Dell AppAssure Sizing Guidelines
Version 2.0

Dell Data Protection Presales Team
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AppAssure 5 Sizing Guidelines

This chapter describes the release of the AppAssure 5 Sizing Guidelines.

AppAssure 5 Sizing

The following are revised Sizing Guidelines for AppAssure 5 and intended for Information Technology (IT), backup and recovery, and network administrators to help determine the hardware and infrastructure requirements for implementing AppAssure 5 in your organization.

Results may vary

The U.S. Environmental Protection Agency (EPA) requires a set of standards for automobile emissions, including city and highway gas mileage estimates for each model. Since no test can exactly simulate all factors and conditions, most advertisers include the standard disclaimer "your mileage may vary." The same can be said for sizing a software deployment.

Determining sizing requirements is more art than science, because there are many variables to consider which make each situation unique. As such, the recommendations in this document are to be considered guidelines and not firm requirements.

Dell recommends that you read this guide and familiarize yourself with the contents. If you have questions after thoroughly reading this document, please contact a sales or support representative.

Sizing is an ongoing requirement. The AppAssure 5 hardware configuration you build for your current environment, when sized appropriately, will back up that environment. If you then add additional agent machines or additional mail or database servers to your protection regime, or increase other demands on the system such as continuous export, you must revisit the parameters included in the sizing matrix to see if you have exceeded the guidelines for the current tier for which you are configured. Perform this analysis whenever your environment changes.
Determining Sizing Requirements

This chapter describes general considerations for determining the hardware and network infrastructure required to support a robust implementation of AppAssure 5 in your environment. It includes the following topics:

- Caveats, exclusions, and assumptions
- AppAssure 5 Sizing Guideline Matrix
- Reviewing sample sizing efforts

The sizing Guidance Matrix is structured to consider the number of agents to be protected as the first criteria, and is then broken into five tiers, ranging from very small (one to five agents) to enterprise-level (more than 50 agents). You should carefully review the caveats, exclusions, and assumptions to ensure you meet the requirements for each tier.

Caveats, Exclusions, and Assumptions

If the situation your organization faces is described in any of these exclusions, the sizing matrix is not applicable without adjustments. You will require greater system resources than documented in the sizing guide matrix.

Dell recommends contacting your sales or support representative with a detailed description of your situation, including which one or more exclusions above apply, so that we can assist you in recommending hardware and infrastructure for a successful Dell AppAssure 5 deployment.
Caveats

This section includes caveats regarding sizing, aspects of the sizing process that are excluded from the guidelines in this document, and assumptions you should be aware of as you size your deployment of AppAssure 5.

The sizing information provided in this document is for informational use only.

Every organization has its own specific set of circumstances, all of which make sizing requirements unique. Dell recommends assessing each aspect for sizing with an eye towards continued growth. The data needs of an organization traditionally increase over time. Conservative estimates include a consideration of future growth.

The recommendations in this document are to be considered guidelines, not firm requirements. Several assumptions are made in presenting the sizing recommendations in this document. If your situation differs, results may vary accordingly.

Key Contributors Affecting Core Performance
- Number of protected machines increases (always size up!)
- Insufficient memory allocated
- Minimum CPU(s) allocated
- If protecting 1-10 agents the Core can be installed in a virtual machine, (VMware or Microsoft Hyper-V) as long as minimum sizing guidance resources are dedicated to the Core VM
- Physical Server required for medium, large and enterprise sizing tiers
- Insufficient network bandwidth (NICS must be dedicated to core)
- Total Exchange and SQL data being backed up is greater than 10% of backups
- Too many background tasks occurring simultaneously
- Understand and use Data Integrity Checks. Please review the KB article AppAssure 5 Data integrity Check Process
- Backing up more than the maximum number of Exchange and SQL Servers
- Virtual Standbys per sizing tier should not be greater than 10% of total protected machines

Key Contributors Affecting Repository sizing
- Retention Policy for Core and if Customized by agent
- Compression ratios (assumption for this document is 50% compression)
- Data Protection Intervals (AppAssure default is hourly snapshots)
- Snapshot change rate
  - Very small and small tiers are generally not greatly affected as the number of servers being backed up is less than 10; can use snapshot change rate average over period of time
  - Medium Tier – Use snapshot change rate average over period of time
  - Large/Enterprise Tier – Can use an average, however, consider Performance Monitor (Perfmon) or Disk Pulse analysis for best results
- Not enough Disks to support the IO required for Core tasks

---

The Summary Report (from the Core) provides agent change rate information. PowerShell scripts can enable automated report generation.

