Hardware Solutions

BAR Framework Overview

The BAR Framework is a BAR solution architecture that uses BAR servers and a gigabit BYNET network to improve the performance and availability of a data warehouse. The BAR Framework is the advocated architecture for all BAR solutions, but is required for:

- Advocated and Certified solutions
- Teradata systems with hot standby nodes in cliques, which ensure access to all BAR resources in failover scenarios

The BAR Framework is recommended for Enterprise Fit customers who want to provide and support their own disk and tape storage.

Advantages of BAR Framework

The BAR Framework improves data warehouse performance by providing a dedicated infrastructure for the movement of data from Teradata Database to primary backup and archival storage. It simplifies implementation and expansion by providing a consistent grouping of components that Teradata Corporation certifies and supports.

The BAR Framework has dedicated Ethernet architecture that provides optimal throughput and BAR servers that offload work from Teradata Database nodes. There is flexibility in handling increased workloads because BAR servers can be added.

Downtime is reduced because no physical changes to Teradata Database system are required when the BAR configuration is upgraded. The BAR Framework is isolated from the Teradata Database system. Teradata Corporation validates the BAR servers, network, and cabinet infrastructure for the customer, reducing complexity of what is typically the most complex portion of the backup infrastructure.

BAR Framework Components

The BAR Framework uses Teradata Managed Server for BAR (TMSB) as an administration and data movement server. In a TMSB system, BAR servers are typically installed in the same platform cabinet as Teradata Database nodes or within a Teradata Managed Server cabinet. BAR managed servers allow Teradata server management software to monitor the TMSB system.

The BAR Framework consists of:

- BAR servers

- Dedicated InfiniBand or Gb Ethernet network switches that connect to Teradata Database nodes
- Fibre channel connections to disk and tape devices
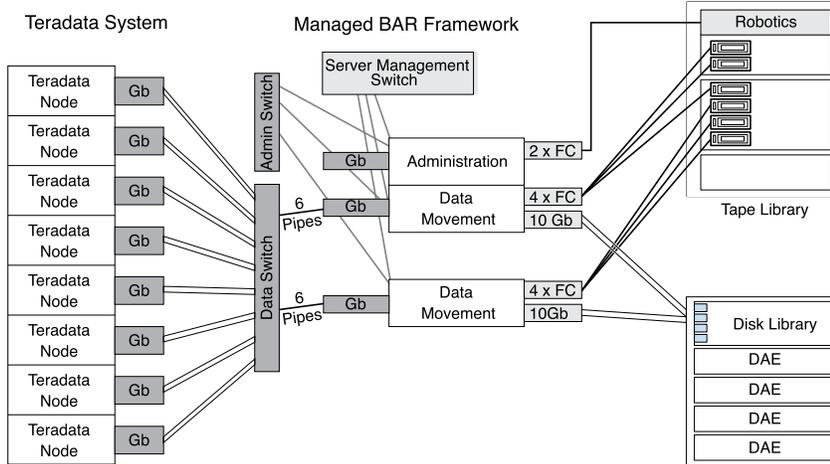
Figure 7: Example of a BAR Solution Configuration

Table 4: Location of Software

Software	Administration Server	Data Movement Servers	Integrated Administration and Media Server
Third-party administration software (NetBackup master server, for example)	X		
Software for the NetBackup media server		X	
Teradata Extension for NetBackup		X	
Vault		X	
Data Stream Controller			X
DSC Repository			X
DSA Network client			X
DSA Access Module			X
Third-party backup application software			X

Third-party administration software such as NetBackup master server software resides on the administration server. In an Advocated solution using Teradata Extension for NetBackup, software for the NetBackup media server, Teradata Extension for NetBackup, and Vault reside on data movement servers. In an Advocated solution using Teradata DSA, the Data

Stream Controller, DSC Repository, DSA Network client, DSA Access Module, and third party backup application software reside on an integrated administration and media server.

Table 5: BAR Solution Hardware Components

Hardware Type	Description
BAR Server	Teradata Managed Server Cabinet
Switches	• Dell 1 Gb Ethernet switch for administration traffic and data movement • Blade 10 Gb Ethernet switch for administration traffic and data movement • Mellanox InfiniBand switch for administration traffic and data movement • Brocade fibre channel switch for SAN functionality for the tape libraries
Disk	• Teradata EMC Data Domain systems
Tape Drives	Linear Tape-Open (LTO) magnetic tape drives
Tape Libraries	Quantum tape libraries • Quantum Scalar i80 • Quantum Scalar i500 • Quantum Scalar i6000
Tape Encryption	Key management. Architecture and components vary, depending on the product. • Scalar Key Manager

Go to BAR Hardware OCIs for hardware Ordering and Configuration Information (OCI).

BAR Architecture Options

Advocated Solutions Hardware

Advocated solutions use the BAR Framework, which includes the Teradata Managed Servers for BAR (TMSB) and network switches, and Teradata-supplied disk and tape storage.

Certified Solutions Hardware

Certified solutions use the BAR Framework, which includes the Teradata Managed Servers for BAR (TMSB) and network switches, and Teradata-supplied disk and tape storage.

Teradata has existing legacy NetVault customers who use direct-attached systems in which direct-attached tape drives and tape libraries connect directly to the Teradata Database nodes. Upgrading to the BAR Framework, however, is strongly recommended for improved performance and reliability.

Enterprise Fit Solutions Hardware

Enterprise Fit solutions use a mix of Teradata and customer-supplied systems. The customer can implement the BAR Framework hardware and software, or only the BAR hardware.

