

# DATA PROGRESSION

## THE INDUSTRY'S ONLY PROVEN AUTOMATED TIERED STORAGE

- » Eliminates risk by delivering dynamic data migration with technology in use since 2005
- » Offers the most complete sub-LUN tiering solution, with full automation and system integration
- » Provides unmatched value by cutting storage costs up to 80 percent while improving performance



### KEY BENEFITS

- » Built into virtualized storage platform for optimum efficiency and performance
- » Granular, real-time intelligence for precise, efficient data placement on optimum tier and RAID level
- » Policy-based automation allows you to “set it and forget it”
- » Leverages all other software features, including snapshots for read/write performance
- » Puts most active blocks on fastest, outer tracks of each drive, grouping associated blocks together
- » Platform independence so you can scale without limits

### MANAGING RAPID DATA GROWTH

With the amount of data doubling every 18 months, more and more organizations are turning to automated sub-LUN tiering solutions. After all, analysts estimate that more than 70 percent of enterprise data becomes inactive within 60 days of creation. Yet most solutions fail to deliver on the potential benefits of Automated Tiered Storage. The functionality isn't truly integrated into the storage platform, but rather tacked on at the application level. There is no real-time awareness of how data is used, resulting in inaccurate data placement. Data is moved as large “all or nothing” pages. The tiering profiles are limited in scope, often requiring manual intervention. And licensing is restricted to a particular hardware platform, limiting scalability for future business growth.

### FULLY INTEGRATED, AUTOMATED TIERING

The industry's only proven Automated Tiered Storage solution, Compellent Data Progression is not only fully automated and integrated into the storage layer, but also moves data based on policy-based profiles at a highly granular level using real-time intelligence. Data Progression automatically migrates data to the optimum storage tier and/or RAID level based on actual use and performance needs—without technology add-ons or manual intervention. You simply activate the feature and let it run, with the ability to customize the built-in algorithm if desired. The result is a self-tuning storage system that requires fewer high-performance disks, reduces power and cooling costs, and minimizes the data center footprint. With Data Progression, data is always in the right place at the right time for the right cost.

## BUILT INTO VIRTUALIZED STORAGE PLATFORM

The Compellent Fluid Data architecture was engineered from the ground up to include Automated Tiered Storage. Data Progression is a fully integrated component of the virtualized storage platform, not a “bolt-on” technology or server-side agent.

With a truly virtualized storage environment, data migration is not confined to conventional disk groups or even a pooled subset of the array. Data moves freely between tiers and drive types, as well as among multiple RAID levels within the same tier, for a constant balance of performance and cost. Only Data Progression brings automated tiering to the RAID level, providing unmatched precision and optimization in data placement.

Users can choose to leave the storage system virtualized as a single pool, or easily set up smaller pools to meet specific business objectives. Either way, no volumes need to be converted to take advantage of Automated Tiered Storage, and all storage is pre-discovered so there’s no delay when provisioning or expanding volumes.

## GRANULAR, REAL-TIME INTELLIGENCE

The more granular the approach to sub-LUN tiering, the more effective the solution. Thanks to a Fluid Data architecture, which enables the management of enterprise data in small 2MB blocks, Data Progression dynamically migrates data between tiers and RAID levels with 500 times the granularity of other systems. You also have the option to move data in even smaller or larger blocks—either 512KB or 4MB in size—to meet specific application requirements.

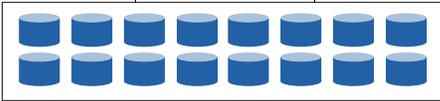
Use characteristics about each block are captured in flight throughout the day, providing real-time intelligence for ongoing optimization. The system leverages this information to automatically move blocks eligible for migration at a scheduled time. Since the blocks are so small, only data that meets a policy-based threshold are moved. This ensures that data is always moved with the utmost precision and efficiency based on actual use and performance needs.