<table>
<thead>
<tr>
<th>Name</th>
<th>Protected Volumes</th>
<th>Total Work</th>
<th>Current protected space</th>
<th>Change rate per day (Average / Median)</th>
<th>Job Statistic (Passed / Failed / Canceled)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAREVCH</td>
<td>Volume Labeled 'System Reserved'; C:, D:, E:, F:, G:</td>
<td>13.02 GB</td>
<td>366.11 MB</td>
<td>130.05 MB / 130.05 MB</td>
<td>49 / 0 / 0</td>
</tr>
<tr>
<td>AASQL</td>
<td>Volume Labeled 'System Reserved'; C:, D:, E:, F:,</td>
<td>99.32 GB</td>
<td>3.2 GB</td>
<td>1.6 GB / 1.6 GB</td>
<td>26 / 0 / 0</td>
</tr>
</tbody>
</table>
Exclusions

The sizing guidelines provided below are based on parameters that most organizations meet. However, recommendations for sizing are likely to change if your organization differs in some key parameters. These exclusions include the scenarios described below:

- **Enterprise Exchange users** in which the Exchange server has individual incremental snapshots greater than 100 GB over a one day period, and/or is consistent between incremental snapshots

- **Enterprise Exchange users** in which the Exchange server has 5,000 or more mailboxes or accounts
  
  - Dependent on the size of the mailboxes
  - Understand your change rates

  - **Virtual Standbys (Continuous Export)**
    
    - **Very small or small-tier deployments** Virtual standby greater than one protected machine (agent)
    
    - **Medium, large, or enterprise-tier deployments** Virtual Standbys do not exceed greater than 10% of total machines protected by the Core

- **Considerations where the virtual standby resides**
  
  - **Local (DL4000 and AppAssure Software)**
    
    - If storing Virtual Standbys on local disk, and the Virtual Standbys are greater than 10% of total protected machines, additional disk resources are needed. This is due to both a read and write of the data to local storage

  - **Remote**
    
    - If storing Virtual Standbys remotely and the Virtual Standbys are greater than 10% of the total protected machines, additional network resources may be required.

  - **Configurations with more than 30 TB of data to back up with 15 or fewer agents**
    
    - Determining change rate is critical in this situation
    
    - Performance monitor (Perfmon) or Disk Pulse can be used to calculate change rate on the server

  - **Configurations for any tier (any number of agents)** that do not meet the corresponding criteria are described in the same row in the matrix
- No more than 10% combined Exchange and SQL data of the total data being backed up by tier

For Example, if backing up 1 TB of data, no more than 100 GB combined Exchange and SQL data
Assumptions

Core Operating System - Dell recommends using Windows Server 2012 as the Operating System on the Core server. Using Windows 2008 Server R2 will require an additional 2 GB of additional RAM per TB of repository space.

Network Backbone/Infrastructure - Dell recommends organizations use a 1 gigabit Ethernet (GigE) backbone for efficient performance in the Very Small, Small and Medium sizing tiers, and recommends using a 10 GigE networks for robust performance in large and enterprise sizing tiers. The suggestion is based on typical needs of a network infrastructure to support all business operations in addition to backup, replication, and recovery capabilities provided by AppAssure 5.

Network Interface Cards - If you are sizing for any deployment over five agents, Dell recommends using multiple 1-Gigabit network interface cards (NICs). These must use teaming mode for aggregate bandwidth and load balancing, to take full advantage of the combined memory on the NICs. Please review the Microsoft TechNet Articles and Video by Operating System for configuration assistance. If you have purchased Dell ProSupport with your hardware, you may also contact them for help.

NIC Bond Mode Recommendations by Sizing Tier

- Small Sizing Tier deployment - NIC failover (switch independent)
- Medium Tiers – Round Robin (switch independent) or LACP
- Large/Enterprise or using using 3+ NICs – LACP (switch dependent)

Dedicated Bandwidth Requirements – Ensure the Core configuration has dedicated network cards and bandwidth as specified in the Network column of the Sizing Guidance Matrix. If you have applications that require specific network bandwidth allocations, and/or are implementing a Storage Area Network, these bandwidth requirements are separate and can’t be combined with the AppAssure Core Network requirements. Please refer to the KB article Determining Bandwidth Capabilities for Replication.

Choice for Repository Storage - A repository is used to store the snapshots that are captured from your protected workstations and servers. AppAssure 5 stores backups on the repository configured in the Core. This storage can be in the form of Direct-Attached Storage (DAS), a Storage Area Network (SAN), or Network-Attached Storage (NAS). Each of these storage methods has benefits and deficiencies. If the needs of your organization exceed DAS, most organizations experience a greater level of success using a SAN device. A NAS is not recommended for anything above a small deployment, and is only recommended when using a high quality NAS device. For assistance when considering storage for your repository, please refer to our knowledge base article, Repository Options: Direct Attached Storage, Storage Area Network or Network Attached Storage?
Storage Recommendations for replication Core Repositories

- Target Core Repository should be sized for total number of protected machines being replicated
- DAS and SANs are recommended for replication target repositories
- For multiple site replication, staggering and/or scheduling replication to target Core for best performance is suggested
- Replication Throttling is supported for environments with slower uplink speeds
- Replication configuration (target) will require configured Core and Repository prior to establishing replication.