Servers

Types of Servers

BAR servers can be categorized into physical servers and BAR software servers, such as a DSC server. Software server types for BAR servers reflect their functionality.

Physical

Administration Server

A BAR administration server:
- Runs the tape management software that controls BAR devices such as drives, robotics, and storage media.
- Starts backup jobs on the media (data) servers and provides the command and control for backup and restore jobs.

There is only one administration server in a BAR solution. The BAR administration server is sometimes referred to as the BAR master server.

Media (Data) Server

A BAR media server:
- Runs the client software components and the TDE (Teradata Extension) agents for the backup application software.
- Assumes the role of clients, processing administration server requests for BAR functions and moving data to and from the nodes during backup and restore jobs.

The BAR media server is sometimes referred to as the BAR data server. There can be multiple media servers in a BAR solution.

The BAR media server is certified to be connected to BYNET V5/ InfiniBand switches.

BAR Integrated Administrative and Media Server

A Teradata Data Stream Architecture (DSA) configuration combines administrative and media server functionality in an integrated server.

Software Servers for Teradata DSA

DSC Server

In a Teradata DSA configuration, a DSC server is a Teradata Managed Server for BAR where the DSC Repository resides and on which the Data Stream Controller (DSC) software component runs.

Software Servers for NetBackup

NetBackup Enterprise Server

A NetBackup Enterprise server is a BAR server on which NetBackup Enterprise server software is installed. A NetBackup Enterprise server can be part of a Teradata DSA configuration, or included in a Teradata Extension for NetBackup configuration.

(NetBackup) Master Server

In NetBackup terminology, a master server is a BAR server configured to administer all NetBackup components. The master server is also responsible for scheduling archive and restore operations. In an Enterprise Fit solution, the NetBackup master server resides on one of the media servers, or it can be a separate BAR server from the media servers. In an Advocated solution, NetBackup master server software resides on the administrative server.

(NetBackup) Media Server

In NetBackup terminology, a media server is a BAR server configured to control one or both of the following:
- Library changer arms
- Tape drives

A media server is controlled by the master server.

Overview of TMSB Architecture

The Teradata Managed Server (TMS) is the building block for several types of application servers, including the Teradata Managed Server for BAR (TMSB). A TMSB cabinet includes:
- One administration server (admin), which controls backup and restore jobs
- One to six media servers (data), which move data from Teradata nodes to the associated backup devices
  Media servers such as NetBackup media servers are considered client servers.

In a standard Teradata Data Stream Architecture (DSA) configuration, administrative and media server functionality is combined in a BAR integrated administrative and media server.
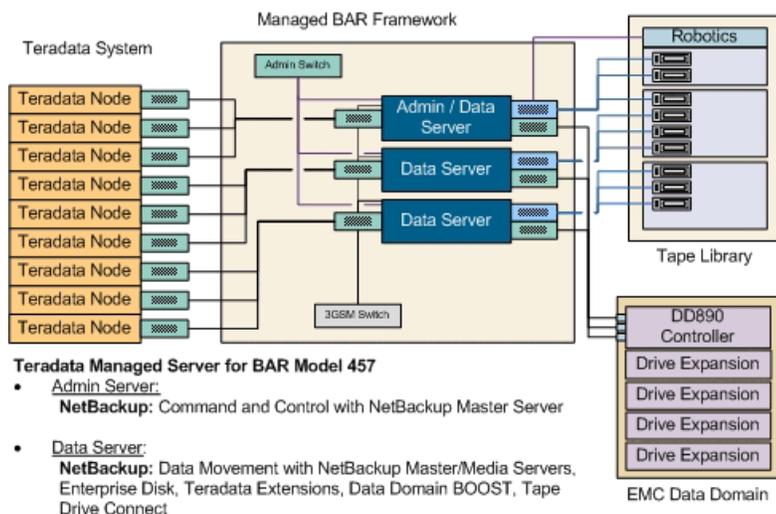
In other TMSB cabinet configurations, the administration server can host a NetBackup Master Server.

See the *Teradata Managed Server Product and Site Preparation Guide for Cabinet and Server, Models 4X5, 4X7, and 6X7* for information about TMS configurations.

Teradata Database nodes can exist inside or outside the TMSB cabinet. In either configuration, the TMSB is connected to the nodes with Gb switches, and to storage devices with optical or copper cables and switches.

The following figure shows TMSB architecture used in a configuration with NetBackup and Data Domain.

FOR TERADATA USE ONLY

Figure 8: TMS for BAR Model 457 Architecture

Teradata Managed Server for BAR Model 457

- Admin Server:
  NetBackup: Command and Control with NetBackup Master Server

- Data Server:
  NetBackup: Data Movement with NetBackup Master/Media Servers, Enterprise Disk, Teradata Extensions, Data Domain BOOST, Tape Drive Connect

BAR Configurations

The following figure shows an example of a BAR single-purpose TMS server cabinet configuration. The Teradata Managed Server cabinet can also be configured as a multiple-purpose cabinet that includes any combination of BAR configurations.

Figure 9: Teradata Managed Server Cabinet Configuration - BAR Single-Purpose

Maximum BAR configuration consists of one of the following:

* TMS BAR data servers with 48-port 1 Gb switches

* TMS BAR data servers with 24-port 10 Gb switches and 48-port 1 Gb switches

Optional:

*48-port 1 Gb admin and data switches in single-cabinet or small Teradata systems

*BAR admin server in single-cabinet systems

*40-port Brocade Fibre Channel switch (24 ports active)

Required:

*TMS BAR admin server in multiple-cabinet Teradata systems

*BAR admin switch if a BAR admin server is present

The BAR data server-to-switch ratio (the data building block) depends on the BAR configuration. Data building blocks consist of 1-4 BAR data servers with 1-2 associated data switches (1 Gb and/or 10 Gb).

