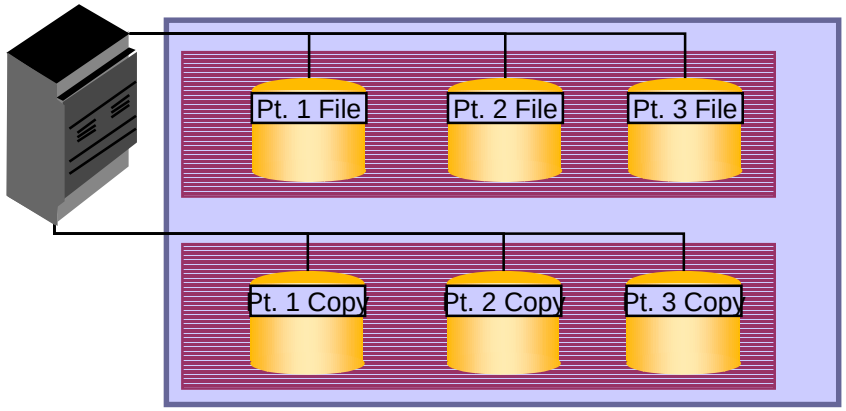
Comprehensive disk and array management

- Common management across OS/storage platforms
- Flexible online management
- Better data redundancy/protection
- Increased performance
- No (or minimal) downtime for planned maintenance/change
- Ensure optimal use of on-line storage resources
- Storage virtualization in a SAN environment



Host-based RAID

Software/ Host-based RAID



RAID 0 or Striping:

Stripes data across all drives. No Redundancy.

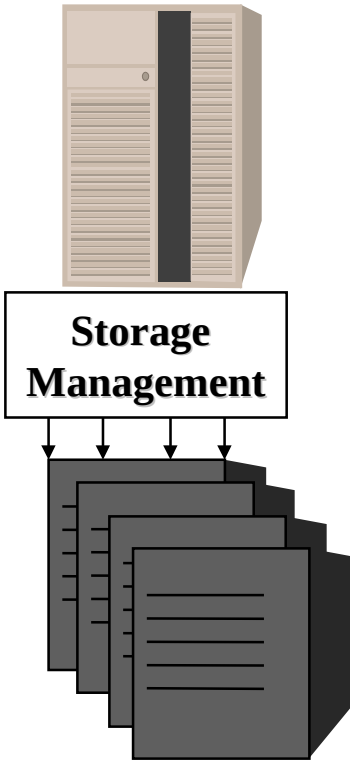
RAID 0 + 1 or Mirrored Stripes:

Stripes data across all drives. Mirror with another RAID 0 column. Redundancy with Full Performance.

HA through Storage Management

Minimize downtime for scheduled maintenance

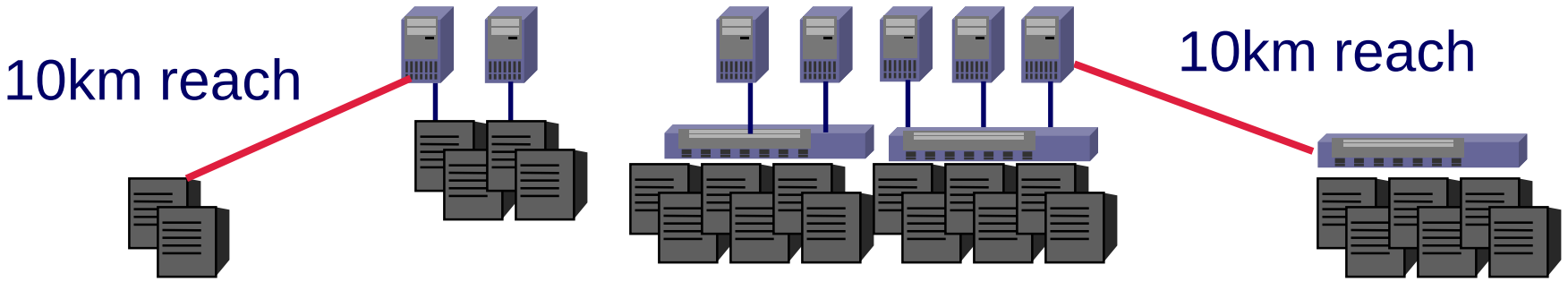
- **Grow volumes online**
- **Migrate data from one array to another**
  - Upgrade arrays
  - Change array vendors
  - Growing storage outside 1 array
- **Reconfigure storage while applications remain available**
- **Migrate data from one server to another**
  - Upgrade server
  - Upgrade OS



