

## **UDO vs. DVD**

The use of DVD for long-term archival storage has grown in popularity over the last few years. Certainly Plasmon has seen an increase in sales for our own D-Series DVD libraries within enterprise storage environments. The popularity of DVD is based on two primary factors, low cost and format familiarity.

DVD drives and media are very low cost when compared to 5.25 inch optical and tape technologies. While this can be a distinct advantage, there are definite trade-offs that must be factored in when considering the total cost of operation and ownership when compared to UDO.

A less tangible element to DVD's success is the general comfort level that people have with the media. DVD is something that most of us have in our home. We use DVDs daily in consumer video applications and are very comfortable with the performance they provide. Here too, it's important to consider the use of this very popular consumer format in a more demanding archival storage role.

While DVD clearly has its place as a data storage format, increasingly Plasmon is seeing those customers reconsider their use of DVD if they're operating in a demanding storage environment. Listed below are some of the key points that should be considered when comparing UDO and DVD technologies for long-term archival storage.

### **Target Market**

DVD products have been designed to hit a price / performance point acceptable by the consumer market. As a result, drives have duty cycles that are 10x lower than UDO with read/write performance that's adequate for desktop applications, but may not meet expectations in environments where performance is a critical requirement.

It's a fact that DVD drives will need to be replaced more frequently than technologies such as UDO that were built specifically for professional applications. The increased maintenance and replacement costs must be factored into longer term total cost of ownership considerations. In simple terms, DVD is a consumer technology adopted for professional use and this will have an impact on the overall dependability of the entire solution.

### **Media Form Factor**

Today, DVD used in libraries is mainly delivered as a bare, non-cartridged, media which presents a significant risk to data in high duty cycle professional environments. The handling of DVD media puts it at risk of contamination or damage, which could result in the inability to access data. Even within a library where the physical handling of media is kept to a minimum, there is still a risk of contamination or damage. Customers using DVD in a production environment should develop operational strategies that minimize the handling of bare DVD media and may consider making redundant copies of media to be stored off-line in the event of media damage. These types of considerations do not come into play with cartridge UDO optical media.

### **Media Quality**

Due to the success of DVD on the computer desktop, dozens of DVD media production facilities have sprung up all over the world. Competition for DVD media sales is very intense; driving down cost and quality. In addition to quality concerns, some DVD media has been optimized to operate with specific drive manufacturers making the media inappropriate for other drive types. Plasmon has tested DVD media from many manufacturers and has found a startling range in quality and compatibility.

For the storage of critical business information, it's vital that top quality media be used even if this means paying more. It's tempting for customers to select the cheapest media, but since all media is not created equally, saving a few dollars may compromise the integrity of their data.

By contrast, products designed for the professional storage market like UDO are influenced much less by dramatic market fluctuations. Media pricing is much more consistent and quality from all the manufacturers is maintained at a high level and compatibility regularly reviewed.

## Recording Formats

Even before DVD was available, it was a battleground for competing standards. Today there is a wide range of possible formats from a host of industry consortiums each fighting for their share of the royalty pie. These different standards have generated a good deal of confusion in the market and created significant technical compatibility issues for hardware and software vendors.

Thankfully, two primary standards have emerged as the leading contenders for DVD data storage: DVD-RAM and DVD-R. With the help of multifunction drives that support multiple formats, the issues of compatibility are less critical today. However, since these formats do have very different performance and validation characteristics, they must be rationalized within an overall DVD storage strategy.

Both 5.25 inch MO and UDO were developed with broad industry consensus. Each of these technologies has one format for media recording, eliminating any potential for customer confusion and greatly simplifying software and hardware support considerations.

## Performance and Data Verification

The two primary DVD formats for data recording are DVD-R and DVD-RAM. DVD-R is a write once, sequential recording format without drive based write verification. This is very similar to CD recording. This means that you must manually verify that the data has been correctly written to the media. If there was an error in writing, you must start the write process over with a new piece of media. While the overall write performance for DVD-R is fairly good, there is significant additional overhead if the write process is to be properly verified.

DVD-R uses CLV (Constant Linear Velocity) technology for reading and writing data. CLV changes the speed of the motor as the head moves across the media; spinning slower on outside tracks and faster on inside tracks to maintain a constant data rate. CLV provides high constant transfer rates for large files, but seek times are negatively affected since the drive rotational speed must constantly change to accommodate random seek operations. The recording and verification properties of DVD-R are very well suited for applications such as video streaming where file access requirements are modest and data verification isn't absolutely critical.

DVD-RAM is a rewritable format specifically designed for data storage. It uses a 32k hard sectored based media with 2k emulation and full write verification. DVD-RAM drives operate with CAV (Constant Angular Velocity) technology. CAV maintains the drive motor at a constant speed; allowing the transfer rate to vary from inside to outside tracks. CAV provides quick seek times, but read/write performance varies across the media surface.

When recording on DVD-R media you must first collect the target data on the hard disk until you're ready to burn the entire disk capacity (4.7GB). In some environments, this can create data integrity concerns since the data must sit on a hard disk for some time before being committed to the media. In theory, DVD-R media can be written in smaller data packets, but in practice this "packet writing" feature has typically not been implemented by software vendors in library environments.

Overall, Plasmon recommends the use of DVD-RAM media with a hardcoat for data storage since it's the only DVD format that offers write verification. However, DVD-RAM is a rewritable media, so some customers still prefer to use DVD-R where write once media is important for audit trail management.

By contrast, both MO and UDO media provide dynamic write operations with full write verification. UDO provides superior performance to DVD, greater flexibility and a level of write verification essential to enterprise storage environments.

## Product Roadmap

DVD media is currently available with 9.4GB media capacity. Limitations with current drive technology means that this capacity will not increase until a new generation of Blue Laser based drives are available. While development work is underway by several manufacturers, it may be years before next generation DVD products are available and it's likely that these products will be optimized for consumer based applications and not data storage (as we've seen in the past).

Unlike UDO, a multiple generation roadmap for Blu-ray DVD is unclear. Assuming product development will be driven largely by the demands of the consumer market, it's impossible to say whether the media capacity will increase in line with the demands of the data storage market. If not, the product will rapidly fall behind on capacity, performance and TCO. To date, there are no published roadmaps for Blu-ray DVD products.

## Future Compatibility

While next generation Blu-ray DVD media may well offer higher capacities, this increased data density makes the media much more susceptible to contamination. For this reason, it's almost certain that next generation DVD media will need to be delivered in a cartridge to minimize exposure to dust and dirt. What this cartridge looks like is not yet defined and there may be different formats from different manufacturers. This changing media form factor means that customers with existing DVD libraries (regardless of manufacturer) will not be able to support the new media and it remains to be seen which cartridge form factors will be supported by which library manufacturers.

Future media form factor compatibility for UDO is not in question. UDO uses that same ISO standard cartridge format as previous generations of 5.25 inch MO. Through mixed media library configurations, customers can upgrade their existing G-Series Plasmon libraries and protect their initial library investment.

## Summary Today

DVD media has a definite place within the data storage hierarchy, but like all technologies it's strengths and weaknesses must be carefully considered. DVD has fitted in data storage environments where cost is an important consideration, performance is not a driving factor and concerns about data and media integrity are less critical or can be effectively addressed. DVD can also be an excellent solution where media distribution or transportability is required since DVD drives are commonly available. With the introduction of UDO, which has specifically been designed to be a professional, permanent and cost effective solution, the cost argument for DVD will be diminished. UDO offers a very cost competitive alternative to DVD where performance, data integrity and hardware reliability is critical to the archival storage environment.