Symantec Backup Exec Blueprints
Blueprint for Performance Tuning

Backup Exec Technical Services

Backup & Recovery Technical Education Services

Notice

This Backup Exec Blueprint presentation includes example diagrams that contain objects that represent applications and platforms from other companies such as Microsoft and VMware. These diagrams may or may not match or resemble actual implementations found in end user environments. Any likeness or similarity to actual end user environments is completely by coincidence.

The goal of the diagrams included in this blueprint presentation is not to recommend specific ways in which to implement applications and platforms from other companies such as Microsoft and VMware, but rather to illustrate Backup Exec best practices only.

For guidelines and best practices on installing and configuring applications and platforms from other companies, please refer to best practice documentation and other resources provided by those companies.

Backup Exec Blueprints: How to Use
Getting the most out of Backup Exec blueprints

- These **Blueprints** are designed to show customer challenges and how Backup Exec solves these challenges.

- Each **Blueprint** consists of:
  - **Pain Points:** What challenges customers face
  - **Whiteboard:** Shows how Backup Exec solves the customer challenges
  - **Recommended Configuration:** Shows recommended installation
  - **Do's:** Gives detailed configurations suggested by Symantec
  - **Don'ts:** What configurations & pitfalls customers should avoid
  - **Advantages**: Summarizes the Backup Exec advantages

- Use these **Blueprints** to:
  - Understand the customer challenges and how Backup Exec solves them
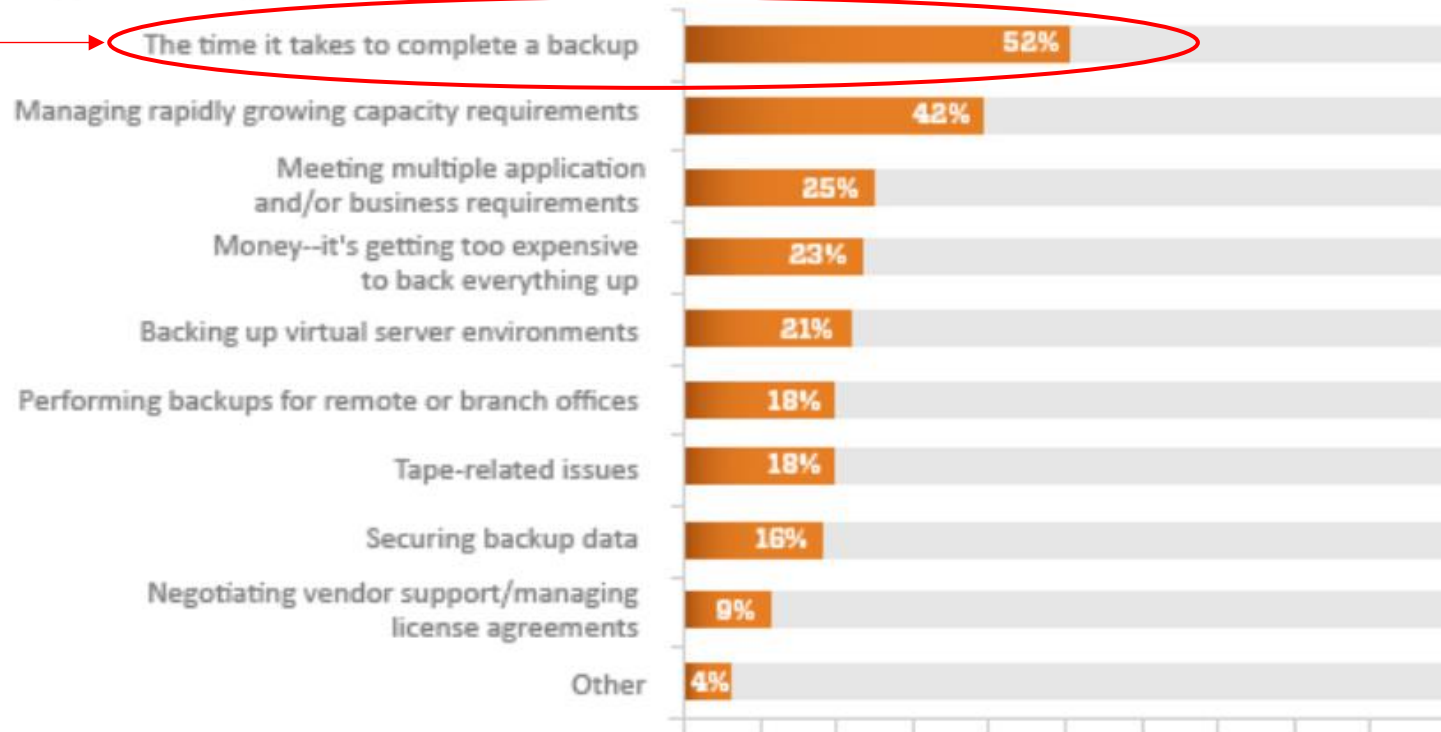 - Present the Backup Exec best practice solution

Pain Points

- Configuration and Tuning
  - As we talk about "Tuning" today, we are talking about matching the components in the environment properly AND proper configuration of those components, in addition to actual "tuning"

- Performance is a Hot Topic
  - Some of the most commonly asked questions posed to Backup Exec technical support relate to performance
  - Most performance issues can be traced to hardware/environmental issues
  - Basic understanding of the **entire** backup data path is important in determining maximum obtainable performance
  - Poor performance is usually the result of unrealistic expectations and/or poor planning

- **The Bottom line – It's All About Bandwidth**

Biggest backup challenges you face today:
(Up to 3 answers permitted)

Challenge	Percent
The time it takes to complete a backup	52%
Managing rapidly growing capacity requirements	42%
Meeting multiple application and/or business requirements	25%
Money--it's getting too expensive to back everything up	23%
Backing up virtual server environments	21%
Performing backups for remote or branch offices	18%
Tape-related issues	18%
Securing backup data	16%
Negotiating vendor support/managing license agreements	9%
Other	4%

Source: TechTarget

Source: TechTarget

Introduction

- Performance Dependent Upon Hardware
  - Different hardware will have different throughput capabilities
  - "Matching" the throughput will help avoid bottlenecks
  - Goal is to make the final storage point the bottleneck (i.e. the tape drive)
- Tuning Provides Higher ROI
  - Reduces the need to buy more hardware
  - Improves scaling
- Tuning Helps Paint the Full Picture
  - Helps provide understanding of how everything works together
  - As you tune, you become more familiar with your environment
  - A data protection solution has a lot of "moving parts"
  - Each much be balanced from end to end
- Tuning Reduces Management Costs
  - If things are running smoothly, less time is needed to baby sit backups

Notes and Best Practices

- Setting Proper Expectations
  - Never expect to exceed 70% of the rated capacity of any component
  - Manufacturer performance specifications based on theoretical environment – seldom (if ever) achieved in real world
  - Trust us on this one ☺