**Note:** We do not license by the Core. If you are only replicating and not backing up agents on the Target Core no additional agent licenses are required
Capacity Optimization Considerations

Compression Ratio - Data Compression will vary greatly depending on the type of data being backed up to the repository. Baseline compression for the Sizing Guidance Matrix is 50%. Additional factors also impact the ratio.

Deduplication Ratios – Many factors impact data deduplication. Baseline compression for the Sizing Guidance Matrix is 50%. Additional factors also impact the ratio.

The following table provides factors to consider that may yield higher/lower compression/deduplication ratios based on the type of data.

<table>
<thead>
<tr>
<th>Higher Ratios</th>
<th>Lower Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Generated Data</td>
<td>Natural Data (Images, Videos, Sound clips etc.)</td>
</tr>
<tr>
<td>Uncompressed and Unencrypted Data</td>
<td>Compressed and Encrypted Data</td>
</tr>
<tr>
<td>Applications with Low Data Change and Transfer Rates</td>
<td>Applications with High Data Change and Transfer Rates</td>
</tr>
<tr>
<td>Inactive and Infrequently Accessed Data</td>
<td>Active and Frequently Accessed Data</td>
</tr>
<tr>
<td>Long Retention Periods</td>
<td>Short Retention Periods</td>
</tr>
</tbody>
</table>

Snapshot Intervals - Assumes one hour default snapshot interval and 10% daily change rate

Change Rates – Perhaps the most overlooked, and most critical consideration in Core performance, ample repository storage and overall sizing success. Know your change rates before you size the Core. This is strongly suggested for Medium, Large and Enterprise tiers. If the change rates are large and there are many servers with large change rates, the background tasks that occur during incremental backups will cause bottlenecks, latencies and affect overall Core performance. Use disk performance tools to calculate change rates on all protected machines. (Note: Medium sizing tiers may consider the average change rate.)

Retention Policy - When protecting your data using AppAssure, backup snapshots are taken and saved to the repository. These recovery points are deduplicated, and represent the ability to restore the agent to the point when the snapshot was taken. The more frequently an agent is backed up, the more granular the recovery point. Whether one agent or many are backed up to a Core, they proliferate quickly in the
repository. To conserve resources over time, this data is then generally rolled up to an incrementally less granular series of recovery points.

A retention policy is the set of business rules that define the length of time the backup snapshots of protected machines are stored in the repository.

Depending on the frequency of snapshots taken, the number of machines protected by the AppAssure Core, and how long you retain the snapshots will have an effect on sizing your repository storage.

Disparate retention policy support provides the option to set different retention policies on the source and target cores when replicating.

Please refer to the KB article, Understanding Retention Policy and Rollup for additional information.

**Virtual Standby**

Virtual Standby (Continuous Export) - All calculations in the sizing guidelines matrix assume for medium-size deployments or larger, no more than 10 percent of protected servers are continuously exported (Virtual Standby) from the Core to a Virtual Machine. These virtual machines reside outside of the Core repository, and are either stored locally or on remote storage (i.e. VMware Datastore, Microsoft Hyper-V Storage)

**Replication**

Replication - Replication is the process of performing a local AppAssure incremental backup and then replicating only the changed blocks to the replication (target) site. Each site must have a configured Core and repository for the number of Agents being backed up, and sufficient Wide Area Network (WAN) bandwidth. Please refer to the KB article Determining Bandwidth Capabilities for Replication.

Regardless of the scenario, each site must be sized to the correct sizing Tier of protected machines.
For example, Site one has 5 agents to back up, Site two has 15 agents. They are both replicating to a target site. At the target site the Core and repository must be sized to support 20 agents.

Supported Replication Scenarios:

1. Replication to a Local Location - The target core is located in a local data center or on-site location, and replication is maintained at all times. In this configuration, the loss of the Core would not prevent a recovery.

2. Replication to an Off-site Location - The target core is located at an off-site disaster recovery facility for recovery in the event of a loss. Mutual Replication - Two data centers in two different locations each contain a core and are protecting agents and serving as the off-site disaster recovery backup for each other. In this scenario, each core replicates the agents to the Core that is located in the other data center.

3. Hosted and Cloud Replication - AppAssure MSP partners maintain multiple target cores in a data center or a public cloud. On each of these cores, the MSP partner lets one or more of their customers replicate recovery points from a source core on the customer’s site to the MSP’s target core for a fee. In this scenario, customers would only have access to their own data.

Sizing Guidance Recommendation is Per Core Server - All recommendations in the sizing guidance are per Core server required. If your configuration requires multiple cores, consider these recommendations for each Core server. If replicating, note that the multiplication factor that helps determine the amount of storage you need is per Core. The exact same storage requirements will apply on the target Core server that is replicating the source Core. CPU and memory requirements are higher for the source Core, which is performing both backup and replication actions. However, if you need to turn on your replication site in the event of a disaster, you will need sufficient resources at that target Core (acting as the source core) for backups and all activities that were running on the Source Core.
AppAssure 5 Sizing Guidelines

To use the sizing guidelines, consult the first column to determine the number of agents, both physical and virtual that matches the number of machines to protect in your organization. Number of agents is the first factor in determining which sizing tier of requirements applies to your environment. Then, proceed horizontally along that row to review the minimum recommendations for CPU and RAM on the core server, and specifications for the network, including network interface card (NIC).