18	Primary Server Mgmt Switch	40
17	Secondary Server Mgmt Switch	39
	cabling	38
16	Brocade 5100 FC Switch	37
		36
		35
		34
		33
15		32
		31
14	BAR Data Server	30
		29
13	1 Gb BAR Data Switch	28
	cabling	27
12	BAR Data Server	26
		25
11	1 Gb BAR Data Switch	24
	cabling	23
10	BAR Data Server	22
		21
9	1 Gb BAR Data Switch	20
	cabling	19
8	BAR Data Server	18
		17
7	1 Gb or 10 Gb BAR Data Switch	16
	cabling	15
6	BAR Data Server	14
		13
5	1 Gb or 10 Gb BAR Data Switch	12
	cabling	11
4	BAR Data Server	10
		9
3	1 Gb or 10 Gb BAR Data Switch	8
	cabling	7
2	BAR Admin Server / BAR Data Server	6
		5
1	1 Gb BAR Admin Switch	4
	cabling	3
	AC Box	2
	AC Box	1

— optional (37, 36, 35, 34, 33, 32, 31)

— one data building block (30, 29)

— one data building block (26, 25)

— one data building block (22, 21)

— one data building block (18, 17)

— one data building block (14, 13)

— one data building block (10, 9)

— optional (6, 5)

(#) managed chassis

[#] unmanaged chassis

BAR Interconnect

There are many possible BAR interconnect configurations. The following configuration example shows a 2:1 TPA-node-to-BAR server ratio with 2+1 clique. The example uses 1 Gb Ethernet connections with the database nodes. Other configurations use 10 Gb Ethernet connections with the database nodes.

Note: The solid lines around the cabinet in the figure below represent the PFC cabinet boundary. Chassis inside the solid lines are located in the cabinet.

Figure 10: 2:1 TPA-Node-to-BAR Server Ratio with 2+1 Clique
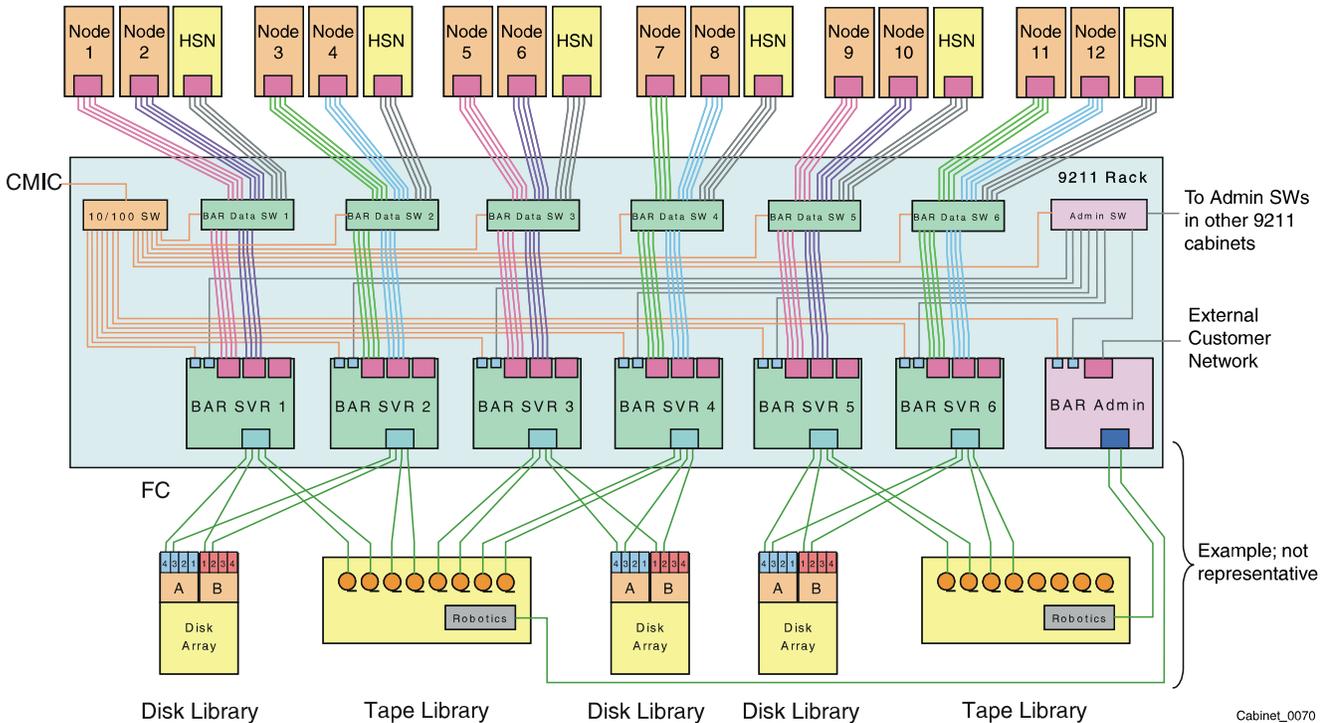
Storage

Tape Drives

Tape Drive Overview

A tape drive reads and writes computer data to magnetic tape for the purpose of backup, archive, and restore: it writes the data one tape at a time. The data on magnetic tapes can also be erased.