- 70% Rule Applies Everywhere
  - Disk, CPU, Network, Memory, Internal Bus, Fiber Channel, etc.
  - Response time **significantly** increases after 70% utilization threshold is exceeded
  - **Tape drives are an exception to this rule**

Response Time*

(latency - ms)

As throughput approaches 100%, response time is 7 times the minimum

Percentage of Maximum Throughput (bandwidth)
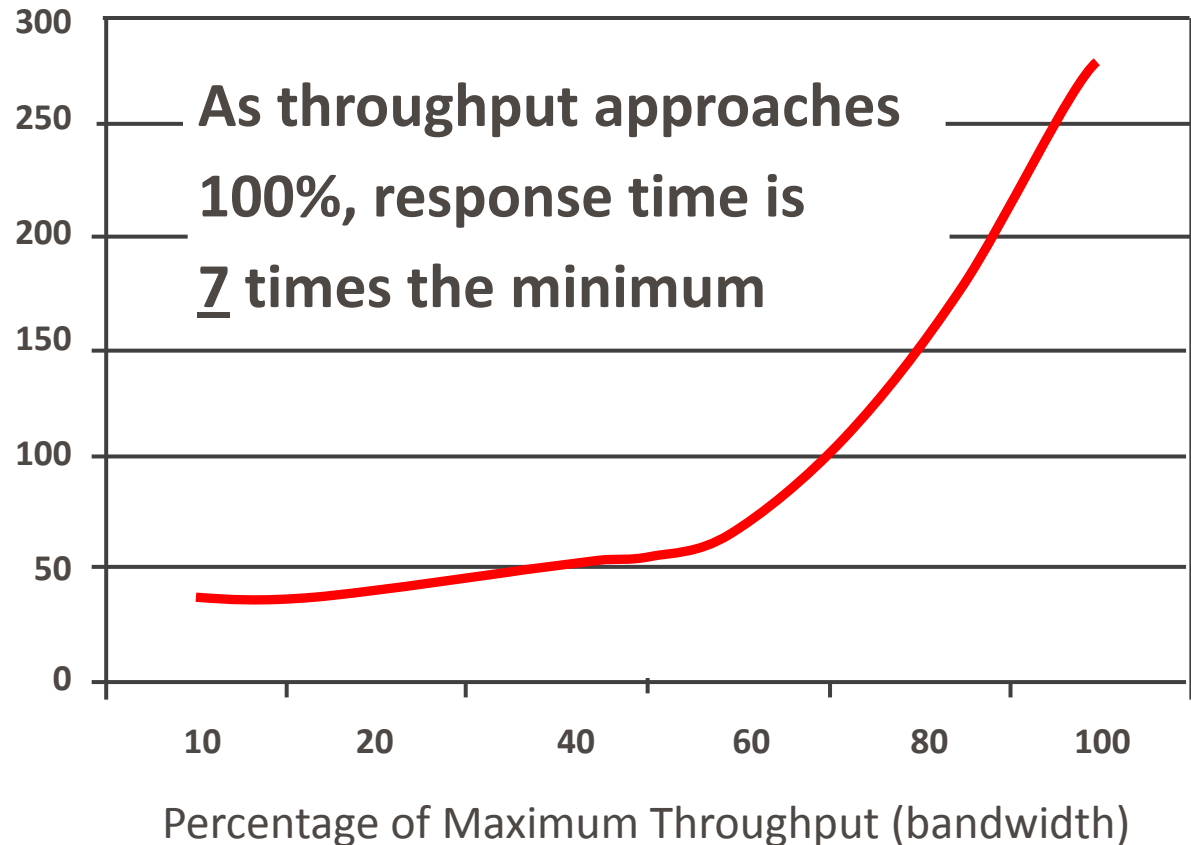
*Hennessy & Patterson, "Computer Architecture – A Quantitative Approach"

- ## Main Backup Exec Server Tuning Settings
  - Buffers

- ## Use Exclude Lists – Not Include Lists
  - Guaranteed you will pick up added drives
  - Do you really need 1000's copies of the "WINDOWS" folder?
  - Have you looked at **Deduplication**?
    - Stop backing up the same file over and over

- ## Perform Fewer Full Backups
  - Most RTO are not strict enough to warrant frequent Full backups
  - Change your backup paradigm
  - Synthetic backup can help here

- Finding the Right Hardware Configuration
  - So……. what servers should I purchase?
  - This question is like the "How long is a piece of string" question
  - It all depends on your requirements and your goals/needs

- Some Basic Hardware Guidelines:
  - CAS Servers – High CPU requirement, lower I/O
    - As a general guideline, CAS servers should have multiple CPU's and lots of RAM
  - Managed Backup Exec Server – Lower CPU requirement, High I/O
    - As a general guideline, Managed Backup Exec Servers should have PCIExpress bus
  - Any Backup Exec Server – Buy Something That Can Be Upgraded
    - Expandability can reduce hardware expenditure later
    - This means don't buy something that will be maxed out tomorrow

- Backup Exec Server I/O Capability Recommendations
  - PCIexpress is your friend
  - Most newer servers will support PCIexpress
  - PCIexpress makes I/O bottlenecks less of an issue than it was previously

- ## Number of CPUs in a Backup Exec Server
  - I/O Bus is more important than CPU in Media Servers
  - Example
    - A LAN Media Server backing up 20 clients at 5 Mb/sec each to a tape drive would need 1000MHz of available CPU power
      - 500MHz to receive the data across the LAN
      - 500MHz to send the data to the tape device
    - Depending on the Media Server, other applications and the OS may use CPU cycles
    - You may see why, with modern servers, the CPU is not as important as the I/O

- Amount of Memory in a Backup Exec Server
  - More is always better
  - Server prices are coming down; doesn't make sense to skimp on RAM
  - Other apps on the Backup Exec Server and the OS use memory
  - Backup Exec uses shared memory for local backups
    - Buffer tuning on the Media Server can increase throughput dramatically
      - Buffer tuning (covered later) is a requirement
    - Buffers use shared memory – a finite resource
    - To determine how much memory is being used, use this formula:
      - (buffer_size * number_buffers) * number of drives * MPX
    - Defaults:
      - Sixe = 65536 (64 * 1024)
      - Number = 30
  - Properly size RAM on server where Dedupe Storage Folder resides
    - Minimum RAM is 8 GB, which supports 5 TB of deduplicated data
    - For over 5 TB of deduplicated data, RAM = 1.5 GB per TB of deduplicated data

Is the Backup Exec Server the bottleneck?

Is the Backup Exec Server sized properly?

Is the Backup Exec Server dedicated to the role of backup server?

Disk Storage

Backup Exec

Tape Library

Which tape-drive technology or backup-to-disk folder configuration are you using?

Which SCSI or HBA make, model, and type are you using?