Windows 2012 Server is recommended as the operating system on the Core. If using Windows 2008 R2 as the OS on the Core, you must add an additional 2 GB of RAM for each TB of data in the repository.

To determine the amount of repository storage required you must calculate the total amount of data you will be backing up in all protected machines. Multiply that number by 1.2 or greater for one year of backups. When the system enforces the nightly retention policy by rolling up aging incremental snapshots into a base image, it creates a new base image to hold the combined data. While this is in process, the drive needs space to hold two base images until the rollup is complete. Upon completion, the old base image is then deleted.

The last two columns in the matrix are critical to proper sizing. If your configuration exceeds the application assurance triggers, if the data in your environment has a higher change rate than the maximum listed, or if you have more than 10% virtual standbys, then Dell recommends proceeding to the next tier, represented by the next subsequent horizontal row in the matrix, as your baseline sizing guidelines.

The guidelines are only a recommendation. If your configuration meets any exclusion or caveat indicated in this document, does not use a minimum of a 1 GigE network backbone, does not meet the minimum configuration requirements in the sizing guidance matrix, or uses repository storage that is not dedicated to backups, you are likely to encounter difficulties. It is much easier to correct before implementation than after, so use a conservative approach to sizing.
## AppAssure Sizing Guidance Matrix

<table>
<thead>
<tr>
<th>Number of Agents (physical and virtual)</th>
<th>CPU(1)</th>
<th>RAM - Server 2012 (2)</th>
<th>RAM - Server 2008 R2(3)</th>
<th>Network Cards</th>
<th>Repository Size(4)</th>
<th>Disk</th>
<th>Total Repository Size(5)</th>
<th>Application Assurance Triggers(6)</th>
<th>Change Rate Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very Small</strong> 1-5 Agents</td>
<td>One dual-quad core processor</td>
<td>8GB</td>
<td>Add 2GB RAM per TB of repository space to Server 2012 Memory</td>
<td>1 Gigabit NIC</td>
<td>1.2 x total amount of data in all protected servers for Year 1, Each year add .5TB to accommodate growth</td>
<td>NAS, DAS, or SAN</td>
<td>0 - 2.5TB</td>
<td>1 SQL Server/ 1 Exchange Any number of regular servers Max 10% SQL/EXCH Data Max 10% Virtual Stands</td>
<td>Total change rate across all agents &lt; 10% daily and &lt;20 GB/hr. Maximum size of a single incremental from any agent not to exceed 10 TB</td>
</tr>
<tr>
<td><strong>Small</strong> 1 - 10 Agents</td>
<td>One quad core processor, minimum ES-3400</td>
<td>8-16 GB</td>
<td>Add 2GB RAM per TB of repository space to Server 2012 Memory</td>
<td>2 x 1 Gigabit NIC in teamed mode.</td>
<td>1.2 x total amount of data in all protected servers for Year 1, Each year add .5TB to accommodate growth</td>
<td>NAS, DAS, or SAN</td>
<td>2.5 - 6TB</td>
<td>2 SQL Servers 1 Exchange Any number of regular servers Max 10% SQL/EXCH Data Max 10% Virtual Stands</td>
<td>Total change rate across all agents &lt; 10% daily and &lt;20 GB/hr. Maximum size of a single incremental from any agent not to exceed 10 GB</td>
</tr>
<tr>
<td><strong>Medium</strong> 11 - 20 Agents</td>
<td>One six-core processor, Intel ES-2400 or better.</td>
<td>16-32 GB</td>
<td>Add 2GB RAM per TB of repository space to Server 2012 Memory</td>
<td>2 x 1 Gigabit NIC in teamed mode.</td>
<td>1.2 x total amount of data in all protected servers for Year 1, Each year add .5TB to accommodate growth</td>
<td>DAS or SAN Sustained bandwidth of 200 MB/sec is strongly recommended</td>
<td>6 - 12 TB</td>
<td>4 SQL Servers 2 Exchange Any number of regular servers Max 10% SQL/EXCH Data Max 10% Virtual Stands</td>
<td>Total change rate across all agents &lt; 10% daily and &lt;75 GB/hr. Maximum size of a single incremental from any agent not to exceed 100 GB</td>
</tr>
<tr>
<td><strong>Large</strong> 21 - 50 Agents</td>
<td>Minimum one six-core or eight core processor, Intel ES-2650 or better. Recommended 2 x six-eighth-core processors</td>
<td>32-64GB</td>
<td>Add 2GB RAM per TB of repository space to Server 2012 Memory</td>
<td>4 x 1 Gigabit NIC in teamed mode, minimum.</td>
<td>1.2 x total amount of data in all protected servers for Year 1, Each year add .5TB to accommodate growth</td>
<td>DAS or SAN EqualLogic storage or equivalent is strongly recommended Sustained bandwidth of 300 MB/sec or higher</td>
<td>12 - 30 TB</td>
<td>8 SQL servers 4 Exchange Any number of regular servers Max 10% SQL/EXCH Data Max 10% Virtual Stands</td>
<td>Total change rate across all agents &lt; 10% daily and &lt;225 GB/hr. Maximum size of a single incremental from any agent not to exceed 75 GB</td>
</tr>
<tr>
<td><strong>Enterprise</strong> 51 - 100 Agents</td>
<td>Two six or eight-Core processors, 2 x ES-2600 or better.</td>
<td>64-128GB</td>
<td>Add 2GB RAM per TB of repository space to Server 2012 Memory</td>
<td>4 x 1 Gigabit NIC in teamed mode, minimum.</td>
<td>1.2 x total amount of data in all protected servers for Year 1, Each year add .5TB to accommodate growth</td>
<td>DAS or SAN Compellent or EqualLogic storage or equivalent is strongly recommended Sustained bandwidth of 400 MB/sec or faster</td>
<td>&gt; 30 TB</td>
<td>16 SQL servers 10 Exchange Any number of regular servers Max 10% SQL/EXCH Data Max 10% Virtual Stands</td>
<td>Total change rate across all agents &lt; 10% daily and &lt;400 GB/hr. Maximum size of a single incremental from any agent not to exceed 75 GB</td>
</tr>
</tbody>
</table>