Tape drives store data sequentially. Specific data is accessed by starting at the beginning and sequentially reading the tape until the desired data is reached.

Drive Speed

Teradata Database interacts with its primary disks through continuous I/O where data is continuously written or read. Most applications are intermittent users of I/O, reading then stopping or writing then stopping. The flow of data during a backup job also follows a similar pattern, with Teradata Database sending data continuously from its disk arrays and typical applications going through a directory structure with many "start/stop" actions. Backup-to-disk solutions are able to quickly start and stop writing whereas there is a mechanical time delay for tape media.

This is not true when a continuous stream of data is sent to tape, where tape is capable of equivalent and sometimes faster performance. The reason for this is that after the tape drive heads have physically come into contact with the media, the tape drive can continuously stream data onto the tape media.

Connectivity

Tape drives are located in the tape libraries and use fibre channel connectivity. In BAR Framework architecture, tape drives connect to the BAR servers. In direct-connect architecture, the tape drive connects to the Teradata Database nodes.

Tape Drive Sharing

All Teradata tape libraries can be shared with another Teradata system. Typically, a shared library has dedicated tape drives. For example, a library shared between a Teradata production system and a Teradata development system would have a tape drive dedicated to each system.

A fibre channel switch allows multiple Teradata systems to share tape drives, thereby providing better use of tape resources. All Teradata tape libraries can be shared between several systems by directly connecting the systems to tape drives in the library/silo. Fibre channel switches permit the sharing of the drives themselves.

On the left side of the following diagram, two Teradata systems share a library but are connected to a specific tape drive. On the right side of the diagram, the library shares the tape drives.

Figure 11: Shared Library Comparison
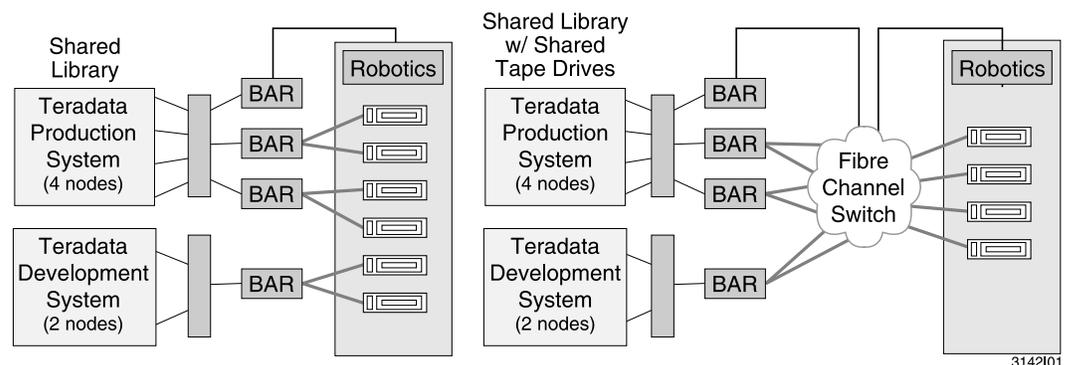
Tape Libraries

Tape Library Options

Choosing a Tape Library

All Teradata tape libraries are designed to provide optimal performance when backing up, archiving, or restoring. Each library has been designed to scale for future growth and use advanced robotics to support a mixture of environments.

Increased throughput per node has been observed in test environments using the Teradata Managed Server for BAR in a current, advocated configuration with two streams of data from each node. Two tape drives per node are needed for optimal backup performance. Up to four tape drives can be connected to each BAR Server.

Quantum Scalar i80

The Quantum Scalar i80 is an entry-level tape library that supports up to five drives. Features include proactive monitoring and remote diagnostics that can reduce management time and service calls. Multiple i80s can be used to back up a single Teradata Database system, but only media in each i80 module is accessible to tape drives within the same module.

Quantum Scalar i500

The Quantum Scalar i500 is a scalable tape library that supports up to 18 nodes for growing, midrange storage environments. Features include:
- Proactive monitoring and remote diagnostics that can reduce management time and service calls
- Access control and FIPS compliant encryption key management

Quantum Scalar i6000

The Quantum Scalar i6000 is a high-availability, high-performance tape library that supports up to 96 drives. Features include:
- Proactive monitoring and remote diagnostics that can reduce management time and service calls
- Access control and FIPS compliant encryption key management
- Enterprise consolidation of Teradata and Enterprise Servers and Systems to a single library or set of libraries
- Extended import/export, which allows administrators to make general storage slots look like SCSI import/export elements.
- Automated Media Pooling (AMP), which is part of the partitioning feature. An AMP partition can be created that is used as a common pool of licensed storage that can be quickly and easily assigned to host managed partitions.

Virtual Tape Library

A virtual tape library (VTL) presents hard disk storage as a tape library or tape drives so that it can be used with existing backup software. Scalability is achieved by adding more disk drives and enclosures. Advantages of using a VTL over a tape library include:
- Disk technology does not use streaming, therefore using a VTL eliminates the streaming problems that occur with tape.
- Virtual tape library performance is frequently better than tape library performance in both backup and recovery operations.

Disk Drives

Disk Drive Options

Data Domain Drives

Teradata EMC Data Domain system configuration options include primary control modules, disk expansion shelves, I/O adapters, rack/power and software licenses. Some of these items are also available in bundles.