Backup Exec Blueprints: Performance Tuning
Recommended Configuration
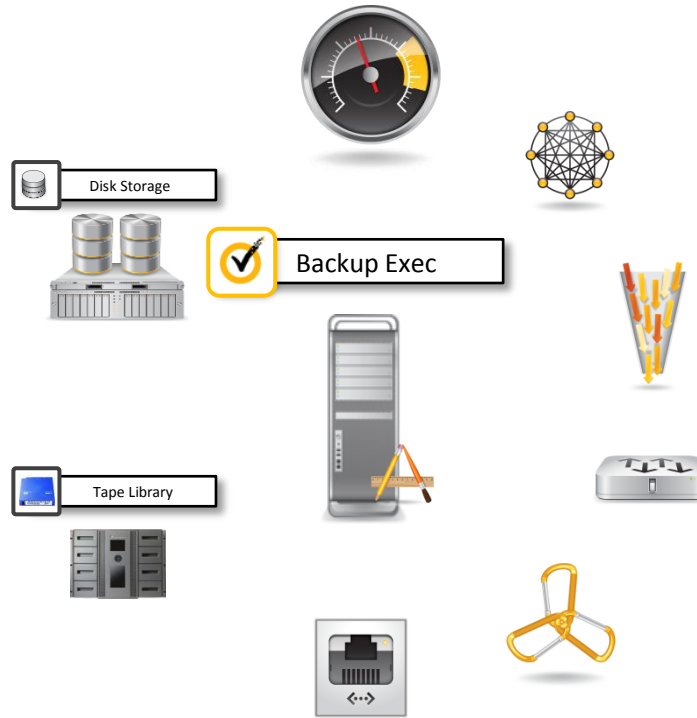
- Evaluate the Needs of the Backup Exec Server
  - CPU, bus speed, and memory
  - Quality SCSI and HBA
  - Ample slot expansion
- Evaluate Snapshot/mirror Technologies
- Look for Large Volumes with Stringent Recovery Requirements
- Avoid Resource Conflicts Backup Exec Server
  - Ensure other disk-intensive operations don't conflict with backups
  - Good example is antivirus scans
  - Backup Exec Server Backup Jobs Should Run During "Idle" Time

- Maximize Data Throughput to Tape Drives
  - Leverage hardware compression on tape drive jobs
  - Leverage software compression on Backup-to-Disk jobs
  - Increase buffer sizes
- Back Up Multiple Resources at a Time

- General Notes and Observations
  - There is not a single correct configuration
  - Back to "how long is a piece of string" question
  - More horsepower is always better than less
  - If you can't fully configure it now ($$), room for growth is always good
  - Provided the technology will still be available when it is time to upgrade

- **Bottom Line**
  - Look at the Backup Exec Performance & Tuning Guide
  - Leverage the Backup Exec Partner Toolkit (Performance Analyzer Tool)
  - Do the math and decide what is right for you

Design and Purpose of the Backup Exec Partner Toolkit

- Ensure potential backup servers will perform to expectations
- Streamline the Backup Exec licensing process
- Demonstrate the power of Backup Exec's deduplication technology

Features and Capabilities

- Includes three tools:
    1. **Performance Analyzer Tool**
    2. **Deduplication Assessment Tool**
    3. **Front-end Capacity Analyzer Tool**
- Wizard-driven experience, no training required
- Free of charge, available at no cost
- Produces professional, intuitive reports
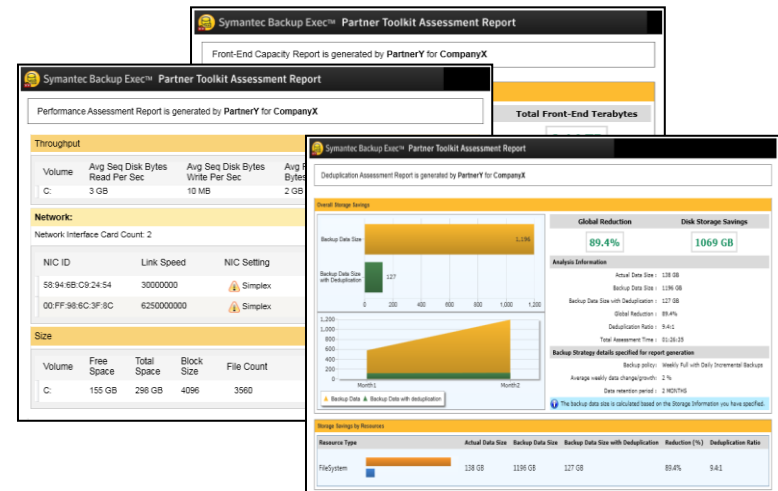
Availability
- Symantec Connect
- PartnerNet

Backup Exec Blueprints: **Performance Tuning**
Disk vs. Tape Discussion

Start   Preface   How to Use   Pain Points   Introduction   Notes and Best Practices   Final Thoughts

- Moving Away from Tape
  - A lot of our customers tell us they want to "do away" with tape
  - Compared to tape, disk is VERY volatile
    - Disk requires a significant infrastructure
    - Disk drives typically non stand-alone (RAID)
    - Cannot move any populated HP disk to IBM array
      - Cannot move any populated RAID disk within same array!

- Disk as a Prime Backup Target
  - Disk must have continuous & specific supporting architecture
    - Storage Array, controller
    - Power
    - Cooling
    - Ongoing maintenance (some vendors require maintenance contracts)
    - These are all significant recurring costs

Backup Exec Blueprints: Performance Tuning
Disk vs. Tape Discussion

🟢 = Good   🔴 = Bad

Attribute	Disk	Tape
Write Streaming Performance	🟢	🟢
Read Streaming Performance	🟢	🟢
Random Access	🟢	🔴
Access Time	🟢	🔴

So, why not use disk for all backup operations?

Let's add a couple of more rows to the table …

Backup Exec Blueprints: Performance Tuning
Disk vs. Tape Discussion

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🟢 = Good   🔴 = Bad

Attribute	Disk	Tape
Write Streaming Performance	🟢	🟢
Read Streaming Performance	🟢	🟢
Random Access	🟢	🔴
Access Time	🟢	🔴
Media Volatility	🔴	🟢
Total Cost of Ownership (TCO)	🔴	🟢

Backup Exec Blueprints: **Performance Tuning**
Disk vs. Tape Discussion

| Start | Preface | How to Use | Pain Points | Introduction | Notes and Best Practices | Final Thoughts |

- Disk
  - Disk price is at historical lows
  - Disk offers performance advantages tape cannot provide
- Tape
  - Tape offers TCO advantages
  - Tape can easily and cheaply be sent offsite
- Overall
  - Disk staging can take advantage of specific strengths of disk and tape while avoiding weakness of each

Backup Exec Blueprints: **Performance Tuning**
Disk vs. Tape Discussion

Start | Preface | How to Use | Pain Points | Introduction | Notes and Best Practices | Final Thoughts

