

Advanced Technology Group



Accelerate with ATG: Introduction to IBM's newest Tape Storage, the IBM Diamondback

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- North America ATG Storage - IBM Storage Scale and Storage Scale System GUI
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- North America ATG Storage - Managing Copy Services on the DS8000 Using IBM Copy Services Manager Test Drive
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Meet the Speakers



Carl Reasoner is a Senior Storage Technical Specialist -IBM Advanced Technology Group (ATG) - Tape Solutions. He has 23 years experience with tape including 15 years with IBM, specializing in Open Systems tape and IBM Storage Archive.

Introducing IBM Diamondback

- Ultra-high-density (UHD) library and drive frame
- Data center rack width
- Self-service design
- Simplified installation
- 5U “top rack” option



IBM Diamondback Benefits

- Less than 30-minute deployment
- Efficient use of floor space and energy
 - No side clearance required
 - 5U “top rack” option
- Simplified operations*
 - Lower configuration burden
 - Library management with control system that integrates built-in and external tools
- Mechanical design lowers maintenance costs



Why Diamondback?



- Ease of planning installation
- Reduce floor space per frame by 28%
- Reduced installation at <30 minutes
- Self-service; most service completed in <2 minutes
- Improved options for data center deployment with pre-loaded media
- TB/MBpS ratio less than 5.0

Diamondback R1 – Storage Transformation

- Support for LTO-9 tape drives
 - Up to 14 tape drives
 - Read and Write compatibility with LTO-8 media
- Ultra Density single frame slot capacity up to 28.5 PB*
 - Up to 1584 cartridge slots*
- 12 Gb SAS and 8 Gb Fibre Channel interfaces
- Supports all Drive functions
- AES-256 Data-at-rest encryption
- IBM Storage Archive™ support
 - Incorporates Linear Tape File System™ format
- Data security and regulatory compliance through support for Encryption and WORM media



IBM Diamondback - Overview



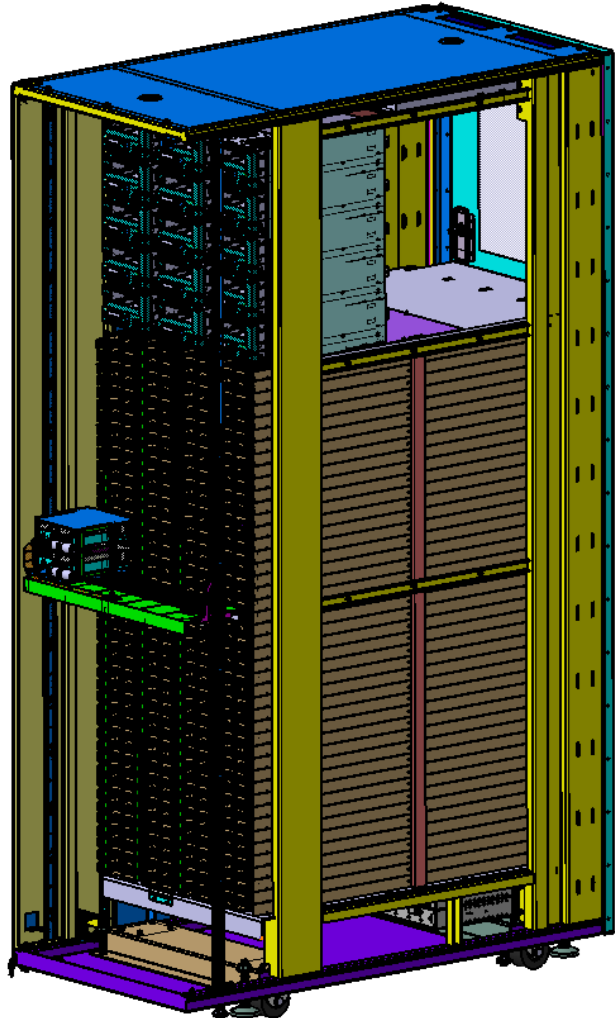
- Single Frame design – No expansion frames
- Up to 14 LTO-9 Tape drives
- Up to 1548 Tape media storage
- 27.8 PB uncompressed usable capacity
- Single cartridge service magazine, 10 I/O slots
- Single robot, high availability grippers
- Pre-loaded media option
- Self-service design
- GKLM library managed Encryption
- Open systems attachment including AIX[®], Linux, MS Windows[®]

