

# 2011

Hie Electronics

TeraStack® Solution



## [STORAGE SOLUTIONS: LAW ENFORCEMENT]

Police Departments across the country are virtualizing their evidence and other video data. However, are they preparing for the future of data storage?

## Introduction:

New improvements in video technology for law enforcement have put stress on IT departments everywhere. Virtualizing evidence puts strain on IT departments to store, access, and archive data in the short and long run. How will they store this sensitive video data? The IT department has many choices as to how they will store this data: hard disk drives, solid-state drives, magnetic tape, optical media, or a combination. Each media type has inherent qualities that make the media good for storage or limit what it can do. Output from higher resolution video, higher definition audio, in-car video recording, and new on-person worn video cameras all require a lot of storage space. Video files can be up to 1 GB per minute uncompressed, but with video compression (video codecs) this cuts the file size down to 1-4 GB per hour.






This is still a substantial amount of data that may need to be uploaded and saved each day. Saving this video cuts down on the “he said she said” that can happen in the courtroom. The written police report is backed up by video evidence. This keeps an accurate police report from being misinterpreted. The video, audio, and metadata will all have to be stored unchanged in order to qualify as forensic evidence. The type of electronic storage chosen will have an effect on the data if the storage media breaks down or has errors. In other words, the type of media has a direct relation to data integrity. The type of media is generally chosen based on these factors: capacity of the media, how long the media will last, how durable the media is, the cost of media per GB, and how long the type of media will be around prior to obsolescence. The rest of this white paper will discuss these factors; along with the best choice for your IT departments for long run tiered data storage.

## Options for Storing Law Enforcement Data

There are basically just four viable options for the storage of law enforcement data, optical disc (Blu-ray or BD), hard drive (HDD), solid-state drive (SSD), and magnetic tape. Due to the high cost of SSD, that option is not practical for large video files. While magnetic tape is very inexpensive per TB, the cost per TB for both HDD and Blu-ray are also low. There are a few major drawbacks to using tape media. Tape is very sensitive to its environment, has to be kept at specific levels of temperature and humidity, cannot be randomly accessed, and tape degeneration or “Sticky Shed Syndrome” is a big concern. (Zelst, 2008) Correspondingly, a tape’s useful life is only from five to seven (5-7) years. Even though it has been the choice by many in the past, this media type is not reliable enough for evidence records.

HDD and optical disc media are getting less expensive, while their capacities are increasing. Hard disk drives also have drawbacks. Hard disks are constantly spinning while being written to or read; this

	2010-	2020-	2030-	2040-
<b>BD</b> 	BD Media (UDF format) BD Drive	→	→	→
<b>Tape</b> 	Tape Media Tape Drive	→	→	→
<b>HDD</b> 	→	→	→	→

movement generates heat, which reduces performance and longevity of the media. HDD can last longer when not being used but doing this means long latency when trying to find a specific police video. A Carnegie Mellon study found that 25% of HDD failed after five (5) years and jumped to 50% after six (6). Studies further show that once there is a failure with one drive that is in an array,

such as a RAID system, will increase the likelihood of another drive in that array to fail. Dr. Schroeder of Google states that after the first HDD failure, there is a multiplied factor of four for another drive to fail within the same hour. This can be detrimental for data management. Therefore, data migration must be consistent, as failure rate of hard drives do increase proportionally to the age of the drive. (Ku, 2011) Taking into account the firmware, applications, configurations, and interfaces involved, changing any of these relations of HDD will increase the probability of failure. This naturally leads to IT managers replacing disks constantly, while installing new drives at the same time. This painful data migration cycle can be noted in the chart above.

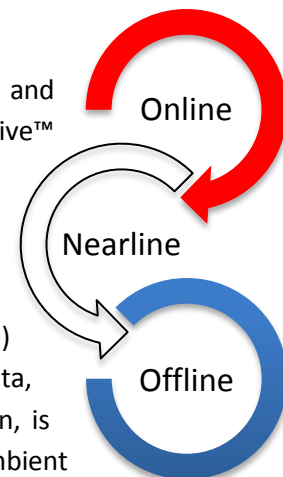


Blu-ray discs will last 50 or 100 years, re-writeable or write once respectively. These discs will not need substantial cooling because the disc creates very

little heat by design. Having the ability to use WORM (Write-Once Read Many) is excellent for security of the information; the data cannot be modified after it is written. New information can always be added but never erased so this qualifies as a very usable storage media for law enforcement information. The discs can be encrypted while the data is burned to the disc, further enhancing security. This is very important for law enforcement records and worries about their information being stolen.