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(1) CPU
References Sandy Bridge Chipset

(2) RAM 2012
Use Sliding Memory Scale – Start point of protected machines lower value to Maximum number of protected machines per sizing tier higher value

(3) RAM other 64 bit OS
Accommodate other 64 bit OS’s however need to add additional memory
Start with Server 2012 RAM as Base, then ADD 2GB of RAM per 1TB of repository data

(4) Sizing Repository
Use Archive feature as appropriate
Add storage locations as needed 4096 extents per repository is supported), maximum size of a repository is 32 Exabytes
Strongly recommend working with a AppAssure Solution architect for a customized solution especially if desired retention policy is greater than one year, and/or if there are multiple exceptions

(5) Total Repository Size
Assumes 50% compression ratio, however also depends on type of data being backed up, change rates of protected machines and retention policy(s)

(6) Application Assurance Triggers
Maximum number of SQL and Exchange servers
Total amount SQL and Exchange data must not be greater than 10% of total data being backed up into the repository
Any number of other server types (file, print, active directory, domain controller, other application servers)
Maximum number of Virtual Standbys should not exceed greater than 10% of total protected machines
DL1000

Fast, reliable, affordable backup and recovery appliance powered by AppAssure.

Spend less time managing your backups and more time growing your small business with a fast, affordable backup and recovery appliance that protects your growing digital world. The DL1000 Backup and Recovery Appliance, built by Dell and powered by AppAssure, provides peace of mind with enterprise-quality data protection at pricing made for small businesses.

The DL1000 appliance is specifically designed for a wide range of environments. Its short 15.5” depth, low power draw, quiet acoustics and fresh air cooling make it ideal for space-constrained office environments. Available in 2TB and 3TB provisioned backup capacity (with an option for up to two standby virtual machines) the DL1000 is powered by award-winning AppAssure backup and recovery software. This provides protection for Windows and Linux servers using incremental forever snapshots, built-in replication, in-line deduplication and compression, and features that enable you to quickly recover applications and data.
## DL1000 Sizing Guidelines

<table>
<thead>
<tr>
<th>Model</th>
<th>DL1000 2TB</th>
<th>DL1000 3TB</th>
<th>DL1000 3TB 2VM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Size Protected Data</td>
<td>Up to 5TB</td>
<td>Up to 7TB</td>
<td>Up to 7TB</td>
</tr>
<tr>
<td>60% Assumed Compression/ Deduplication Reduction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DL1000 Configuration</td>
<td>Total Customer Data</td>
<td>DL1000 Configuration</td>
<td>Total Customer Data</td>
</tr>
<tr>
<td>2TB</td>
<td>5.0/4.4* TB</td>
<td>3TB No VM</td>
<td>7.0/6.1* TB</td>
</tr>
</tbody>
</table>

* Designates 85% of total capacity as a best practice recommendation.