Install like a server rack



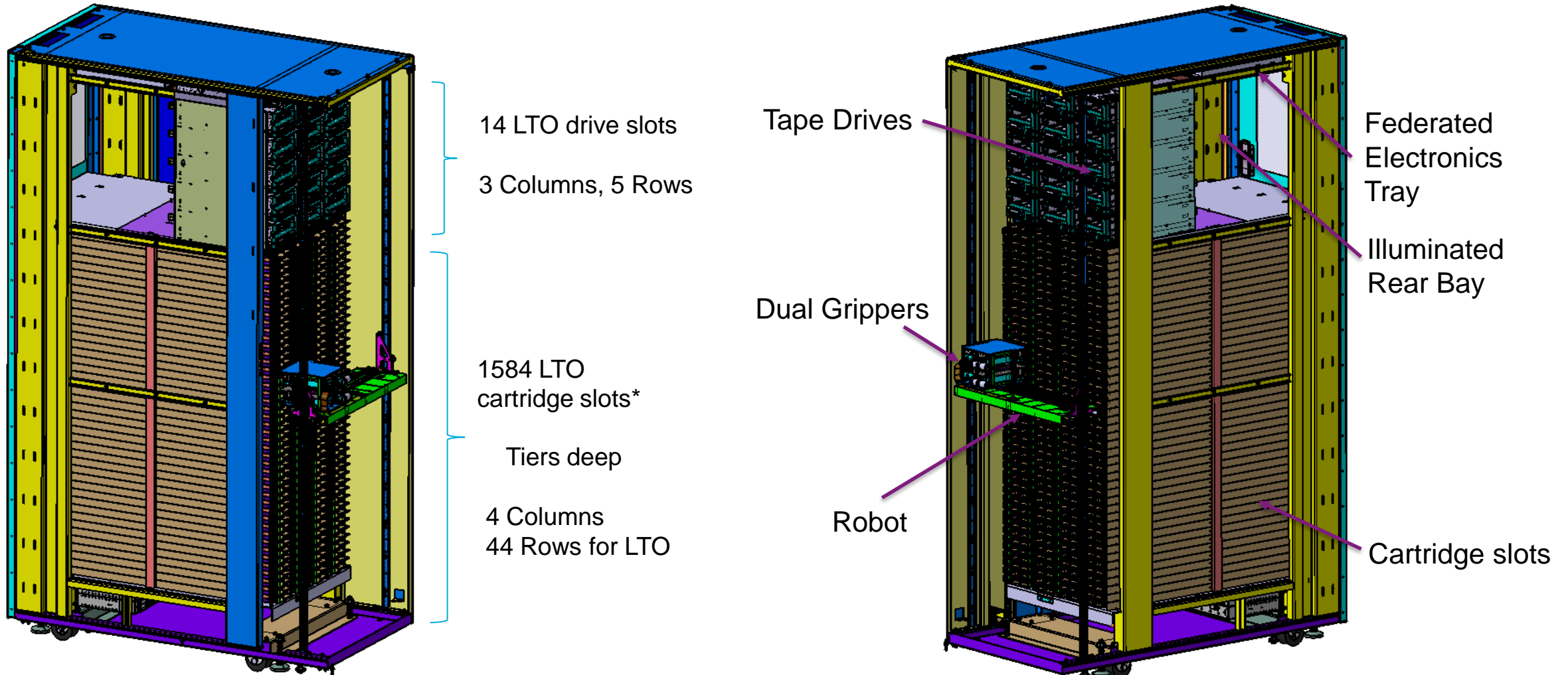
- Quick Deployment
 - Positioning to power-on in <30 minutes
 - Tool-less, less than 2 minutes removal of restraining brackets
 - Robotics parked in front of drives for shipment
- Install side-by-side (no side service clearance required)
- Support shipping fully loaded with media
- Power-on self-install (auto-discovery and calibration)
- REST API to support system verification and deployment (based on TS4500 REST API)*