- Disk is Great, When Done Correctly
  - While disk is nice, it must be properly architected
  - VTL may look nice, but it doesn't smell like tape
  - If disk is not properly configured, your performance will suffer
    - In most cases, DP admins must talk about requirements to the storage admins **before, during, and after** the purchase/implementation
    - In most cases, disk is configured for read performance, in the case of DP read and write must be **balanced**

Backup Exec Blueprints: Performance Tuning
Disk vs. Tape Discussion

Start   Preface   How to Use   Pain Points   Introduction   Notes and Best Practices   Final Thoughts

- Key Disk Considerations
  - An important number for performance is **IOPS / GB**
  - With larger disk capabilities, I/O tends to be spread across fewer spindles
  - Place data over as many **spindles as possible**
  - High capacity disk makes this less obvious
  - Test your disk subsystem: Iometer (www.iometer.org)
  - So, you have decided you want to move to disk?
    - SCSI or SATA?
      - SCSI beats SATA in every possible technical sense
      - SATA provides 85% of the performance of SCSI
  - Be careful what you buy and how you implement it

- Symantec Best Practice Recommendations
  - All backups initially go to disk – eventually to tape
  - Requires enough disk to mirror backup environment
  - Takes maximum advantages of individual strengths of disk & tape technologies
  - Advantages
    - All data written to tape is local – no "shoe-shining"
    - Majority of restores are faster (from disks)
    - Backups stay on disk after copy to tape
    - Synthetics are easily created
  - Disadvantages
    - Significantly initial and ongoing expense
  - Make sure that any backup to tape jobs use hardware compression if possible, as this will speed up the backup rate

Block size (per device) defines the preferred size of data blocks written to media in this device.

If the device does not support block size configuration, this option is unavailable.

Buffer size (per device) defines the preferred amount of data sent to the device for read or write requests.

Increasing the **Buffer size** may improve device performance.

Buffer count defines the preferred number of buffers allocated for this device.

If you change the **Buffer count**, you may need to adjust the **High water count** accordingly.

Create a local backup of at least 2 GB

Check the throughput in the job history log

Change preferred configuration settings *

Rerun the backup and check the throughput again

Did throughput improve?

Yes → Increase configuration settings

No → Decrease configuration settings

Continue testing until you achieve the desired throughput

* Change settings in this order:

1. **Buffer size**
2. **Buffer count**
3. **High water count**
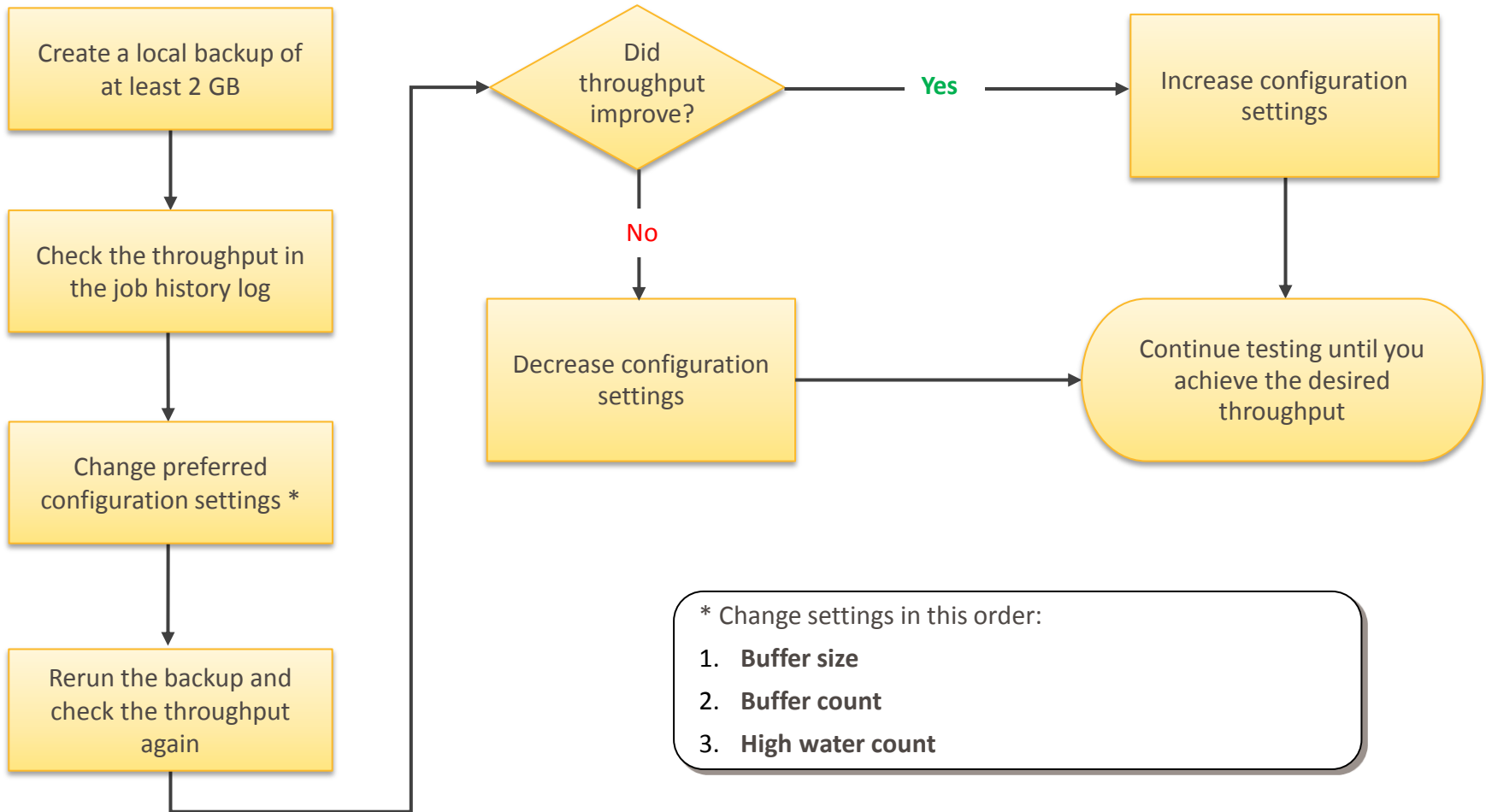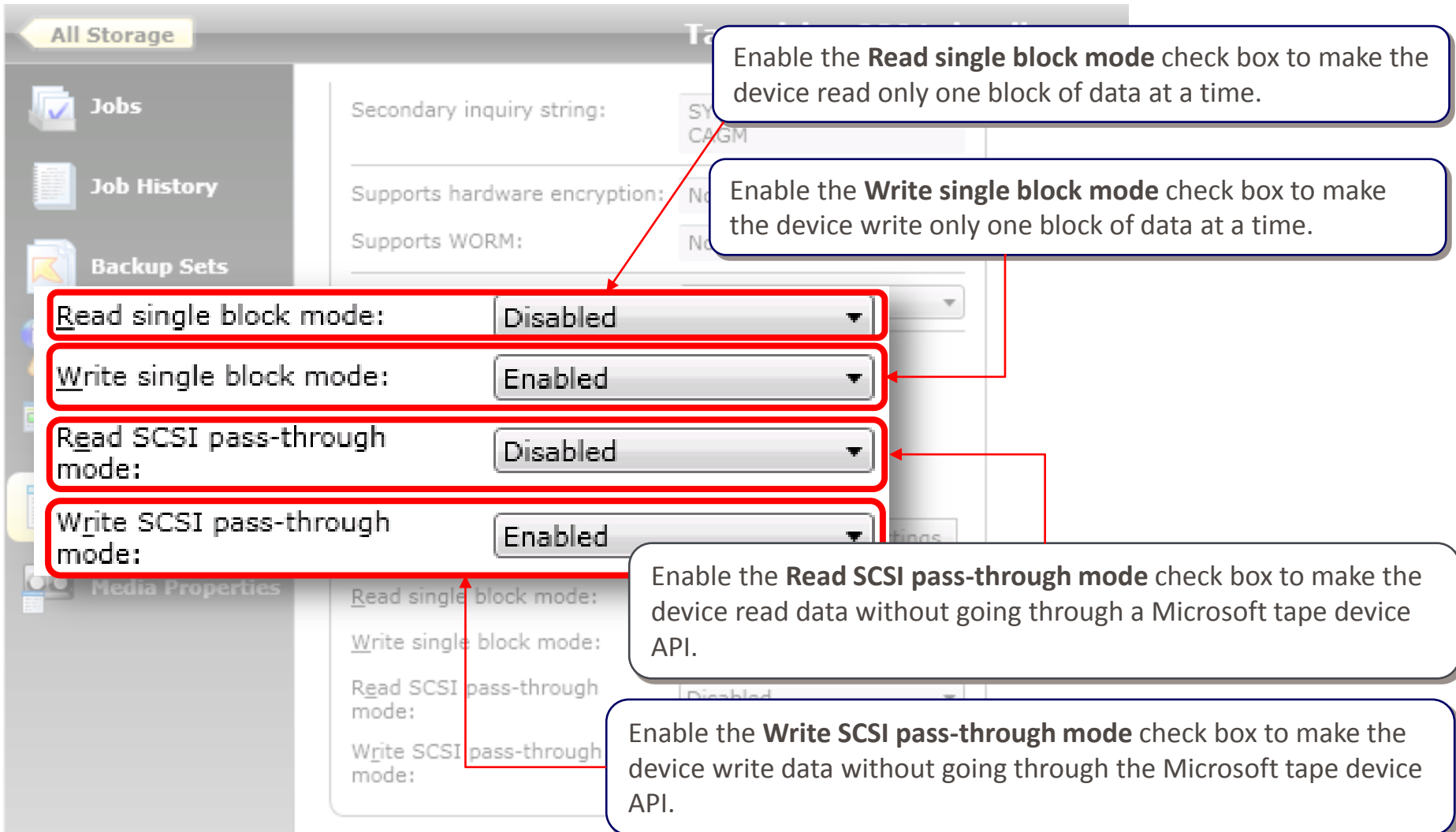
- Changing device configuration settings may improve performance, however doing so may have a negative effect on your backup and system performance

