

Drives, He Said

by Norman C. Berns

It wasn't that long back when my buddy, Bill Meredith, cautioned against the 5MB hard drives that were just leaving the labs and heading into the market (with their new, low, low introductory price tag under \$5000). "Don't put all your work on one drive," he warned. "Those things are way too fragile. Besides, anything that big is just a fad."

These days, a hundred bucks can buy a low-end 1TB drive and leave you with a pocketful of change. 200 times the capacity for 1/50th the cost.... Seems we'll soon find hard drives at the bottom of Cracker Jacks boxes.

What are they for? Do we need them? How will you use them? (After the Cracker Jacks are gone, of course.)

Everything. Yes. Every way imaginable. And anyway, you can do better than Cracker Jacks. I mean, have you looked in the mirror lately...? Oh, sorry, that's another sore subject.

We live (or die, alas) by the quality of our storage. Our work, our writing, every second of our films, our stills, on-set continuity and location snaps, our loves and the joy of our days, our dailies and audio tracks, rough cuts and fine cuts are all digitized and stored in cases that could barely hold a pair of slippers and a pipe.

We're talking about one huge load of data – our entire life and career. Is it **ACCESSIBLE** when we need it? Is it **TRANSPORTABLE**? And most of all, is it really, truly **SAFE**...?

Quickly. Easily. Very.

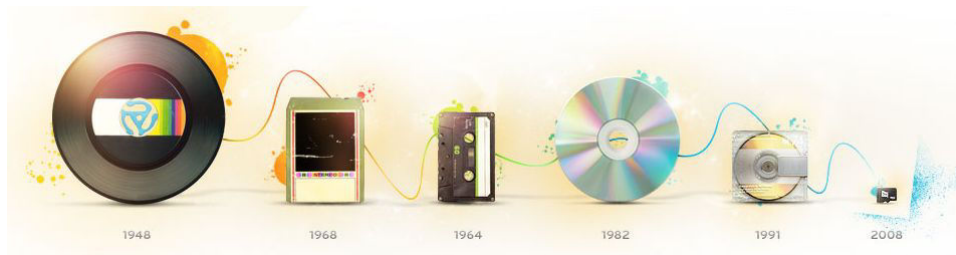
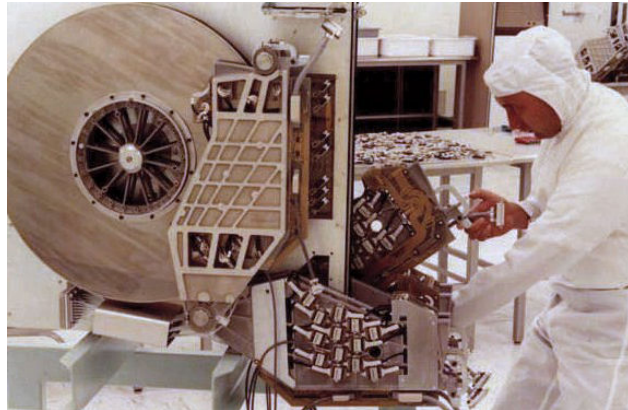
These days, most of us are need to use five types of storage space for our work. Maybe more, but this is a good start.

- *tiny and accessible*: Making it easy to transfer programs, data, even settings wherever we go.
- *live storage*: Data captured live, made movable from camera to computer, from set to edit suite.
- *inside the computer*: A hard drive that's best for day-to-day work.
- *massive and mobile*: So we can shift our work from computer to computer, job to job.
- *secure and readily available*: So all our work is super-safe, but easy to use.

Some background here.

Before you flood my mailbox, I really do know that megapixels

mean far less than their owners would have you believe. Quality comes down to lenses and sensors. And my 8 year old, 3MP Nikon 990 takes alarmingly better pictures than my newest 10MP point-and-shoot. Unlike the marketing madmen, we're counting megapixels only to illustrate our ever-growing need for space and



speed.

Hasselblad's newest camera is based on a Kodak chip (You do remember them? Used to make film....) that

SOME STIX FOR COMPARISON

*In case you were wondering, it takes **a thousand gigabytes** to make one **terabyte**. Into that maw, you could stuff about 150,000 7MB photos. Or a quarter-million MP files (delivering nonstop music for the next two years). You can store 1,000 hours of standard video or 250 hours of high-def. Or something near nine hours of 4K RAW footage from a RED ONE.*

*Seagate just released their state-of-the-art, overwhelmingly huge 1.5TB internal hard drive. And they're planning to release their 300TB drive within two years. What's next? Can the world's first **petabyte** (1,000 terabytes) drive be far behind? And in case you're wondering, a thousand of those equals one **exabyte**, of which a thousand will begat a **zettabyte**, which will begat a **yottabyte**, at which point, bite me for all I care.*

I'm inclined to say "what could we possibly store in such a huge space," but then I'm reminded of my buddy, Bill, and I know that the universe – like my closet – will always find ever more things to fill every spare space.