HA through Storage Management

Protect against array failure

- **Mirror between arrays**
  - Controller failure
  - Power failure...
- **Mirror over fiber for campus-wide availability**



Performance = Availability

No performance

- users complain that system is not available
- users go somewhere else (competition)
- some applications are sensitive to performance

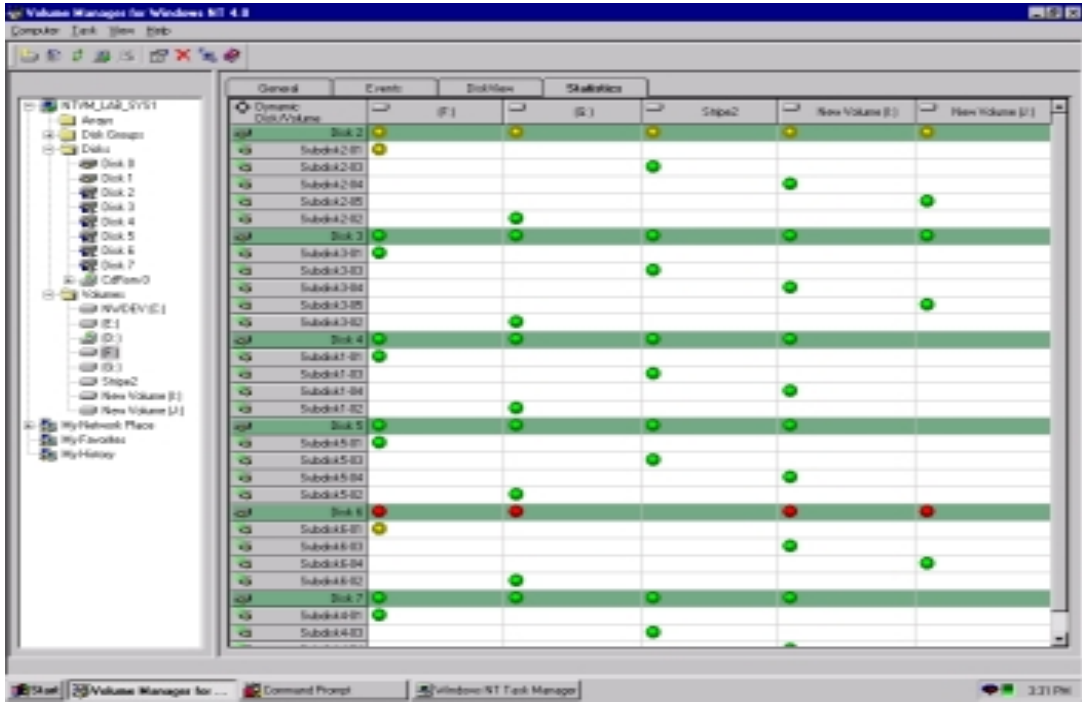
Achieve high performance by:

- **Striping across multiple disks and/or arrays to maximize I/O throughput**
- **Load balancing among multiple mirrors to accelerate read performance**
- **Load balancing across multiple paths between arrays to accelerate read and write performance**
- **Online relocation to eliminate performance bottlenecks**
- **Striping/Load balancing across arrays**