- Changing block size may also affect your ability to restore data

  – Verify and test after change!

- Thoroughly test any changes you make to ensure that system performance does not deteriorate

- Perform a test restore of the data backed up using the modified settings

All Storage

Jobs

Job History

Backup Sets

Media Properties

Secondary inquiry string:

Supports hardware encryption:

Supports WORM:

Enable the **Read single block mode** check box to make the device read only one block of data at a time.

Enable the **Write single block mode** check box to make the device write only one block of data at a time.

Read single block mode: | Disabled
Write single block mode: | Enabled
Read SCSI pass-through mode: | Disabled
Write SCSI pass-through mode: | Enabled

Read single block mode:
Write single block mode:
Read SCSI pass-through mode:
Write SCSI pass-through mode:

Enable the **Read SCSI pass-through mode** check box to make the device read data without going through a Microsoft tape device API.

Enable the **Write SCSI pass-through mode** check box to make the device write data without going through the Microsoft tape device API.

Backup Exec Blueprints: Performance Tuning
Backup Exec Database Overview

Database backup file
..\Data\BEDB.BAK

Catalogs
..\Catalogs\

License file
.slf

Location of database files
..\Program Files\Symantec\Backup Exec\Data\

Backup Exec

BEDB

The database contains:
- Storage devices
- Backup definitions
- Server containers
- Alerts
- Job History
- Catalog index
- Logon accounts
- Audit Log

Database files
..\Data\bedb_dat.mdf
..\Data\bedb_log.ldf

Configuration and Settings > Backup Exec Settings > Database Maintenance

Preferences
Alerts
Backups
Job Status and Recovery
Job Logs
Catalog
Database Maintenance
Reports
Logon Accounts
Discover Data to Back Up
LiveUpdate
Network and Security
Simplified Disaster Recovery
Storage
Barcode Rules
Granular Recovery Technology
Oracle
DBA-initiated Job Settings

☑ Enable Backup Exec database maintenance

Last time maintenance was performed: Never

Perform database maintenance daily at: 4:00:0

Delete aged data
  ☑ Delete aged data
    Job History:
      ○ Keep job history for data on media that have curren
      ● Keep job history for specified number of days:
    Number of days to keep data before deleting it from the B
      Job logs: 30
      Alert history: 7
      Reports: 14
      Audit logs: 30

☐ Perform database consistency check
☑ Save contents of database to the Backup Exec data directory
☐ Optimize database size

Each database maintenance operation is performed independently on each database.

Deleting aged data conserves disk space.

Informational alerts are generated each time database maintenance is performed.

Checks the logical and physical consistency of data in a database

Symantec recommends that you periodically perform consistency checks, optimize database size, and back up all Backup Exec databases daily.

Storage
Granular Recovery Technology
Oracle
DBA-initiated Job

Job logs: 30

☐ Perform database consistency check
☑ Save contents of database to the Backup Exec data directory
☐ Optimize database size

☑ Save contents of database to the Backup Exec data directory
...ase size

Reorganizes fragmented pages and decreases the size of the physical database to ten percent more than the size of disk space actually used