## POLICY-BASED AUTOMATION

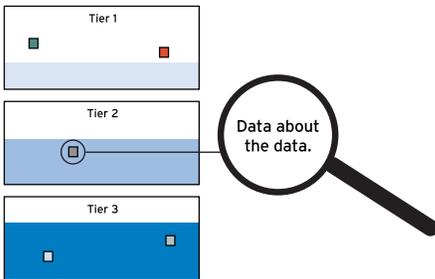
Real-time intelligence about how each block is used allows Data Progression to operate independently of manual intervention. Years of pragmatic sub-LUN tiering experience is built right into the solution. You simply activate the proven migration engine and let it run using a default profile. Or you can customize the tiering algorithm. The level of interaction is entirely up to you.

Policy-driven profiles provide hands-free management throughout the data lifecycle. Profiles can specify not only the storage tiers to be utilized by each volume, but also the various disk types, rotational speeds and RAID levels within each tier. Migration occurs online as a background process so applications never have to wait for data. And users can view all tiering statistics at a glance or schedule automatic email notifications.

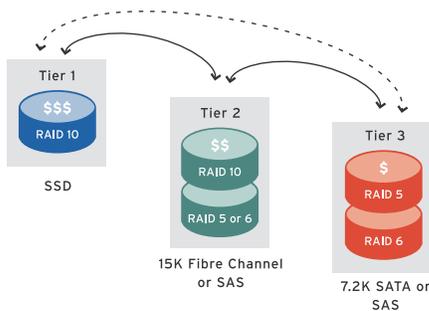
SSD	FC	SAS	SATA
RAID 10	RAID 5		RAID 6
15K	10K	7.2K	



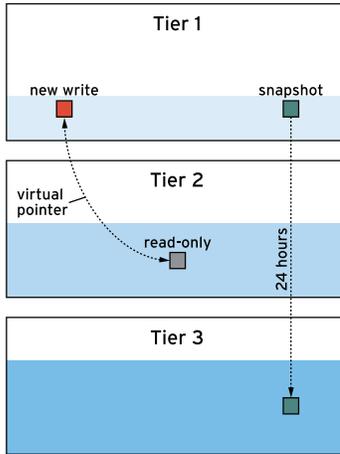
True storage virtualization pools storage across all disk types, speeds and RAID levels.



Fluid Data technology continuously collects use characteristics for real-time intelligence.



Built-in migration engine provides hands-free management through policy-based profiles.



Data is written to Tier 1, yet snapshots move to the lowest tier within 24 hours.

## LEVERAGES ALL OTHER SOFTWARE FEATURES

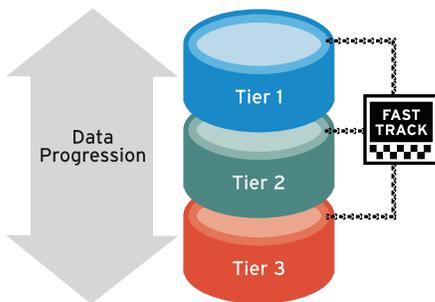
Tight integration between Automated Tiered Storage and other enterprise functionality drives the efficiency and performance of Data Progression. Thin Provisioning optimizes disk utilization within the tiering environment. Users can provision virtual volumes of any size without setting aside physical space, and expand those volumes on demand. There are no RAID set capacity limitations or write performance penalties, as is common with other sub-LUN tiering solutions.

To ensure ongoing write and read performance within the tiering scheme, Data Progression leverages Compellent Instant Replay (snapshot) technology. New data is always written to Tier 1 to provide the best write performance. Yet change-only snapshots move to a lower tier and RAID level within 24 hours. Over time, the Replay engine prepares infrequently accessed blocks for downward migration through read-only conversion. This frees up 20 to 40 percent of space on Tier 1 while maintaining read performance. Users can take an unlimited number of snapshots without affecting volume performance or capacity. And virtual pointers maintain continuity between all read and write blocks, despite distinct placement within the array.

## OPTIMUM DATA PLACEMENT WITHIN EACH DRIVE

Compellent Fast Track extends the power of data migration to the disk level, dynamically placing the most frequently accessed blocks on the outer tracks of each drive. The software uses the intelligence that is continuously collected in flight to identify these most active blocks on each spindle.