Reduced Complexity



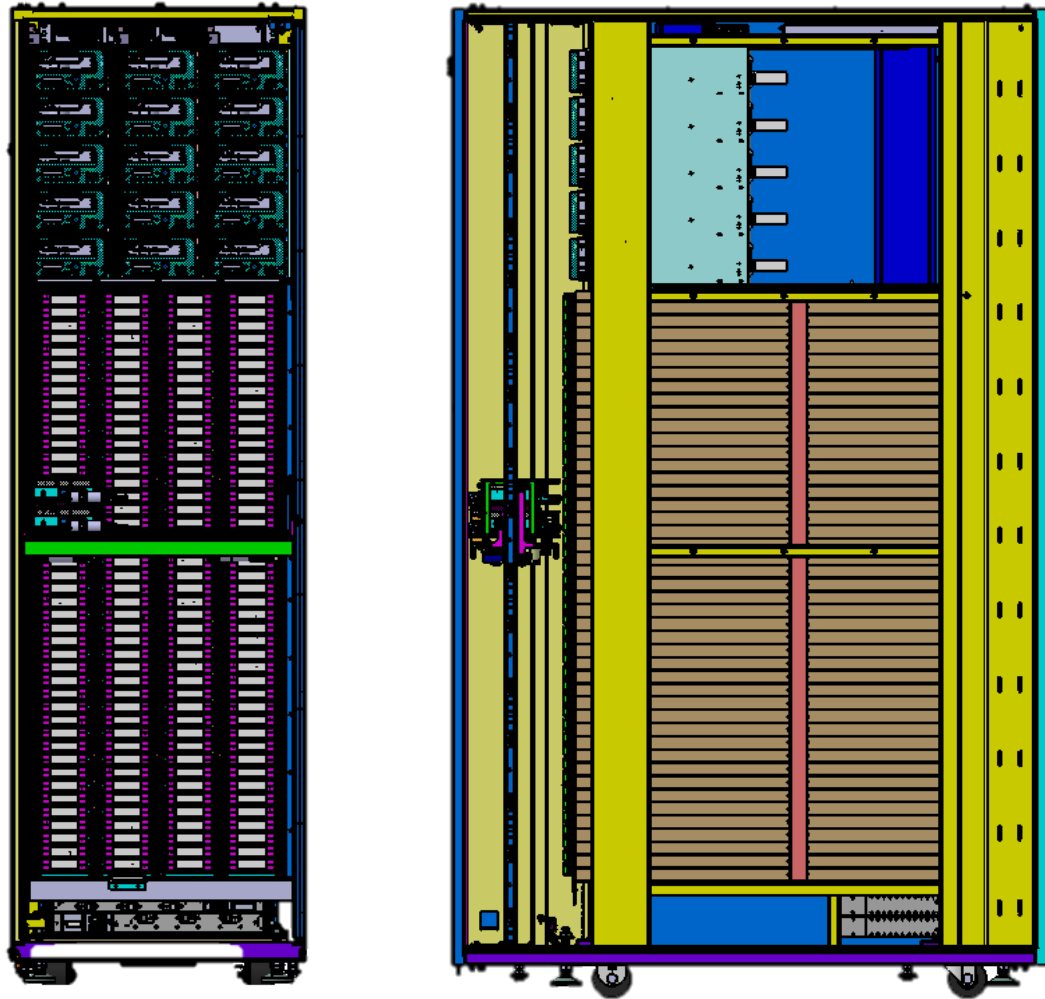
- No expansion frames
 - Lowers frame and robotics maintenance
 - Simplifies library communications and electronics
- No door side storage slots
- No Pivot Mechanism in library robotics
 - Lowers robotics maintenance
- No IMC panel for local GUI
- No front door I/O stations
- No side opening doors
- No dual robotics
- Reduced firmware complexity