DD890 Controller General Platform Features

- 2U dual-socket, hex-core Xeon platform
- 96 GB memory standard for all configurations
- One NVRAM card
- Optional I/O connectivity (three slots maximum – DD OS 5.1)
  - Up to three dual-port copper or optical 10 GbE NICs
  - Up to three dual-port optical 1 GbE NICs
  - Up to three quad-port copper 1 GbE NICs
  - Up to two dual-port 8 Gb FC HBA VTL options
- Redundant external storage connectivity
  - Two quad-port SAS HBAs
  - Two 1M and six 2M SAS cables (included)
- Redundant, hot swap, 1 + 1 Power
- Data Domain Boost and VTL
- Software options: Replicator, Retention Lock, and Encryption

DD890 Expansion Shelves

The Teradata EMC Data Domain Model 890 supports up to 12 expansion shelves for a total of 288 TB usable capacity (384 TB Raw). The Teradata EMC Data Domain Model 890 expansion shelves do not have to be added in pairs and may be added one at a time. The maximum number of shelves is twelve.

DD4200 General Platform Features

- 4U dual-socket, 8-core Xeon platform (Sandy Bridge)
  - 128 GB memory configuration
- One NVRAM IO Module with 4 GB memory
- Six I/O slots for Ethernet and Fibre Channel options
  - Up to four dual-port copper or optical 10 GbE IO Modules
  - Up to four combo 1 GbE IO Modules, two copper ports plus two optical ports
  - Up to four quad-port copper 1 GbE IO Modules
  - Up to four dual-port 8 Gb FC IO Modules
- Redundant external storage connectivity
  - Two quad-port SAS IO Modules for Active Tier
- Redundant, hot swap, 1 + 1 Power
- Supports NFS and optional DD Boost (for Symantec NetBackup)
- Software options include Replicator, Retention Lock, and Encryption
- Up to 270 concurrent write streams; 75 concurrent read streams; and 150 source replication streams

DD4200 Expansion Shelves

The Teradata EMC Data Domain Model DD4200 is available for new system orders with the following drive shelves:
- ES30-30 (24TB usable)
- ES30-45 (36TB usable)
- DS60-3TB (xx TB usable)

With a minimum configuration of 1 shelf, the DD4200 bundles are available with 1 to 5 drive shelves. Additional drive shelves may be added up to a total of 5 shelves per DD4200 controller unit.

DD7200 General Platform Features

- 4U dual-socket, 8-core Xeon platform (Sandy Bridge)
- Two memory configurations
  - Base Capacity: 128 GB
  - Expanded Capacity: 256 GB
- One NVRAM IO Module with 4 GB memory
- Six I/O slots for Ethernet and Fibre Channel options
  - Up to four dual-port copper or optical 10 GbE IO Modules
  - Up to four combo 1 GbE IO Modules, two copper ports plus two optical ports
  - Up to four quad-port copper 1 GbE IO Modules
  - Up to four dual-port 8 Gb FC IO Modules
- Redundant external storage connectivity
  - Two quad-port SAS IO Modules for Active Tier
  - Four quad-port SAS IO Modules for Extended Retention
- Redundant, hot swap, 1 + 1 Power
- Supports NFS, CIFS and optional DD Boost (for Symantec NetBackup).
- Software options include Replicator, Retention Lock, and Encryption

DD7200 Expansion Shelves

The Data Domain DD7200 is available for new system orders with the following drive shelves:
- ES30-45
- DS60-3TB if 128GB of RAM
- DS60-4TB if 256GB of RAM

DD7200 bundles are available with 3 to 12 drive shelves, with a minimum configuration of 3 shelves. Additional drive shelves may be added for a total of 12 per DD7200 controller unit.

Teradata Managed Server for Storage

Teradata Managed Server for Storage (TMSS) is an NFS storage server available in two capacity configurations, dependent on the specific appliance backup utility that is used and the amount of storage capacity required.

TMSS Model 855NAS-14D (Dell R720xd) General Features

40TB for storage-only TMSS.

Notice: If additional customer usable storage capacity is required, specify additional storage-only TMSS units.

- Server Chassis: 2U, Dell E14S, R720XD
- Processor: Two 2.1 GHz ES-2620v2 CPU
- Memory: 128GB (8 x 16GB)
- Power: Redundant, hot swap, 1 + 1
- Disk Drives:
    - • Two 900 GB SED drives for OS (RAID 1)
    - Twelve 4 TB SED drives for data storage (RAID 6) (3.5" drives are used)
- I/O Options:
    - Up to three full height Ethernet adapters (quad 1GbE or dual 10Gbe each)
    - One BYNET v5 InfiniBand adapter, and up to two Ethernet adapters in any combination.

TMSS Model 855NAS-DSU (Dell R720xd) General Features

32TB for TMSS with DSC capability for use with Data Stream Utility (DSU).

Notice: Only one TMSS with DSC capability is required for each DSU installation.

- Server Chassis: 2U, Dell E14S, R720XD
- Processor: Two 2.1 GHz ES-2620v2 CPU
- Memory: 128GB (8 x 16GB)
- Power: Redundant, hot swap, 1 + 1
- Disk Drives:
    - • Two 900 GB SED drives for OS (RAID 1)
    - Twelve 4 TB SED drives for data storage (RAID 6) (3.5" drives are used)
- I/O Options:
    - Up to three full-height Ethernet adapters (quad 1GbE or dual 10Gbe each)
    - One BYNET v5 InfiniBand adapter and up to two Ethernet adapters in any combination.