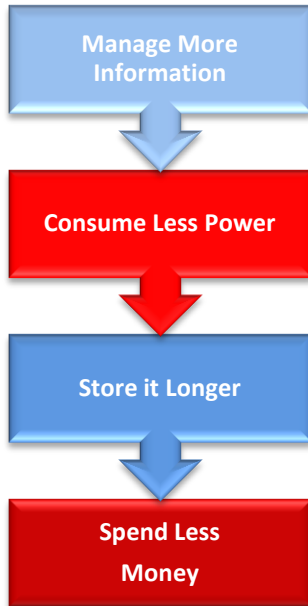
## Active Archive™: A Hybrid Solution

Active Archive™ is the interchange of data access between online, nearline, and offline. (Hie Electronics, 2011) Being a hybrid of HDD and optical, Active Archive™ brings in all the advantages of data retention and speed of access while using space wisely. Active Archive™ is a system that integrates Blu-ray storage and archive, application server, and RAID cache with an easy to use plug and play software bundle, which operates at approximately 10% of the power of existing solutions. Now, data that is commonly needed resides in cache (HDD) and is instantly available and automatically backed-up. The vast majority of data, which is used infrequently or never but must remain available by regulation, is stored on media that has a long shelf life, can reliably retain data in ambient



conditions, and is not continually requiring power to be accessible later. By using a software interface that is made for a basic user, access to all data, regardless of date, becomes seamlessly easy. [Active Archive™ is a trademark of Hie Electronics.]

## Viabile and Strong



By combining the forces of Active Archive™, there is a solution to the storage dilemma. The solution must be a high-density storage option. On top of this, the software interface should be easily manageable with an open yet secure design. The solution must diminish the need for constant data migration, which substantially lowers the total cost of ownership. The solution should consider combining diverse types of solutions to allow for data integrity and energy efficiency. The media used should have a shelf life that combats against extreme environmental conditions. Finally, the solution should be low in maintenance. All of this will save a substantial amount of money for the IT department. The worries and stress of data retention will no longer exist and the breath of life can finally come back.

The viable solution is choosing the Hie Electronics' TeraStack® Solution with Active Archive™. The spider chart in Appendix A shows the solution in which the best performance is the one closest to the center in all areas.

## Encryption

Each Blu-ray disc can be encrypted with an algorithm. Encryption is the process of transforming information using an algorithm to make it unreadable to anyone except those possessing special knowledge, usually referred to as a key. (Encryption, 1998) The higher the strength of the encryption, the more difficult it will be for unauthorized users to access the data. Hie Electronics can cater to the needs of customers by encrypting the discs to their standards. There are options for what is encrypted: the electronic file, the software, the entire disc, the entire system, or a combination of these. Having at least the file and disc both encrypted will add another layer of security to the TeraStack™ Solution.