Overview – Single frame / single robot tape library



* Reserved cartridge slots will be required for swaps and maintenance cartridges

Diamondback Dimensions - An OCP Server Rack design



Base Frame Dimensions equal to 42U OCP server rack

- Height: 2025 mm
- Width: 600 mm (with cover)
- Depth: 1225 mm (with doors)
- Minimum weight: 410 kg
- Max hardware weight: 450.5 kg
- Max weight: 785 kg

With 5U Top Rack, 48U

- Height: 2295 mm

Service like a server rack

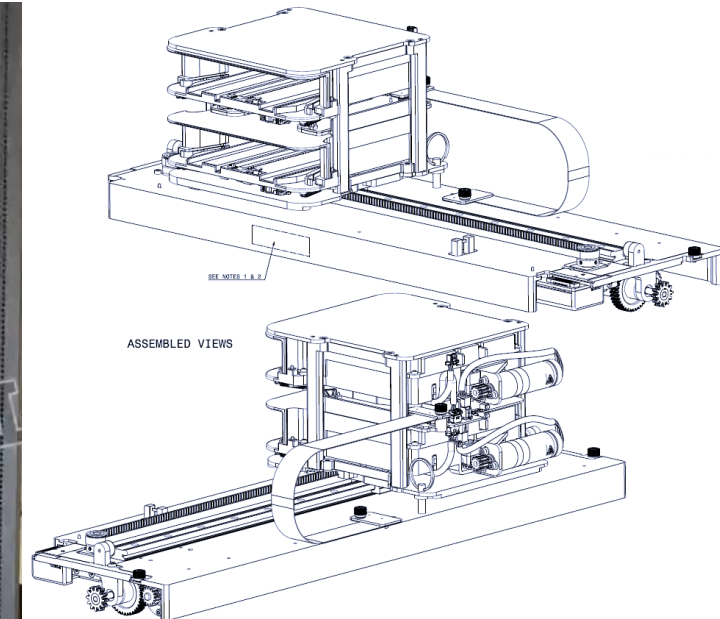
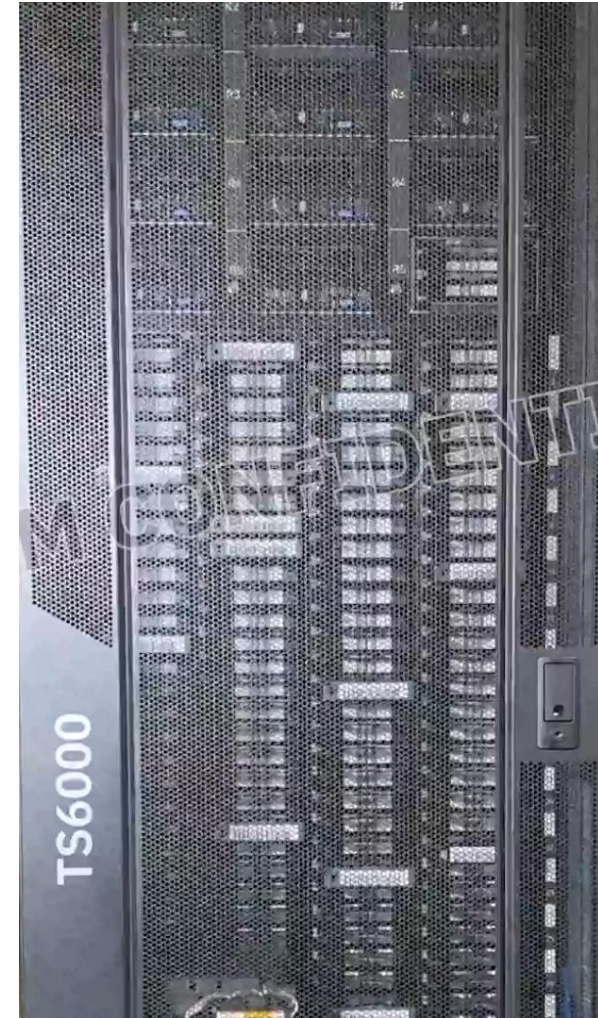