Deduplication With Drives and Libraries

Teradata Data Domain Deduplication

Overview

The Teradata EMC Data Domain deduplication storage system combines high speed, inline deduplication with local compression. The Data Domain system writes only unique data to disk. Deduplication technology reduces disk capacity requirements and overhead, while increasing accessibility and reliability, making a Data Domain system a cost-effective alternative to tape.

Teradata EMC Data Domain systems transfer only de-duplicated and compressed changes across your IP network, requiring a fraction of the bandwidth, time, and cost associated with traditional replication methods. Additionally, Teradata EMC Data Domain systems make use of technologies that offer advanced data verification and integrity, and leverage CPU advancements to directly benefit system throughput and scalability.

Deduplication is only available on DD890, DD4200, and DD72000.

How It Works

Teradata EMC Data Domain Deduplication segments the incoming data stream, uniquely identifies the data segments, and then compares the segments to previously stored data. If an incoming data segment is a duplicate of what is already stored, the segment is not stored again, but a reference is created to it. If the segment is unique, it is stored on disk.

For example, a file or volume that is backed up every week creates a significant amount of duplicate data. Deduplication algorithms analyze the data and store only the compressed, unique change elements of the file. This process reduces storage requirements by 8 to 12 times compared to average backup retention policies on normal enterprise data. This means that companies can store 8 TB to 12 TB of backup data on 1 TB of physical disk capacity, providing significant economic benefit.

Connectivity

Figure 12: Teradata Data Domain Connectivity
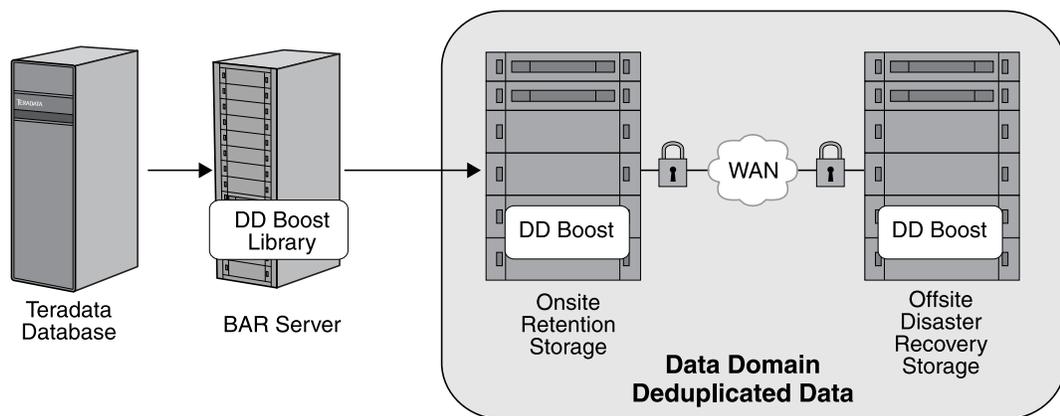
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Data Domain Virtual Tape Library

EMC Data Domain Virtual Tape Library (VTL) software enables Teradata EMC Data Domain deduplication storage systems to emulate many types of tape drives and tape libraries over a fibre channel interface. It provides up to 64,000 virtual slots and up to 250,000 virtual tape cartridges. VTL software takes advantage of Data Domain scalable deduplication features for disk backup and network-based disaster recovery. Data Domain VTL enables easy integration of Data Domain systems into fibre channel SAN environments. Using Data Domain Replicator software, virtual tapes can be transported to remote sites for disaster recovery, remote office data protection, or multi-site tape consolidation.

Boost

EMC Data Domain Boost software significantly increases performance by distributing parts of the deduplication process to the backup server or application client. Without Data Domain Boost, the backup server sends all data, unique or redundant, to a Data Domain system for deduplication processing. With Data Domain Boost, only unique segments are sent to a Data Domain system. Boost is only available for Symantec NetBackup. Replication is controlled by NetBackup through Storage LifeCycles Policies (SLP) or NetBackup Vault Profiles.
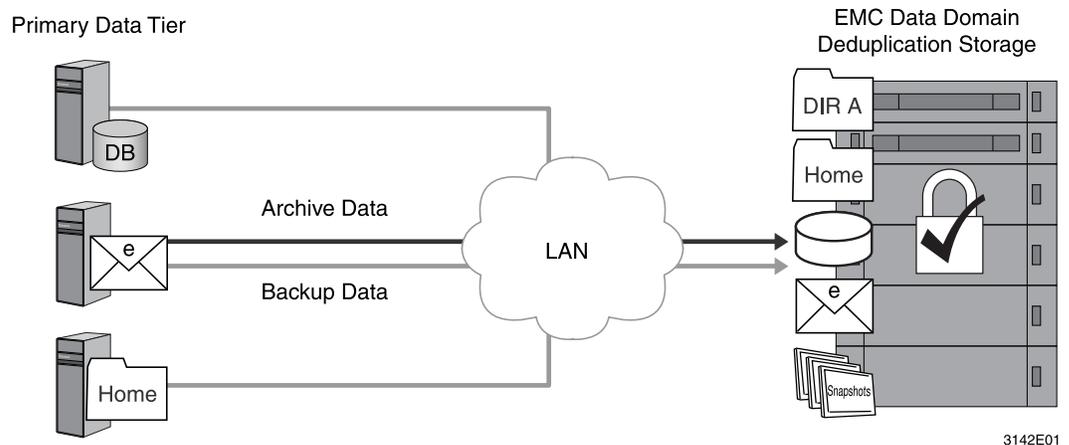
Figure 13: Teradata Domain Boost
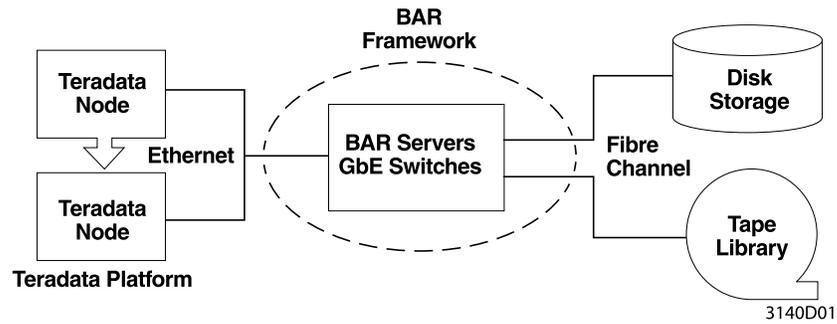
Encryption