Creates a data dump of a Backup Exec database

Backup Exec Blueprints: Performance Tuning
Client-level Tuning

Network

Client

Backup Exec

How fast can the client server send the data?
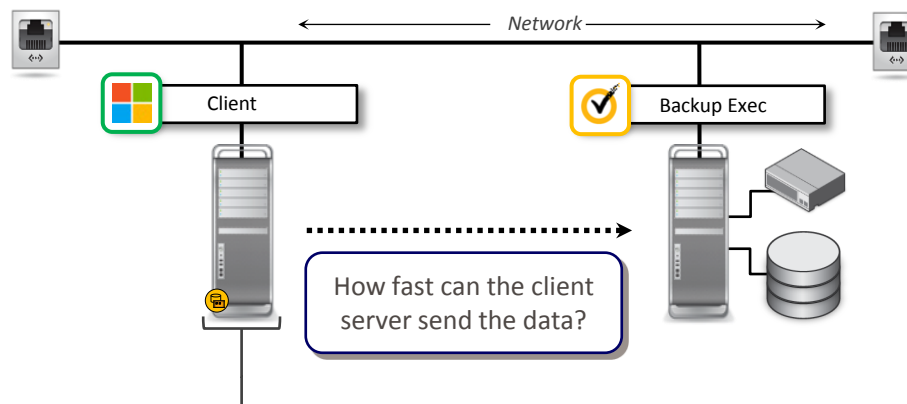
Client-level performance factors:

– Available memory and CPU resources

– Number and sizes of files selected for backup

– Volume layout

– File system fragmentation

– Virus scanning

- Use the Agent for Windows to Protect All Windows Servers
  - Processes data into a continuous stream
  - Provides better data transfer rates
- Design Volumes with Data Protection in Mind
  - Backups accomplished in timely manner
  - Robust RAID configuration and healthy file systems
- Some Clients are Backup Servers in Disguise
  - Promote remote agent systems with large data footprints and local or SAN attached backup storage to Backup Exec servers
- Increasing Job Performance
  - Disable Advance Open File Option (AOFO) if backup window is priority over open file protection
  - Disabling AOFO affects duration of job
  - Disabling Checkpoint Restart makes the jobs faster

  (Known issue: http://www.symantec.com/business/support/index?page=content&id=TECH191072)

- ## NIC Drivers are Important
  - Keep NIC drivers current with correct speed and duplex settings
  - Optimizes client's ability to transmit data
  - Rarely uses auto negotiating

- ## Keep Backup and Antivirus Activities Separate
  - Disable antivirus scanning and maintenance during backup
  - Uses pre and post commands to stop antivirus services
  - Requires no maintenance
  - The dedupe folder should always be excluded from antivirus scans, not just during backups

Backup Exec Blueprints: Performance Tuning
Network Considerations

Network

Client

Backup Exec
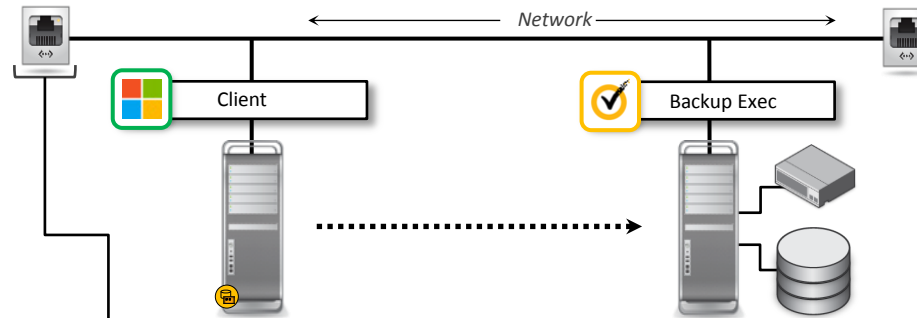
What if the speed of your network became a backup bottleneck?

Network Infrastructure a Key Performance Contributor:

– Backups involve the transfer of large volumes of critical data

– Data may be gathered from complex environments over complex networks

– Network performance is critical in data protection

- Network Infrastructure Impacts Backup Performance
  - QOS, large data transfers, improperly configured VLANs, out of date switch firmware, etc.
  - The backup speed for a remote disk is limited by the speed of the physical connection
  - Features such as "full-duplex" and "auto-detect" may not be fully supported in every environment
    - Manually set the speed to 100 Mb and the duplex to half/full for the server side
    - Set the SWITCH PORT setting to 100 MB and half/full duplex for the Ethernet port on the server that is connected to the switch
    - When a hub is in place instead of a switch, full duplex may not be supported
  - Both the switch and the network card must have matching settings

Backup Exec Blueprints: Performance Tuning
Network Recommendations

Symantec.

Use software compression to achieve a smaller network data load.

Promote systems with larger data footprints to Backup Exec Servers that:
- Use locally attached storage
- Keep data loads off the network

Improved backup transfer rates over the network

Configuring a dedicated network interface is often the least-expensive option.

Limit network-intensive maintenance or communication, and schedule activities either before or after backup window.

- Tuning the Backup Exec Server (Media Server)

- VMware ESX 5.x Performance Best Practices
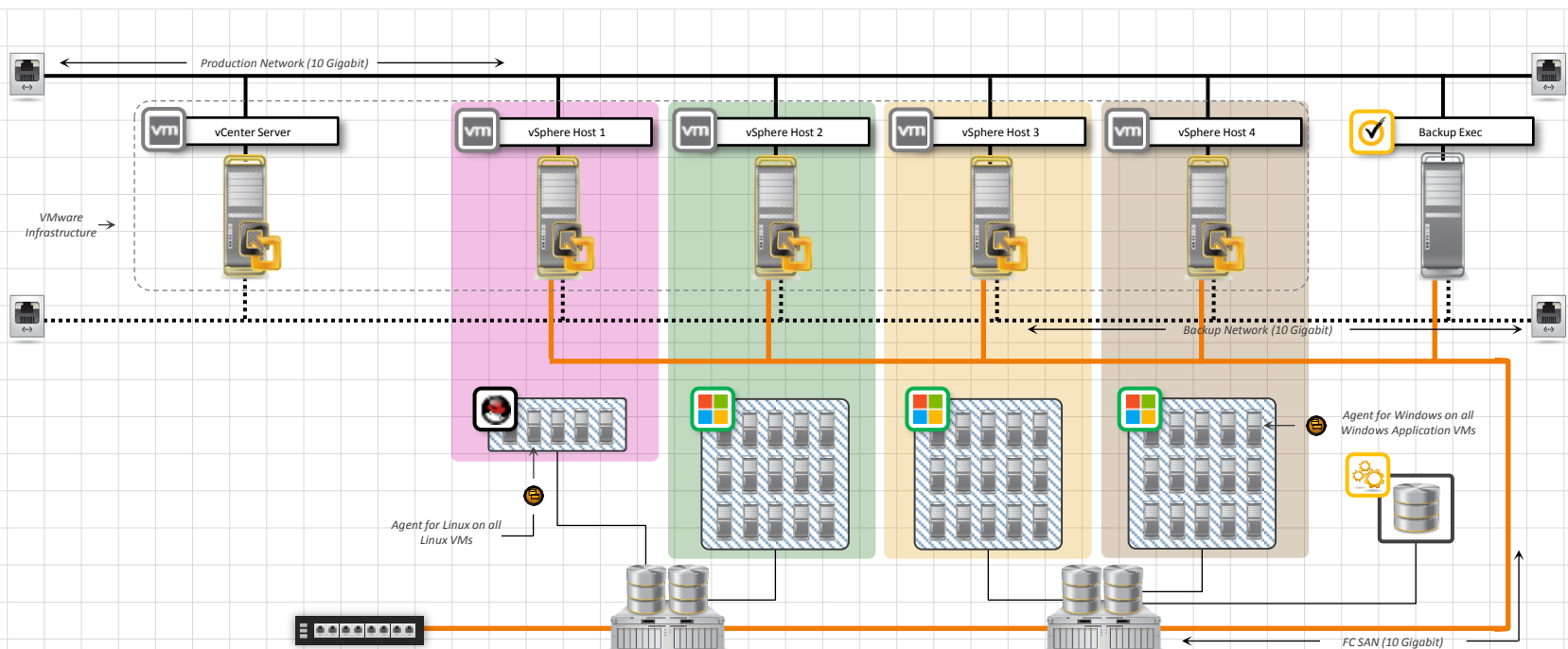
Three layers to look at