- Front and rear access only
 - Robot serviced from front
 - Electronics, drives, and media serviced from rear
- Maximize self-service
- Aggregate FRU's into larger assemblies
- All FRU's to be 23.5 lbs. or less
- Tool-less design where possible
- Most human interactions to be <2 minutes
- All fasteners for FRU's are captive (no loose screws)
- REST API for automating remediation and service tasks*

*not all features available at GA

“Accessor” – Robot and Grippers

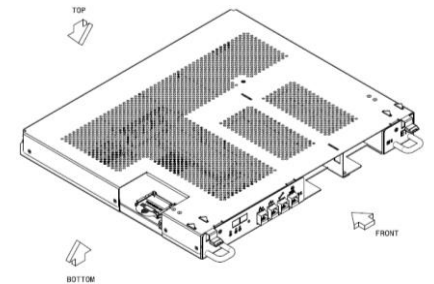
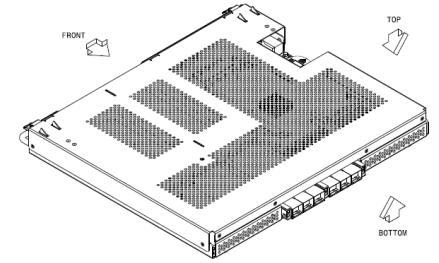
- Reduced Robot complexity
- Operational durability
 - 165 mounts per hour average in full UHD configuration
- Optimized for fastest operations
- Universal dual-active grippers
- Customer replaceable as a single unit*
- Replace from front in ~2 minutes



*Service Expert Care provides client option of On-site repair or CRU replacement

Federated Electronics Tray

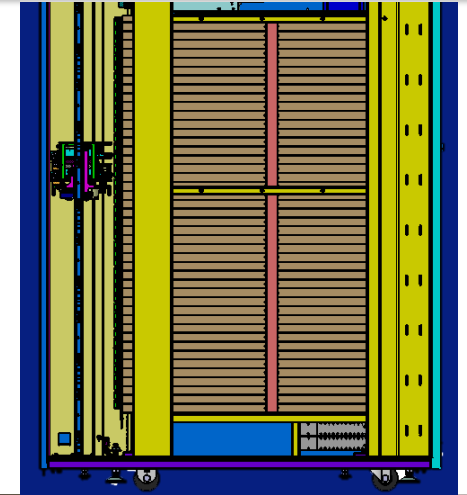
- Reduced service and interface complexity
- Easy access drop down design
- Consolidates previous comparable FRUs
 - FCA
 - LCC
 - ECC
 - LFI eliminated
- Customer replaceable as a single unit*
- Replace from rear in ~3 minutes
- <25 lbs. total weight



*Note: video example will be replaced with ET2 GA tray when available

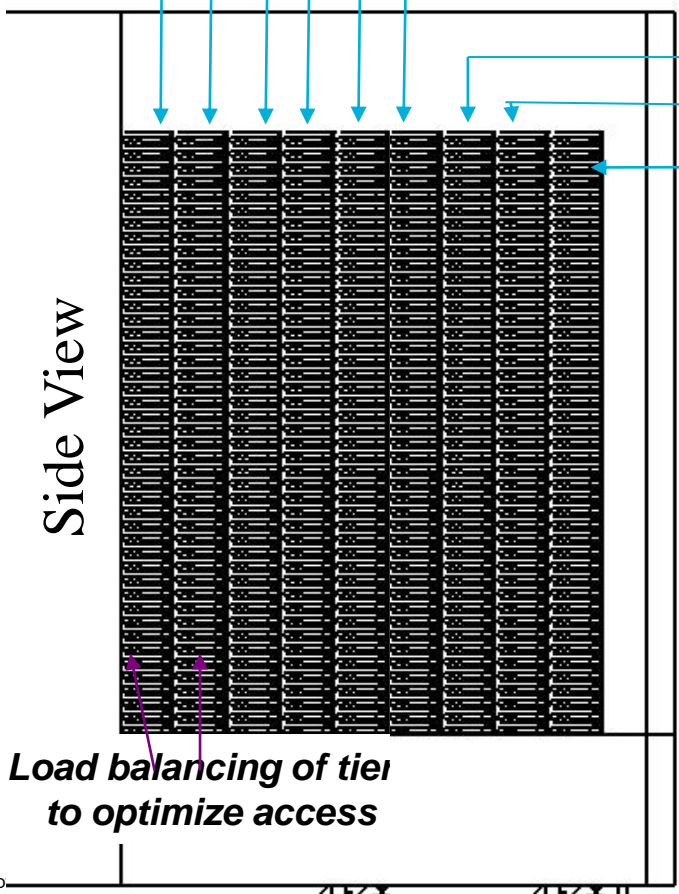
Ultra-High-Density Storage – Nine Cells Deep