EMC Data Domain Encryption software protects backup and archive data stored on Data Domain deduplication storage systems with encryption algorithms that are performed inline, before the data is written to disk.
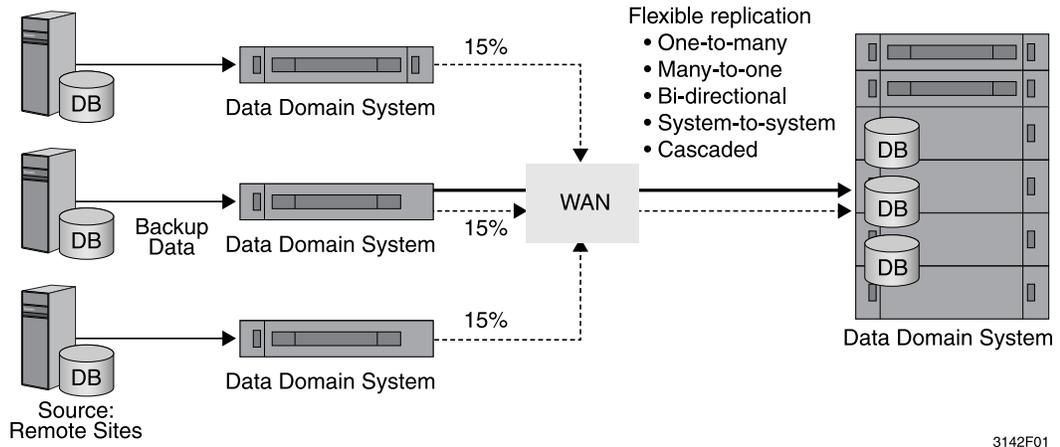
Figure 14: Teradata Data Domain Encryption
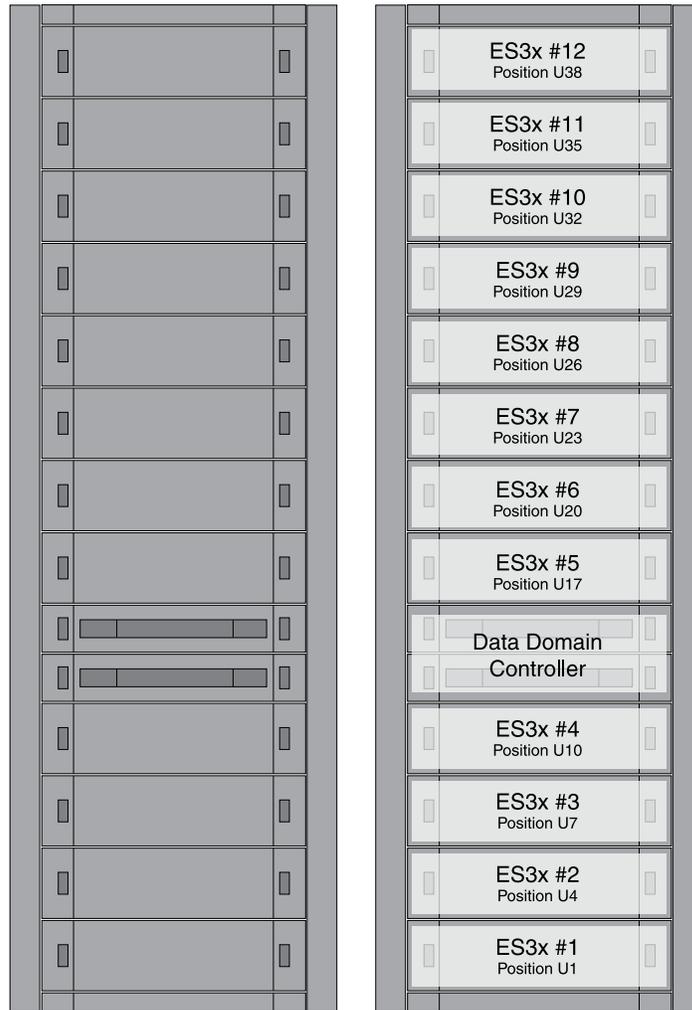

Replicator

EMC Data Domain Replicator software provides fast, network efficient, encrypted replication for disaster recovery, data protection for remote offices, multi-site tape replication, and long-term offsite retention. Data Domain Replicator asynchronously transfers compressed, de-duplicated data over the WAN for cost-effective, fast, reliable replication. Local and cross-site deduplication combine to offer maximum bandwidth reduction. Only non-redundant segments are replicated from a local or remote site, which reduces the amount of data copied.