## The TeraStack™ Solution

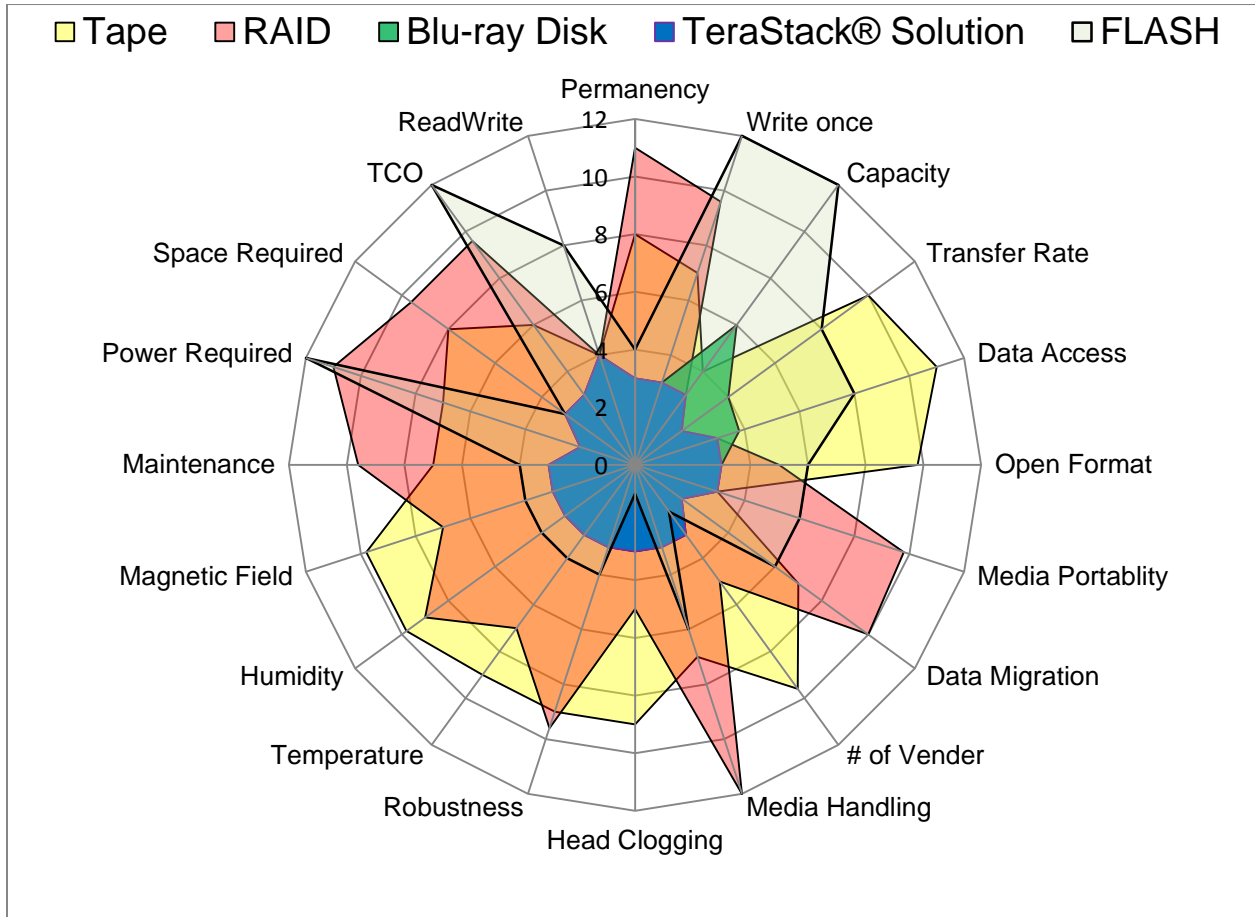
Hie Electronics offers a storage solution that should meet your everyday storage needs, along with long-term archive storage. This solution can store a maximum of 42 TB online, 50 TB nearline, and unlimited data offline. Each TeraStack™ consists of 125 Blu-ray discs, which are inherently energy passive, to reduce cost and increase reliability. Media is also hot swappable for increasing capacity. The TeraStack™ has a metadata catalog built into the bottom that includes all metadata about what is on the drive. This makes finding the files that happen to be in archive storage simple and easy. Since the TeraStack™ magazines can be stored offsite, this increases data security because offline data has no risk of unauthorized virtual access. All these features help all needs in storing data for the short and long term.



## Conclusion

A hybrid TeraStack® Solution with Active Archive™ uses multiple types of media as a solution for law enforcement storage. This is especially important for in-car video, worn video cameras, and other police safety equipment and evidence. Using Active Archive™ will allow continuity throughout three major areas: current data requirements, efficiency of the data, and dynamically preparing for the future. Applying both Active Archive™ and a hierarchical media structure for data storage for law enforcement will ultimately save a vast amount of resources in the end.

# Appendix A: Technology Quality Spider Chart



Note: The bulls-eye candidate is the TeraStack® Solution using Active Archive™ and is glued together by a user-friendly software interface.

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## Images Cited

Police Car: (Kimora)

Magnifying glass and fingerprint: (Don)

Magnifying glass and data: (PC Dynamics)