- Source *(read)*
- Transport *(transmit)*
- Target *(write)*

Backup Exec Blueprints: Performance Tuning
Source read performance

Symantec.
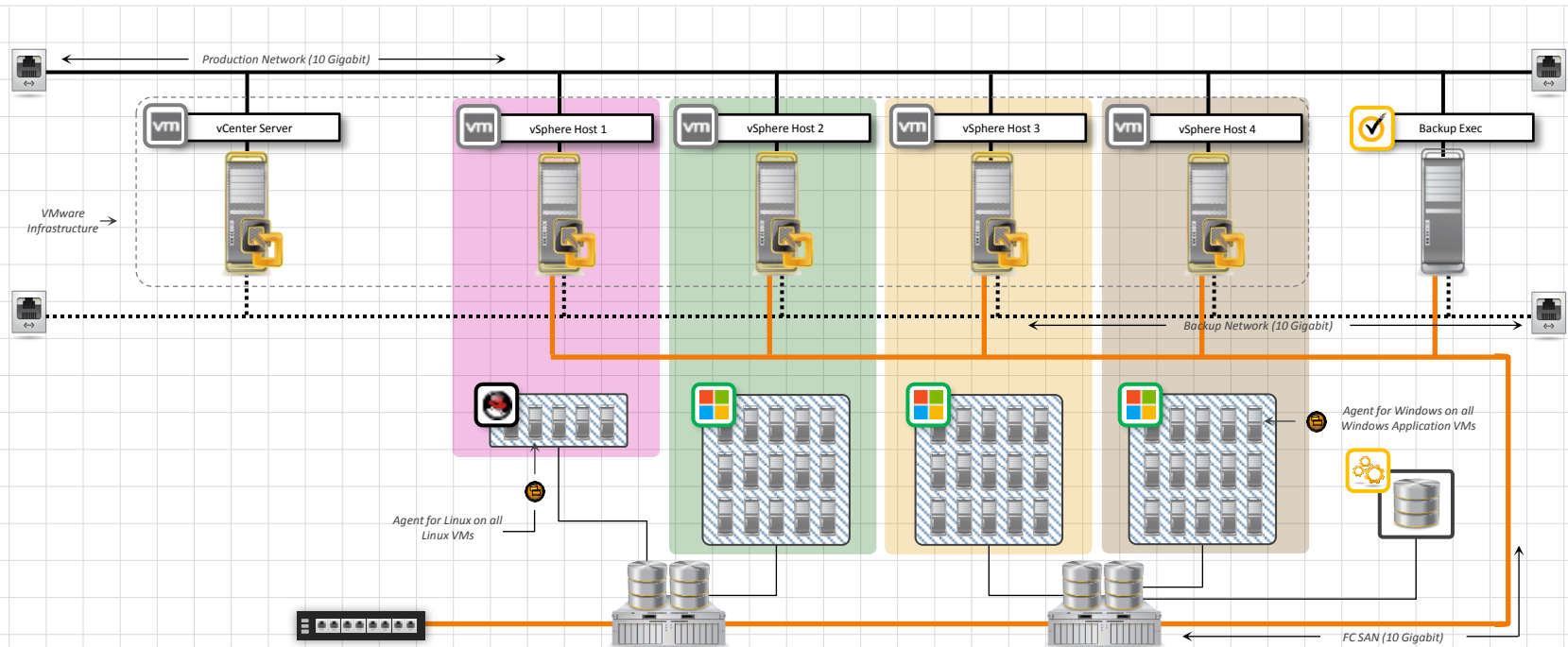
Datastore Location	Backup via NBD	Backup via SAN Transport	Hotadd
Local (non clustered)	Yes	No	Yes
NFS shares	Yes	No	No
iSCSI LUNs	Yes	Yes	Yes
Fiber LUNs	Yes	Yes	Yes

- Backup of Test-VM from NFS share: **4.600 MB/min**

- Backup of Test-VM from iSCSI LUN: **24.200 MB/min**

- Dedicated Network for Backups

- NIC Teaming

- Turn Off Offloading (Microsoft KB 951037)

    - `netsh int tcp set global chimney=disabled`

    - `netsh int tcp set global rss=disabled`

    - `HKLM\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\ EnableTCPA = 0`

- Set Fixed Speed and Duplex On for media server and ESX server(s) as well as on the switch(es)

- Do not run more than 2 concurrent jobs per ESX as that is likely to overload VMkernel, due to its throttling

- VM datastore and datastore for where the disk backup volume is should not be using the same lun as the VM

- The VMFS block size must match

- Disks must be of type SCSI for the VM for it to be backed up using Hotadd

- SAN Transport
  - Backup to tape
    - Tape drive block size
  - Backup to B2D
    - Disk type & volume configuration, unit allocation size, block/buffer size
  - Backup to PDDE
    - Disk type, unit allocation size, data stream size
- Ethernet Transport (NBD)
  - Backup to tape
    - 1GB or 10GB NICs, tape drive block size
  - Backup to B2D
    - 1GB or 10GB NICs, disk type and volume configuration, unit allocation size, block/buffer size
  - Backup to PDDE
    - 1GB or 10GB NICs, disk type and volume configuration, unit allocation size, data stream size

- ## Hotadd

  - ### Backup to disk

    - Datastore io, Disk type & volume configuration, unit allocation size, block/buffer size

  - ### Backup to PDDE

    - Data store io, unit allocation size, data stream size

  - ### Backup/duplicate to Tape

    - Supported as alternative configuration. For example connect to tape device/library using iSCSI.

- **Increasing Disk Storage Performance**

  – When Performance is Needed, Backup to Disk Storage Device (B2D) Rather than Deduplication Storage Device (PDDE)

  – Use Dedicated Locally Attached Disks as Volumes for Disk Storage Device (B2D) and Deduplication Storage Device (PDDE) storage

- **Block Size Recommendations**

  – Format Target Volume with 64KB Block Size - On Array Level As Well As in Windows!