Figure 15: Teradata Data Domain Replicator

Specifications

Figure 16: Teradata Data Domain Cabinet

| | ES3x #12 |
| Position U38 |
| ES3x #11 |
| Position U35 |
| ES3x #10 |
| Position U32 |
| ES3x #9 |
| Position U29 |
| ES3x #8 |
| Position U26 |
| ES3x #7 |
| Position U23 |
| ES3x #6 |
| Position U20 |
| ES3x #5 |
| Position U17 |
| Data Domain |
| Controller |
| ES3x #4 |
| Position U10 |
| ES3x #3 |
| Position U7 |
| ES3x #2 |
| Position U4 |
| ES3x #1 |
| Position U1 |

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Connectivity

Switch Connectivity

BYNET Connectivity

BYNET V5 provides connectivity between Teradata Database nodes and BAR servers. The BYNET V5 switch must provide sufficient links to support connectivity to the TMS(s) for BAR.

Ethernet Connectivity

Ethernet switches enable connectivity between the Teradata processing nodes and the BAR servers. The BAR solution uses switches in two ways; one for administration traffic and one for data movement traffic.

- In 1Gb Ethernet configurations, such as with the Dell X1026, the switch is used for administration traffic and for data movement.
- The Dell 2824 24-Port 1 Gb Ethernet switch provides optional connectivity between two key servers for the Quantum Scalar Key Manager (SKM) Solution.
- The Dell 6248 48-port Ethernet switch enables the connectivity between the Teradata processing nodes and the BAR servers. In 1Gb Ethernet configurations the switch is used for administration traffic and for data movement.
- The Blade G8124 10Gbit 24-port Ethernet switch provides the connectivity between Teradata nodes and the BAR servers. In 10 Gb Ethernet configurations the switch is used for data.

Fibre Channel Connectivity

The Brocade 6510 48-port fibre channel switch provides basic SAN functionality for the SL500, SL3000, i80, i500 and i6000 tape libraries, This switch is not certified for use with Teradata disk arrays. The switch has 24 ports licensed and enabled, with an option to expand in increments of 12 ports up to the maximum of 48 ports.

Adapter Types

The following adapters are available for BAR servers.

Ethernet:
- Intel PRO/1000 PT Quad Adapter Ports
- Intel X520-DA2 Dual 10 Gb Copper Adapter Ports (requires a special cable that is up to 7 meters in length)
- Intel X520-SR2 Dual 10 Gb Fiber Adapter Ports

InfiniBand:
- Mellanox ConnectX-3 BYNET/ InfiniBand

Fibre Channel:
- QLogic QLE2564 Quad 8 Gb FC Adapter Ports

See *Teradata Managed Server for Cabinet and Server, Models 4X5, 4X7, and 6X7, Hardware Service Guide*, B035-5320 and *Teradata Platform Framework Cabinet Model 12 Hardware Service Guide*, B035-5389 for detailed descriptions of adapter specifications.

Encryption

Key Management Tape Encryption

Key management is the advocated encryption solution. Protection of backup data is a crucial element in system security. Data on tapes is vulnerable to security breaches. Handling

physical media, such as tapes, is fraught with human error. Tapes may be lost during transport to an archive location, misplaced, mislabeled, and so on. Many states have laws requiring public disclosure and liability for lost computer tapes that are not protected with encryption. Existing libraries in the field can be easily upgraded with key management.

Key management benefits include the following:
- Securely manages all encryption keys
- Easy to manage and secure
- High availability (dual) key management appliances
- Implemented and supported by Teradata

Key Management Components

Key management architecture and components vary, depending on the product. For example, Oracle Key Manager consists of the following components:
- Key Management Appliance
- Management GUI Server
- Key Manager Cluster
- Agent: tape drive
- Data Unit ID: data cartridge
- Key Groups
- Network connections
- Encryption Card
- Gbit Ethernet Switch
- Rack
- Power

The Scalar Key Manager (SKM) is a server, housed in a rack or cabinet, which manages encryption keys. Each customer must have two SKM appliances for redundancy. The SKM GUI is accessed through the front panel of the library or through the library's GUI. Ethernet cables are required to connect the SKMs to the tape library through a switch.

Note: Tapes encrypted with the OKM cannot be read by the Quantum i500 or i6000 libraries. The reverse is also true: tapes encrypted by the Quantum SKM cannot be read by the Oracle libraries. Unencrypted tapes, however, can be read across libraries.

Performance Variables

Hardware Performance Variables

All Nodes and Servers

Verify the:
- BIOS settings for hyper-threading to ensure that all the cores of multi-core processors are used.
- Device drivers are correct. If the drivers are not correct, update the drivers.
  - Use standard Qlogic device drivers for BAR storage.

Note: Do not use device drivers designed for use with primary storage devices on Teradata Database nodes.

- Verify the latest Teradata-certified drivers are installed for each I/O card.

Network

Verify that MTU settings are the same across all network devices used for data.

BAR Switches

When using *fibre channel* over 10 km, install a license on the switch to support the extended distance.

Match the host bus adapter (HBA) fibre-channel adapter card speed to the small form-factor pluggables (SFPs) used with the fibre-channel switch. For example, connect 8 Gb fibre-channel adapter card HBAs using 8 Gb SFPs on the fibre-channel switch.

Note: Teradata does not sell long distance licenses for fibre-channel switches, or the single-ended SFPs that are able to run a long distance.

For information on software performance variables, see *BAR Software Solution Guide*, B035-3141.