RAID1 on HDD drives

* 5GB per hour change rate per agent OR Maximum 50GB TOTAL per hour

### Number of Agents (physical & virtual)

- 1 Hour Snapshot Interval
- 3 Month Retention Policy
- Assumes 5Gb/hr change rate, OR Up To 50GB Total Agent change rate
- NO Virtual Standbys
- No checks on SQL/Exch
- Up to 10 servers

#### Assumptions

- 1 Hour Snapshot Interval
- 3 Month Retention Policy
- Maximum 50GB Total Agent change rate
- NO Virtual Standby
- No checks on SQL/Exch
- Up to 10 servers

For Agents with 2GB change rate

- 1 Gbps NIC
- 2GB Hour / Agent Change Rate(20GB combined)
- 3 concurrent agents
- 2 Hyper-V exports
- No EXCH/SQL/Encryption
- 50GB/Hour
- Total transfer rate 230MB/s

For Agents with 5GB change rate

- 1 Gbps NIC
- 5GB Hour / Agent Change Rate(50GB combined)
- 3 concurrent agents
- 2 Hyper-V exports
- No EXCH/SQL/Encryption
- 50GB/Hour
- Maximum transfer rate 200MB/s

(1) Capacity based licensing. Number of Agents protected is dependent on type of Agent.
## DL4000 Sizing Guidelines

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>High Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Agents</strong></td>
<td>- Physical &amp; Virtual</td>
<td>- Up to 100 Protected Servers</td>
</tr>
<tr>
<td><strong>Total Size Protected Data</strong></td>
<td>- Up to 60TB***</td>
<td>- Up to 120TB***</td>
</tr>
<tr>
<td><strong>Baseline Data Reduction</strong></td>
<td>- 50%**</td>
<td>- 50%***</td>
</tr>
<tr>
<td><strong>Repository Storage Type</strong></td>
<td>- Internal 5TB and External Up to 40TB</td>
<td>- Internal 5TB and External Up to 80TB</td>
</tr>
<tr>
<td><strong>Application Assurance Triggers</strong></td>
<td>• 8 SQL servers, 4 Exchange servers, Any number of regular servers (not to exceed 50)</td>
<td>• 18 SQL servers, 10 Exchange servers, Any number of regular servers (not to exceed 100)</td>
</tr>
<tr>
<td></td>
<td>Total combined size of Exchange &amp; SQL data must not exceed 6TB</td>
<td>Total combined size of Exchange &amp; SQL data must not exceed 12TB</td>
</tr>
<tr>
<td><strong>DL4000 Configuration</strong></td>
<td>5TB Standard - 10/ 8.5* TB / 850GB</td>
<td>20TB High Capacity - 40 / 34*TB / 3.4TB</td>
</tr>
<tr>
<td></td>
<td>10TB Standard - 20/ 17* TB / 1.5TB</td>
<td>40TB High Capacity - 80 / 68*TB / 6.8TB</td>
</tr>
<tr>
<td></td>
<td>20TB Standard - 40 / 34* TB / 3TB</td>
<td>60TB High Capacity - 120 / 102* TB / 10.2TB</td>
</tr>
<tr>
<td></td>
<td>40TB Standard - 80 / 68* TB / 6TB</td>
<td>80TB High Capacity - 160 / 136* TB / 13.6TB</td>
</tr>
</tbody>
</table>

When using Application Assurance on the DL4000 for SQL and Exchange, the total combined size of the SQL and Exchange data must not exceed 10% of the total protected data.

* Designates 85% of total capacity as a best practice recommendation. Reserved space required for nightly rollup process.

### Total Change Rate Triggers

**Assumptions**
- 1 Hour Snapshot Interval
- Total change rate across all agents less than 10% daily and less than 225 GB/hr. Maximum size of a single incremental snapshot from any agent not to exceed 75 GB
- Maximum Virtual Standby = 2

- For 25 Agents
- DL4000 Only
  - With 1 Gbps NIC - 15 GB/Snap (Maximum)
  - With 4 x 1Gbps Teamed NIC - 48 GB/Snap (Maximum)
  - DL4000 with MD1200
    - With 1 Gbps NIC - 15.3 GB/Snap (Maximum)
    - With 4 x 1Gbps Teamed NIC - 60 GB/Snap (Maximum)

- For 50 Agents
- DL4000 Only
  - With 1 Gbps NIC - 7.5 GB/Snap (Maximum)
  - With 4 x 1Gbps Teamed NIC - 24 GB/Snap (Maximum)
  - DL4000 with MD1200
    - With 1 Gbps NIC - 7.5 GB/Snap (Maximum)
    - With 4 x 1Gbps Teamed NIC - 30 GB/Snap (Maximum)

**Assumptions**
- 1 Hour Snapshot Interval.
- Total change rate across all agents less than 10% daily and less than 400 GB/hr. Maximum size of a single incremental snapshot from any agent not to exceed 75 GB
- Maximum Virtual Standby = 4

- For 100 Agents
- DL4000 with MD1200
  - With 1 Gbps NIC - 3.8 GB/Snap
  - With 4 x 1Gbps Teamed NIC - 15 GB/Snap (Maximum)
  - With 1 x 10Gbps Teamed NIC - 18 GB/Snap (Maximum)

**For 50 Agents**
- DL4000 with MD1200
  - With 1 Gbps NIC - 7.6 GB/Snap
  - With 4 x 1Gbps Teamed NIC - 30 GB/Snap (Maximum)
  - With 1 x 10Gbps Teamed NIC - 36 GB/Snap (Maximum)