By placing newly written data in the best-performing region of the disks, Fast Track provides the lowest latency possible in any spinning disk configuration. Keeping the head focused on that one area of the disk, where the most active data resides, delivers better read/write performance than if the head were forced to seek over the entire disk.



Fast Track groups the most active blocks on the outer tracks of each drive.

## PLATFORM INDEPENDENCE, UNLIMITED SCALABILITY

Data Progression is not tied to any particular Storage Center model or platform, a common limitation with other sub-LUN tiering solutions that often leads to forklift upgrades. You can activate automated tiering on any new or existing Storage Center system at any time—and scale up and out without limits as business needs change. A software subscription provides perpetual licensing, so you only pay for additional licensing when adding more drives or new software features, even when upgrading to new controller technologies.

Since Data Progression is built right into the virtualized storage platform, no downtime is required to take advantage of the functionality. You don't need to waste time and effort converting legacy volumes for a new pooled configuration, or migrating existing data from disk groups to a subset of pooled disks. You simply turn on the feature and let it run. The system automatically begins classifying data based on previously captured use characteristics, then moves eligible data accordingly during the next migration cycle.

### ABOUT COMPELLENT

Compellent Technologies (NYSE: CML) provides Fluid Data storage solutions that automate the movement and management of data at a granular level, enabling organizations to constantly adapt to change, slash costs and secure information against downtime and disaster. This patented, built-in storage intelligence delivers significant efficiency, scalability and flexibility. With a sales network in 35 countries, Compellent is one of the fastest growing enterprise storage companies in the world. For more information and news, visit [www.compellent.com](http://www.compellent.com).

### SUPPORT AND SERVICES

Copilot is a comprehensive support and services offering designed to ensure the satisfaction of every Compellent customer. Copilot integrates storage system installation and setup, administrator training, 24x7 technical support, hardware and software maintenance, and professional services. The Copilot team of enterprise storage experts works day and night to proactively optimize your storage environment for high availability—today and in the future.

#### Compellent Technologies

7625 Smetana Lane  
Eden Prairie, MN 55344  
877 715 3300 tel | 952 294 3333 fax  
[www.compellent.com](http://www.compellent.com)

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## DATA PROGRESSION SPECIFICATIONS

Storage Tiers	
Storage tiers defined by	Disk type, RAID level, rotational speed
Tier-level movement	Between Tiers 1, 2 and 3
RAID-level movement	Between RAID 5, 6 and 10
Disk drive support	SSD, Fibre Channel, SAS, SATA
Disk drive type intermixing	Yes, any combination in shared pool (across tiers and RAID levels)
Snapshot integration	Yes, optimum write and read performance
Data Classification and Movement	
Automated data movement	Yes, based on frequency of access
Automated bi-directional movement	Yes, between all tiers and RAID levels
Volumes stored across multiple tiers and RAID levels	Yes, across entire virtualized array by default, with option of creating pooled subsets
RAID and/or disk group restrictions	None, truly virtualized platform with no distinct disk group limitations
Real-time block-level intelligence	Yes, collected in flight
Size of blocks/pages migrated	2MB by default, with option of 512KB or 4MB
Data types migrated	Writeable blocks, read-only blocks
Snapshots migrated	Yes, full snapshot integration
File-level support	Yes, with optional NAS gateway
Additional software required	None, functionality built into virtualized storage platform
Platform and Scalability	
System model or platform limitations	None
Maximum system size	Unlimited
Maximum volume size	Unlimited
Maximum number of disks	Unlimited
Maximum number of transitions between tiers and/or RAID levels	Unlimited
Make changes on the fly	Yes
Server Interface	
Server agents required	None, functionality built into virtualized storage platform
Server OS support	Microsoft Windows, Oracle Solaris, HP-UX, Linux, IBM AIX, Novell NetWare, Apple, Tru64, VMware ESX

## ENTERPRISE STORAGE THAT REDEFINES THE DATA CENTER

Compellent Fluid Data is enterprise storage technology that always puts data in the right place at the right time for the right cost. With Fluid Data storage, your enterprise or cloud will be efficient, agile and resilient—always, automatically and continually. Best of all, with Fluid Data, your system adapts dynamically at the speed of change, directly in line with your business needs.