- Proven IBM deep cell technology
- Absolute utilization of library frame
- Cell structure mounted from front to rear of unit
- Secure: No cartridge access from rear
- Statistically proven MTBF



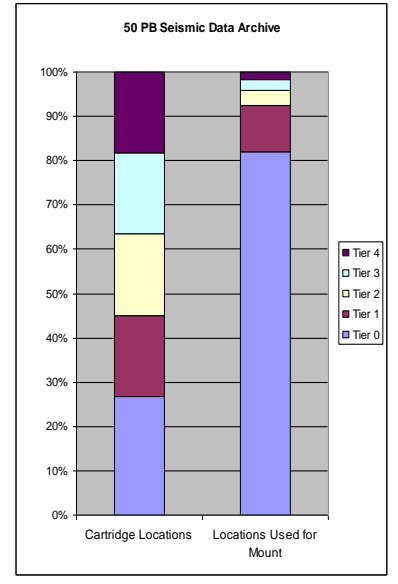
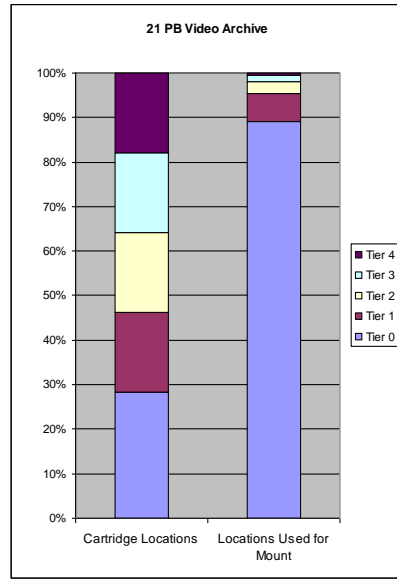
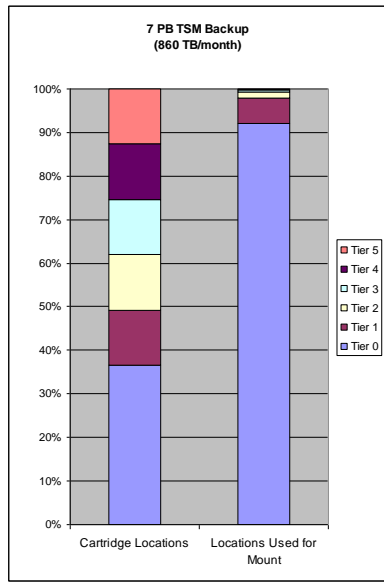
Diamondback – Iteration of Intelligent Tiering

- Tier 1 Slots
- Tier 2 Slots (adds 2.4 seconds latency)
- Tier 3 Slots (adds <14 seconds latency)
- Tier 4 Slots (adds <16 seconds latency)
- Tier 5 Slots (adds <25 seconds latency)
- Tier 6 Slots (adds <39 seconds latency)
- Tier 7 Slots (adds <54 seconds latency)
- Tier 8 Slots (adds <79 seconds latency)
- Tier 9 Slots (adds <100 seconds latency)



These are statistical estimations established with TS4500, field data will come with increase client usage.

Actual latency is dependent on data access pattern, higher latency impacts to highly active archive data and dependent MRU, shuffle configuration.