- **Hardware Changes that Impact Performance**

  – Increasing Spindles Can Greatly Improve Performance

  – Have Write Cache Enabled for Battery or Equivalent Protected Arrays

- # Buffer Tuning

    - `HKLM/Software/Symantec/Backup Exec for Windows/Backup Exec/Engine/VMware Agent/…` (TECH185691)

- # Examples   default / (recommended)

    - `Enable Buffered Reads`   1 / (1)
    - `Enable Buffered Writes`   1 / (1)
    - `Numbers of Read Buffers`   10 / (16)
    - `Numbers of Write Buffers`   10 / (16)
    - `Size of Read Buffers`   1024 / (8192)
    - `Size of Write Buffers`   1024 / (8192)
    - `Write Thread Priority`   1 / (1)
    - `Read Thread Priority`   1 / (1)

- GRT On or Off?

  – Only for VMs where single item restore is needed; not for application servers, i.e. anti virus etc.

  – If GRT is still needed, you're still able to restore the VMDK, mount it to the VM and "restore" the file needed.

  – Practical example: VMs that are backed up weekly or less don't need GRT

- Create Groups in vCenter

  – „Backup daily with GRT"

  – „Backup daily, no GRT"

  – „Backup weekly, no GRT"

- Build a Policy Per Group

  – „VMs daily with GRT"

  – „VMs weekly no GRT"

  – …

- Snapshot Retry - Hybrid Type Snapshot (TECH199718)

  - `HKEY_LOCAL_MACHINE\SOFTWARE\Symantec\Backup Exec for Windows\Backup Exec\Engine\VMWare Agent\`

  - "Use hybrid snapshot method"   value data = 1

  - "Snapshot retry attempts"   value data = 5

  - "Snapshot retry interval"   value data = 60

- Snapshot Cleanup (TECH200709)

  - `HKEY_LOCAL_MACHINE\SOFTWARE\Symantec\Backup Exec for Windows\Backup Exec\Engine\VMWare Agent\`

  - "AutoOrphanSnapshotRemoval"   value data = 1

  - "RemoveSnapshotRetryCount"   value data = 2

- ## Recovery Performance

  - Transport mode is always NBD, SAN is not supported; therefore 10 GBE is recommended

  - Full VM is not always needed; for OS problems you'll only need to recover the VMDK containing the system drive

  - GRT restores need disk-based backups, but for larger amounts of data, i.e. entire VMDKs, tape restores may be the better choice, especially compared to restores from deduplication storages

  - Restores can be redirected (not cross-platform, so not from VMWare to Hyper-V or vice versa) but to a different ESX server, cluster or datacenter

- Hardware Tuning
  - Most hardware, out of the box, is not setup to perform optimally
  - Adding new hardware without considering environmental impact can reduce overall performance
  - By matching hardware performance from end-to-end, higher ROI can be achieved
  - Backup Exec servers require tuning for optimal throughput
  - Increased throughput means:
    - Shorter backup windows
    - Reduced infrastructure costs
    - Reduced management requirements
    - Increased scaling
    - Increased ROI
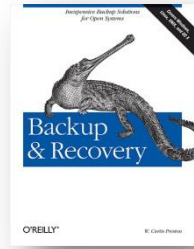   - Happier CEOs (which makes your lives much better)

- Resources

  - Technote that includes the tuning to improve performance for duplicate jobs from Deduplication storage device to tape - TECH216320

  - Main TAPE troubleshooting article – TECH24414

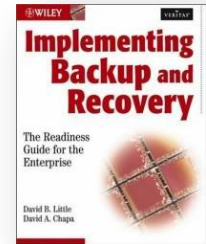 - Hardware Compatibility List

- Related Publications
  - **Backup & Recovery**
    - By W. Curtis Preston
    - Available on Amazon.com

  - **Implementing Backup & Recovery: The Readiness Guide for the Enterprise**
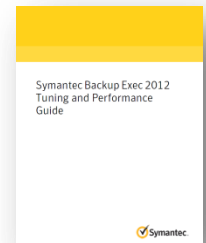   - By David B. Little and David A. Chapa
    - Available on Amazon.com

  - **Symantec Backup Exec Tuning & Performance Guide**
    - Available for download at:

   http://www.symantec.com/business/support/index?page=content&id=TECH179977

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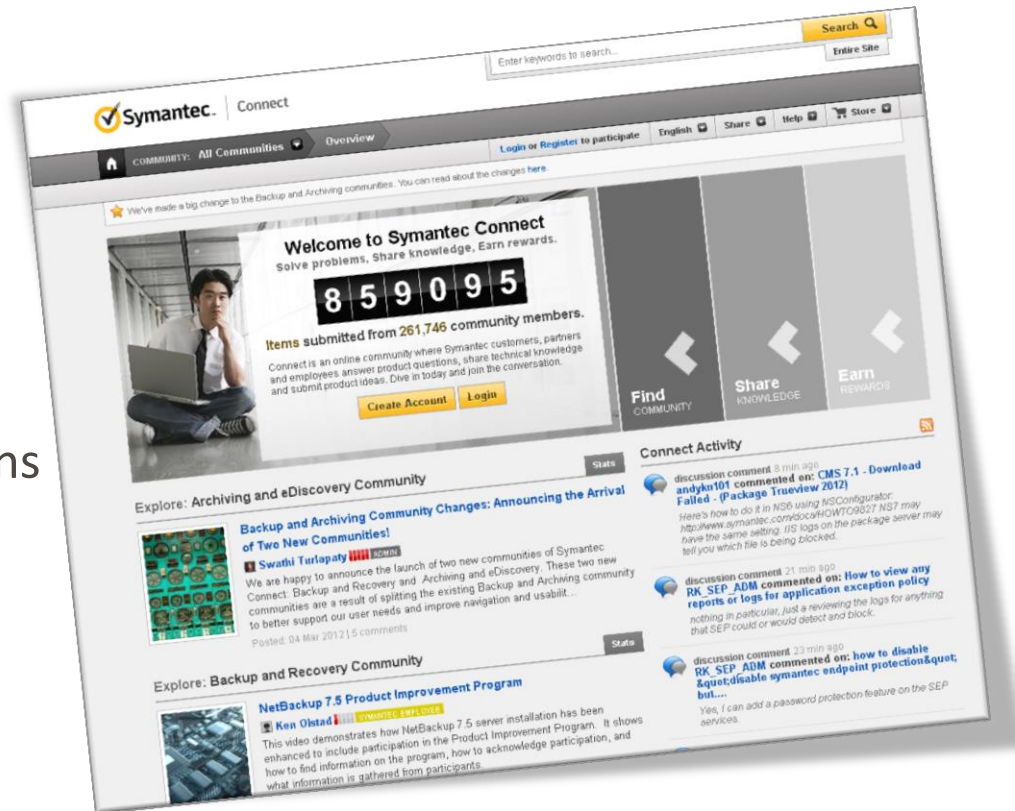
www.symantec.com/connect/backup-and-recovery/forums/backup-exec

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