If you'd like to digitize the 17 million books and documents in the Library of Congress, you would fill 136TB. And spare almost 7M trees that would have met their miller to make the paper to hold all that information.

Just as Brewster Kahle was about to start on his life's goal of digitizing everything on earth, I asked (very naively), "But what about storage? Where will you put it all?" Like talking to a very small child, he assured me that there will always be more room, more room, more room....

Indeed, all the information, all the pictures and maps, all the books and documents, all the history saved for generations in the entire Library of Congress can be tucked into one-half of Seagate's soon-to-be drive.

*Does anyone really need all that storage...? Well, perhaps. Last year, the world yo-yoed about 700,000 **terabytes** of emails. Were we to save all our wisdom and dribble, we'd fill 2,333 of Seagate's 2010 drives. Or – perish the thought – use the paper mulched from 35 billion trees.*

produces 50MP pictures. One RAW image needs to be saved into 65MB of space (150MB for a single TIFF image). Nice to have, but hardly news.

Leaf has had a 56MP camera for awhile. And Lumiere's camera fills 1.3TB with its 240MP snaps, making Nikon a mere piker on this playing field, despite the jaw-dropping quality of its new-to-market 24.5MP SLR.

The RED (digital video camera), of course, has to deliver high quality image 30 times a second. For that, it interfaces with CompactFlash media cards, providing the equivalent of a 400ft film roll of 35mm film per 8GB card. Or about 4 minutes of screen time.

Should you prefer your storage in the giant economy size, the 320GB RED-DRIVE can record up to three hours of 4K RAW footage. Well suited to the "turn it on and let it roll" school of cinematography, but perhaps less than essential on most features.

That's the reality we're facing. Because movie makers have created more images (and more feature-rich images, too, pun intended) and the world has

maintained its unending chatter, we've cajoled the tech industry into creating amazingly dense, fast storage. And that ever-faster, fatter storage has given us the impetus to make even more, denser, richer images. And so on.

So what should FILMMAKERS use? What's the "best" device to store our work?

(1) There's no single answer because (2) our work covers such a broad expanse all the way from basic communications to script writing, from life-like animation to new, mind-blowing HD 3D. So our storage has to suit whatever work we're doing at the moment. And that changes from moment to moment. *Nonetheless, we've named five major categories. And I've found the best example in each.*

TINY AND ACCESSIBLE

First off, we all want something so small that we won't even notice we're carrying it. But large enough to carry all our files and pictures and videos. A lot of them.

The SanDisk 16GB Micro SD is smaller than the nail on my pinkie, yet lets me store all my writing, my pictures and files, my address book plus hundreds of MP3s, an audio book or three.... There are other Micro SD devices with less capacity, but why bother? If not today, you'll need more storage tomorrow, next week, month....



Even longer, perhaps. the Micro SDHC card carries a 5-year warranty. And is designed to take the shock of a ten-foot drop.

Oops, though. You have other things to be careful about. Read your manual carefully before picking up one of these almost-too-small drives. I popped the 16GB into my MP3 player. Which took one look at the expanse ahead and froze like a third-grader at a school play. Fortunately, SanDisk makes these micros (which are the brains of mobile phones, MP3 players and some cameras) from one gig on up. *To each according to his need....*

LIVE, MOVABLE STORAGE

Now that I've got the space to stuff all the stuff I have to carry, what about my camera? I keep forgetting the proprietary cable at home, so it seems I can never transfer pictures while I'm on the road.

(Manufacturers who create equipment with proprietary cables should be required to replace those stupid cables – at their own cost – every single time one is lost.)

Since Bluetooth isn't always accessible, I need a whopping big storage system that lets me transfer my stills easily. And quickly, too. That's the thing with cameras - like regular storage, I want a lot of space. But unlike anything else out there, the read/write has to be so stunningly fast that I can take my next picture without hesitation.



SanDisk Extreme IV 16GB CompactFlash Card (45MB/S read/write) is made for professional photographers who need serious speed and expansive room. Even Hasselblad's 50MP camera could store hundreds of RAW images on this super-fast card.