* Assumes 1 hour snapshot interval and a standard 10% change rate on the protected data size for Standard and High Capacity Editions in the Application Assurance Trigger Section

** Depending on the type of data being backed up, change rates of protected machines and retention policy(s)

*** Total protected data based on estimated data reduction (deduplication rate). Depending on your environmental considerations, reduction ratio can be higher

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* Assumes 1 hour snapshot interval and a standard 10% change rate on the protected data size for Standard and High Capacity Editions in the Application Assurance Trigger Section

** Depending on the type of data being backed up, change rates of protected machines and retention policy(s)

*** Total protected data based on estimated data reduction (deduplication rate). Depending on your environmental considerations, reduction ratio can be higher
Please refer to the PowerVault DL4000 Backup and Recovery Application document for additional information.
Reviewing Sample Sizing Efforts

The following sample scenarios each take a real-life scenario and show how to apply the sizing recommendations in the matrix.

Sample 1 – Windows 2012 Core Example

Aaron is the IT manager from Acorn LTD. He wants to implement AppAssure 5 to protect his organization’s data and provide replication. Company ABC has one Microsoft Exchange Server (300GB), two SQL Servers (totaling 400GB), and six combined application and file servers (totaling 600GB). In total, ABC has 9 servers, totaling 1,300 GB (or 1.3 TB) of data to protect. Multiply 1.3 by 1.2 and Company ABC needs 1.6TB of storage for one year of backups.

Acorn LTD has a 1GigE backbone.

The appropriate sizing is the Small – 1 - 10 Agents tier, because ABC has 9 Agents, 2 SQL Servers and 1 Exchange Server.

Aaron plans to use Windows Server 2012 on his Core server. Thus, the Core requires 8 GB of RAM, and will use direct-attached storage.

If Aaron opts to use Windows 2008 R2 for the AppAssure Core server, sizing rules dictate a need for an additional 2GB of RAM per TB of protected space; therefore, since Aaron has 2 TB of data (rounded up from 1.6 TB), he needs and additional 4 GB of RAM (2 GB RAM * 2 TB Storage = 4 GB RAM).

*Note: Any amount at or above .5 should be rounded to the next integer. Thus, to attain the correct sizing requirements for Company ABC’s Core Server using Windows 2008 R2, 1.6TB of data storage needs is rounded up to 2TB, Adding 2 gigabytes of RAM per terabyte, the 2008 R2 server requires 4 GB of RAM in addition to the base requirement of 8 GB.*
Sample 2– Windows 2008 R2 Core Example

Denise is the project manager for Acme. Acme has three Microsoft Exchange Servers (totaling 2TB of data), six Microsoft SQL Servers (5TB total), eight application servers and one file server (totaling 10TB). In total, Acme plans to protect 18 servers holding a total of 17TB of data in the first year using AppAssure 5.

Although a simple count of servers reaches 18, which would start you in the matrix at the Medium – 11 – 20 Agents tier, the presence of more than four SQL Servers triggers activation of the next tier. When checking the requirements in the Large – 21 – 50 Agents tier, the number of application servers does not exceed the requirements in this tier, nor does total change rate.

However, Acme has a 1GigE backbone. Note that a 10 GigE backbone is recommended for this level of input/output in the network, particularly if there is need for substantial operations such as continuous export to VMs, substantial rollup operations (required when the initial backup policy sets an aggressive threshold such as backups every 5 minutes), and so forth.

17 TB of data * 1.2 = 20.4 TB of storage for one year. In this case, Acme elects to use a high-quality storage-area network such as a Dell EqualLogic device.

Acme plans to deploy the AppAssure 5 Core on Windows Server 2008 R2. Thus, the RAM requirement increases by 2 GB for each TB (2 * 20). In this case, Denise needs an additional 40 GB of RAM. Adding this to the 64 GB required for a Core on Windows 2012 Server, the total requirement is 104 GB of RAM.
Sample 3– Windows 2012 Example with Replication

Konstantin is the IT director for the small law firm of Delta, Echo & Foxtrot (DEF). DEF has one Microsoft Exchange Server (500 GB of data), one Microsoft SQL Server (800 GB total), and three agent servers (totaling 1TB of data). In total, DEF plans to protect 5 servers holding a total of 2.3 TB of data in the first year using AppAssure 5. This firm does not plan any growth in the next three years.

Referring to the matrix, start at the Very Small – 1 – 5 Agents tier. Konstantin starts with robust quad-core processor hardware, and since they use Windows Server 2012, they only need 8 GB of RAM. The change rate is estimated at below 5 percent an hour.

DEF has a suitable 1GigE backbone. They wish to replicate to an offsite location, and will establish a protection regime at one snapshot per hour to start.

2.3 TB of data * 1.2 = 2.7 TB of storage for one year, which rounds up to 3 TB for the source core. This will also require 3 TB of storage for the target core.