Cartridge Service Magazine

- *Single Cartridge service magazine*
- Magazine holds up to 10 LTO cartridges
- Distinctive drive and magazine touch points
- Use case is for replacing expired cleaning or diagnostic cartridges and suspect data cartridges
- Import/export operations...
 - ...are secured by the lockable rear door,
 - ...are non-disruptive to the library robotics, and
 - ...do not allow human access to cartridges in storage slots



Specifications Compare

Feature	Diamondback	TS4500
Base Frames	1	1
Expansion Frames	Not Applicable	Up to 17
Tape Drives	Up to 14	Up to 128
Data Rate per hour	Up to 20.1 TB	Up to 184.3 TB
Supported Tape Drives	LTO-9	TS1150, TS1155, TS1160, TS1170* LTO-5, LTO-6, LTO-7, LTO-8, LTO-9
Supported Media	All drive supported Media	
Storage Slot Configuration	Up to 1584	Up to 23,170
Native Capacity	Up to 28.5 PB	Up to 877 PB
I/O Stations	0 min, 3 max	2 min, 8 Max
I/O Slots	Up to 30	Up to 144
High Availability Robots	1	2
Service and Support	Self-service CRU or IBM Service Support	IBM Service Support
Distributed Systems Attach	AIX®, MS Windows®, Linux®, Unix®	

*TS1160 Industry use cases at 3:1

**LTO Compression 2.5:1

TS4500 vs. Diamondback compare

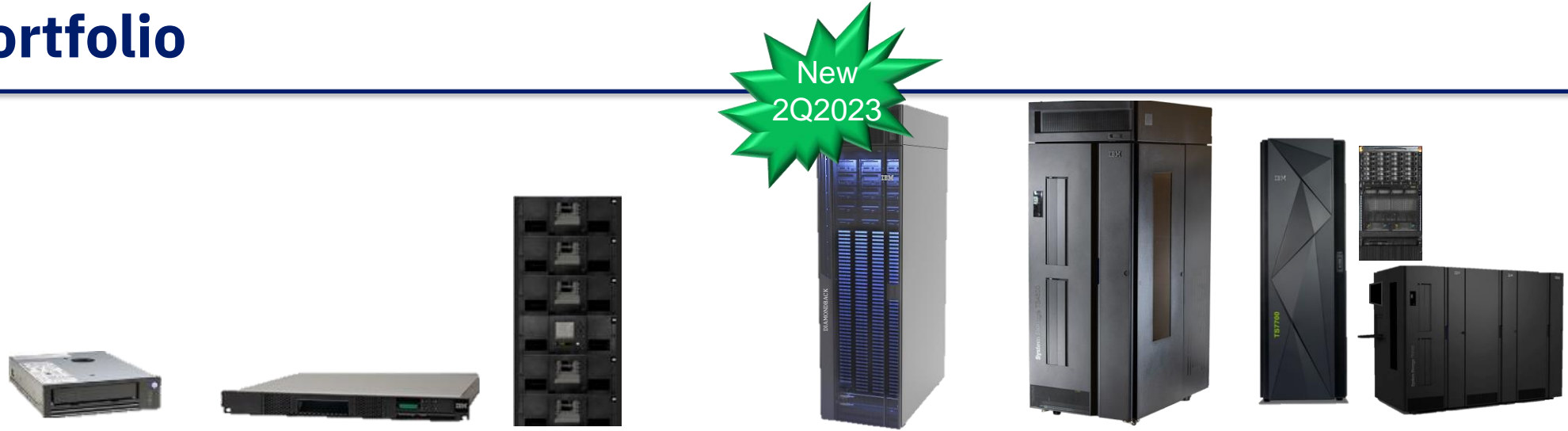


- 40U High
- Non-standard
(28.5" + 28.5" without covers, 10 sq ft per frame + 4X isle space)
- 2050 cartridge slots on L55+S55
- 1936 cartridge slots on S55+L55
- LTO9 Usable Capacity* (-12 or -16 slots for cleaning cartridges)
 - 36,684 TB on L55-S55
 - 34,560 TB on S55-L55
- **417 PB Total capacity**
- 12 on L55+S55, 16 on S55+L55 FH Tape drives maximum
- 1.86 PB / Square Foot
- **Dual robot (optional) with dual grippers**
- Not customer installable / serviceable
- Installation time 260 min
- Not available with pre-loaded media