Storage Performance Tuning

Online Performance Tuning

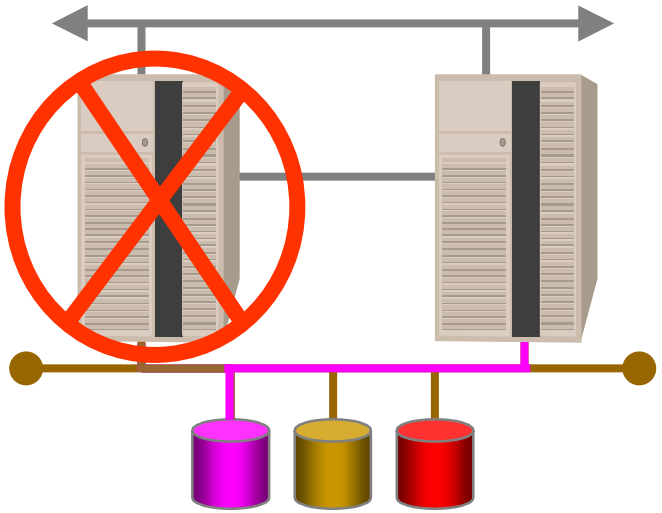
- **Hot spot detection**
  - Identify high I/O activity disk
- **Online subdisk move**
  - Relocate a high I/O activity subdisk region to another low I/O activity disk to smooth out the I/O bottleneck



Storage Management & Clustering

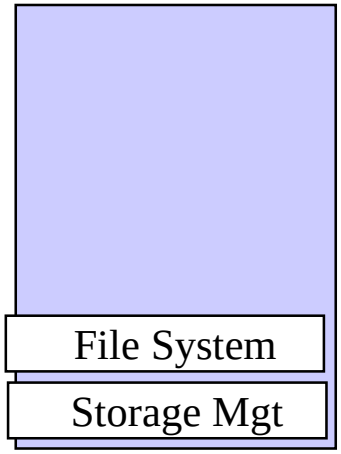
Easy failover of data

- Disks are logically grouped by their application
- This group of disks can be moved by a admin command or automatically by clustering software