Firm DEF meets the specifications for a very small implementation, and the choice of two quad core servers for each core ensures that if requirements increase in the next few years but remains under 10 agents, they will not have substantial upgrade issues.
Glossary

Agent
An agent is a machine or server that is protected. An AppAssure 5 agent machine must be added to the AppAssure Core. When configured, the data from the computer is backed up regularly and saved as recovery points.

AppAssure 5
AppAssure 5 is software that combines backup, replication, and recovery in a single solution that is engineered to be the fastest and most reliable backup for protecting virtual machines in physical and cloud environments.

Byte (B)
A byte is a unit of measurement for digital information storage or transmission consisting of eight bits, and is the unit required to encode a single character of text in a computer. It is the basis for other measurements of digital storage or transmission, using multiples of 1,024 (using the traditional base 2 definition), or multiples of 1,000 if following the later-established base 10 definition adopted by the Institute of Electrical and Electronics Engineers (IEEE). Dell uses the traditional 1,024 multiple unless otherwise specified.

Change rate per hour
The change rate per hour is the amount of data that changes on a server every 60 minutes. This can be calculated by dividing the daily change rate by 24.

Core
The AppAssure 5 Core is the central component of the AppAssure 5 architecture. The Core provides the essential services for backup, recovery, retention, replication, archiving, and management.

Direct-Attached Storage (DAS)
DAS devices include any storage device connected directly to the host computer (in the case of AppAssure 5, the Core server). DAS uses either an internal server disk controller with internal or external drives, or an external system including controller and disks. There is no network between the computer and the storage device. A DAS device can be shared between multiple computers, as long as it provides multiple ports. DAS is also referred to as local storage or locally attached storage. Of the three storage options supported by AppAssure 5 (the others being SAN, and NAS), DAS offers the highest data bandwidth and fastest access rate. It is very easy to implement. See also NAS, SAN.
**Megabyte (MB)**

A megabyte is a unit of measurement for digital information storage or transmission. Following its original base 2 definition, this unit signifies 1,024 kilobytes, or one million bytes.

**Terabyte (TB)**

A terabyte is a unit of measurement for digital information storage or transmission. Following its original base 2 definition, this unit signifies 1,024 gigabytes, or one trillion bytes.

**Network Attached Storage (NAS)**

A network-attached storage device is a special-purpose device, comprised of both hard disks and management software, which is 100% dedicated to serving files over a network. The NAS relieves the server of storage and file serving responsibilities. While a NAS provides more flexibility than direct-attached storage by virtue of being independent, it poses more challenges for sizing and troubleshooting. Many NAS issues are notoriously difficult to diagnose, often seeming to indicate other errors. Data transfer is slower over NAS than DAS or a SAN, increasing the potential for the network to serve as a bottleneck for data transfer. Considering the heavy load of read/write operations, a NAS device used as an AppAssure 5 repository must be dedicated to this purpose alone. Dell recommends high-quality NAS devices rated for enterprise use rather than consumer models for sale in budget outlets and warehouse stores. See also DAS, SAN.

**Recovery point**

A recovery point is a collection of snapshots of various disk volumes (for example, C:, D:, and E:) saved by AppAssure 5 to the AppAssure 5 Core.

**Snapshot**

A snapshot is a point-in-time copy of the folders and files for the volumes on a computer protected by AppAssure 5. The snapshot data is transferred to and stored in the AppAssure 5 Core repository as a recovery point. When you first add a computer to the AppAssure 5 Core as a protected machine, AppAssure 5 saves a snapshot called a base image, which includes all data in the protected volume. Subsequent images are incremental snapshots, which includes all data updated since the last snapshot.

**Storage-Area Network (SAN)**

A storage area network is a high-performance dedicated network providing access to consolidated, block level data storage. With a SAN, the storage devices appear like locally attached devices, although that storage is actually channeled through the network over a Fibre Channel (a reliable gigabit interconnect technology that enables simultaneous communication among workstations, mainframes, servers, data storage systems and other peripherals). A SAN is separate from the local
area network, and the storage is typically not accessible through the local area network by other devices. The SAN’s performance is directly linked to the type of network being used. From an AppAssure 5 perspective, the SAN should be 100% dedicated to serving as the repository for the Core. Using a SAN has many benefits over DAS, with more scalability, consolidating isolated storage islands together, and increasing storage capacity utilization, providing the ability to perform deduplication across volumes. A SAN does not expose an organization to network bottlenecks possible using NAS devices as a repository. See also DAS, NAS.

Sustained bandwidth

Sustained bandwidth is the maximum bandwidth a system can handle after accounting for read latency (the delay a system takes to read data).

Virtual Standby

Virtual standby is an AppAssure 5 feature in which you perform a continuous export of Windows backup information to a virtual machine, providing you with a high availability copy of the data. If a protected machine goes down, you can boot up the virtual machine to then perform recovery. You create a virtual standby by continuously exporting protected data from your Windows machine to a virtual machine (VMware, ESXi, and Hyper-V). When you export to a virtual machine, all of the backup data from a recovery point as well as the parameters defined for the protection schedule for your machine will be exported.
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