- 42U High
- Standard 19 inch (**7.7 sq ft per frame**)
- 1548 usable cartridge slots recommended maximum (LTO9)
- 27,864 TB Usable Capacity
(9 slots for cleaning cartridges, 25 slots for swaps, 2 Diagnostic cartridges)
 - **1 frame image limited**
- 14 FH Tape drives maximum
- **3.62 PB / Square Foot**
- Single robot with dual grippers
- **Customer installable and serviceable (99% Customer Servicable)**
- Installation time < 30 min
- **Available with pre-loaded media**



IBM Tape Portfolio



New
2Q2023

	TS2290	TS2900	TS4300	Diamondback	TS4500	TS7700 Tape Attach TS1150/1160
Max capacity*	18 TB*	162 TB	5.04PB	27.8** PB	417 PB LTO 877 PB* Enterprise	100 PB Enterprise
Max # drives	1	1	21	14	128	16
Max # cartridges	1	9	280	1548 LTO**	23,170 LTO 17,550 Enterprise	5,000 Enterprise
Withdraw from Market	Per drive Gen	Per Drive Gen	8Y+	N/A	10Y+	10Y+

When to use

- Media and Drives live together as a storage “pod”
- Media is not exported and imported outside failures and consumable media (e.g. cleaner carts)
- At scale storage utilizing intelligent erasure coding software or Multi Copy
- Deep archives with multiple pools
- HA of a single module is not production critical
- Data exceeds capacity of smaller rack-able library, but less than 2-3 frames of TS4500
- Data center rack conformance is critical/expected
- Customer Replaceable Unit (CRU)/Self-Service design with greater capacity of TS4300 capacity is a requirement
- No Mixed tape drive generation requirements – Media in library must be supported by the drives

Market Use Cases

Use Case	Simple Positioning		Software Support
		TS4500	
Back-up and Recovery – RPO/RTO can be an issue, ability to expand the performance may be required. Generational drive upgrades is important to TCO/Usability. May require Exporting media from a Library. High Availability demanded.	NO*	YES	Traditional ISV, Proprietary API
Cyber Resiliency External Airgap – Data Protection with external shelf storage airgap requiring high numbers of media import/export.	NO	YES	Traditional ISV, Proprietary API
Active Touch Data Storage – Cartridge to drive ratio lower than 80:1. High availability of the single automation environment	NO*	YES	Unstructured API, Content Manager, Proprietary API
Archive Data Storage – Long term data retention with infrequent single object, but continuous data recall against the environment. May require HA against a single automation environment. Traditional full data segment to tape.	YES (capacity restricted)	YES	Unstructured API, Content Manager, Proprietary API, Traditional ISV
Archive Data Storage – Long term data retention with infrequent single object, but continuous data recall against the environment. May require HA against a single automation environment. Multi-copy-site or Erasure Coded data.	YES (recommended)	YES (legacy)	Unstructured API, Content Manager, Proprietary API
Deep Archive Storage Single Library Image Capacity – Data retention, AI, Edge data consolidation. Low touch or access. Traditional full data segment, TS7700 mainframe with HA	NO**	YES (legacy)	Unstructured API, Content Manager, Proprietary API
Deep Archive Storage Multi-Library Capacity – Data retention, AI, Edge data consolidation. Low touch or access. Multi-copy-site or Erasure Coded data.	YES (recommended)	YES (legacy)	Unstructured API, Content Manager, Proprietary API <i>Traditional ISV</i>

Senior Storage Technical Specialist -IBM Advanced

Technology Group (ATG) - Tape Solutions

*TS1160 Industry use cases at 3:1
 **LTO Compression 2.5:1

No use case is absolute, the table above is a guidance to the best circumstances for deploying the right IBM automation for large scale clients. As the Capacity of the expands due to density of the tape media, the usage of will expand into nearly all use cases

Reference

- Diamondback online reference: <https://www.ibm.com/docs/en/diamondback/2.9.2>

Thank you!

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