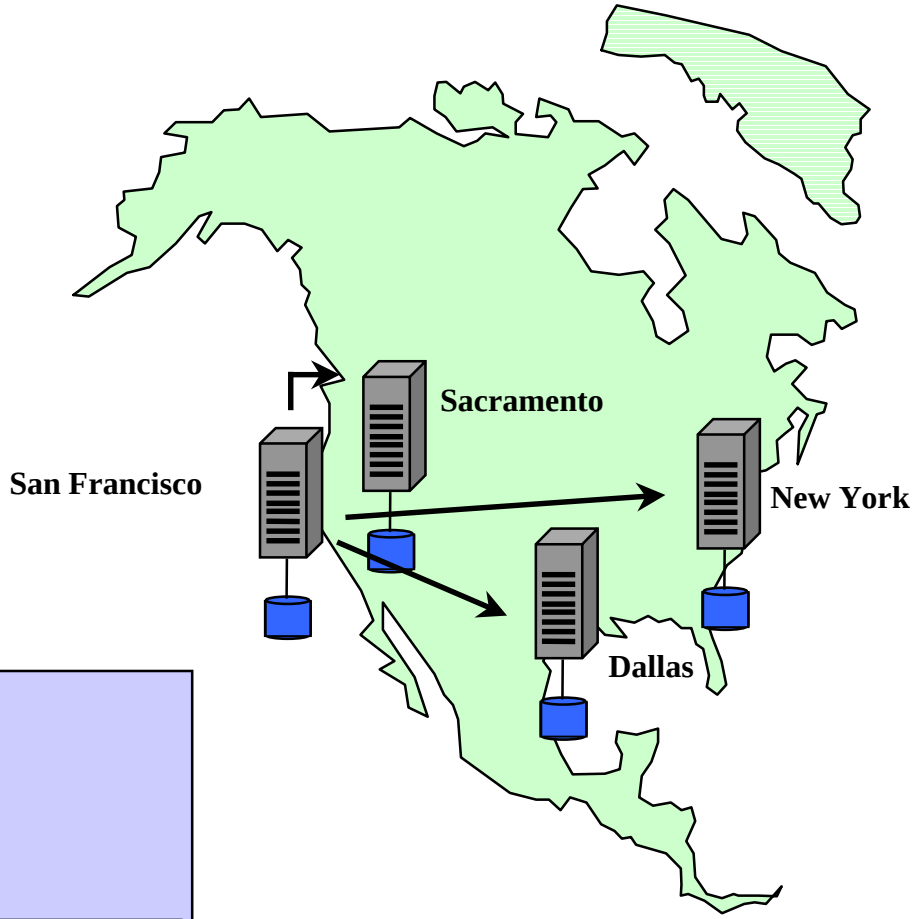


File System & HA - Wish List

- Has scalable performance
- Allows management and reconfiguration of file system on-line
- Recovers quickly from system failure
- Provides file system data integrity
- Limits impact of partial system failure
- Can be backed up without interrupting user access



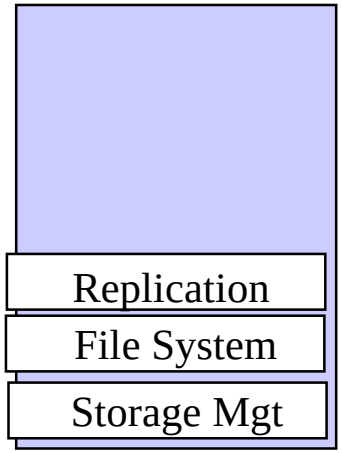
What Is Replication?



- An automated way to keep the changing data states of distributed nodes continuously synchronized

SYNCHRONOUS

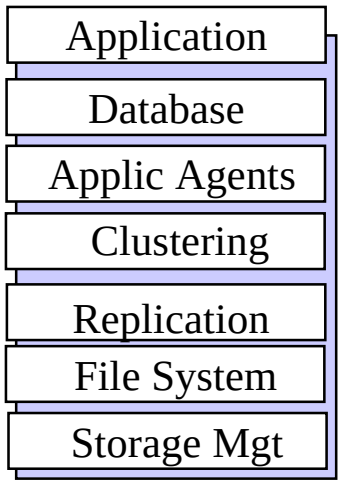
ASYNCHRONOUS



Clustering for NT

Choose the clustering solution which is:

- Easy to install, configure and manage
- Application level cascading failover
- Fast node to node communication & failover
- 3rd party support for your storage
- Agent support for your software or an easy way to create agents
- Scalable
- Integrates easily with your environment



High Availability Planning

Down time objectives - (7 x 24? or 5 x 9?)

Application availability - Exchange? Database?

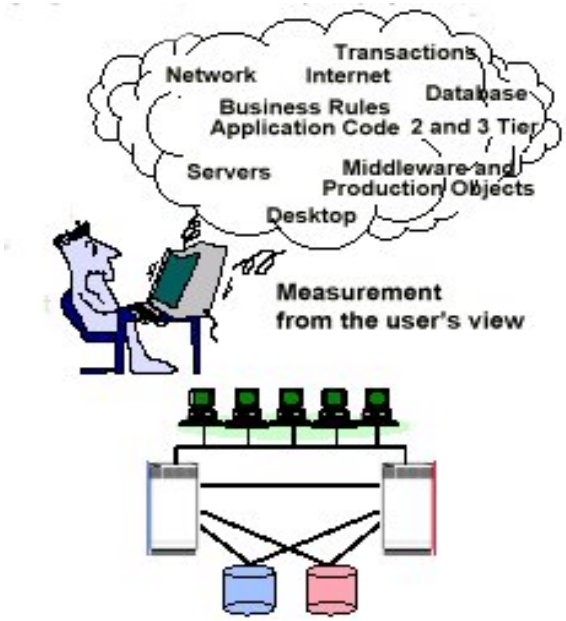
Data growth expectancies

- Mergers / Acquisitions

Administration

User expectations

- Training & Support
- Accessibility



An untested plan is not a plan!!!!

Understand the evolution of your business

Thank you