The little drive is Ultra DMA enabled, which means that data can move from device to storage very quickly. Just as good, the Extreme IV can take the hard knocks of our work - it's tested under high impact and wide weather latitudes. Same caveat here, too, though. If you're thinking of "upgrading" an older system by adding more storage, be sure it can handle the size as well as SanDisk's super-fast read/write speed. Because the Extreme IV is today's cutting-edge, not every old camera can handle it. And it's *not* inexpensive.

Even as the price gnaws at my wallet, I have to stop myself. Whatever the cost here, it's a whole lot cheaper than missing that one, last, key shot that would have made the day.

SanDisk provides the start, ready to go to work. And puts it in the palm of your hand. Yet I'm the first to acknowledge that knowledge can't always be made to fit on the smallest drive in town. The problem isn't always (anymore) simply capturing images. It's working with them. For that you need power, speed and safety, of course. And room to stretch. For that, there are wondrous drives.

After drives that fits in my pocket, there are three unique solutions that change the editing room forever.

INSIDE THE COMPUTER

I've just slipped Seagate's current wonder into my computer. The largest available 3.5" internal SATA hard drive sprawls across 5TB and keeps all my work for the last YEAR covering in one *corner*. Not quite cutting edge, but spinning at a healthy 7500 RPM. And I'm made somewhat secure by Seagate's 5-year warrantee.

Even as drives have grown bigger and faster (and incomprehensibly cheaper), they're also more power-conscious. This Barracuda consumes 43% less power during idle than any previous product. Nicely green.

Surprisingly kind to your personal green, too, the street cost for today's largest consumer drive is hovering barely above \$100. Price and size be damned, I wish this particular drive were just a bit better. It's fast when it comes to reading data. Alas, writing that information back to disk doesn't seem to be its forte. And it's random access speed is a sluggish 15.1Ms – even with the aid of a 32MB cache (for pre-fetch memory) and a 120MB/s sustained data rate. That puts it near the back of the pack.



You may have to update the firmware, too, if you buy this drive. Earlier versions were buggy enough to stutter and hang. Seagate will send the fix, so it's a minor irritant, though I wonder how it was missed before shipping.

Then again, even with those problems, this drive is well worth a bit of effort for so much real estate at such a minor investment. If you need the room, but your wallet's a bit thin, there is no heftier solution.

MASSIVE & MOBILE EXTERNAL STORAGE

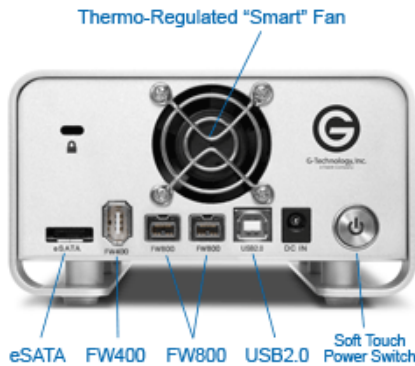
While it's a good thing to have space to stretch, in our business we also need our room to roam. What would the dream drive be...?

Lots of storage, of course. Then add mobility so we can move from the set to the edit room to the mix. We'd want a connection for everything. Speed. Stability. And, since we work in the arts, something that's gorgeous, too...

The answer to that entire equation is the G-Raid3 2TB external hard drive. Here are the details.

When I began this article I lusted for the far reaches of portable storage, a 2TB hard drive. I've taken too long writing this. G-Raid is already introducing their 3TB drive. And their 9oz. 500GB, FireWire Bus powered (that means no AC needed) G-Drive *mini*. Moore was a seer and this is never going to end.

Okay, so we've covered capacious. A bank of these joys could support virtually any cutting room.



Mobility is just as easy. A few pounds. 9x5x2. The hot-swappable drive is plug-and-play, so the computer doesn't even have to be turned off when you unplug it and take it on to the next job.

When it comes to connecting, the G-Raid3 provides four ways to hook up. 3 Gbit eSATA, FireWire 800, FireWire 400 and USB2.0. All on the back, no adapters. Just plug and, alas, get to work.

If you can, you'll want to connect to eSATA for its stunning speed. Each of the other connectors is a bit slower, still fast enough, just delivering data more leisurely than the one before.

Its impressive speed comes from a pair of 7200rpm drives striped together in a RAID 0 configuration, delivering the fastest IO rates of any the RAID system, getting its performance by spreading data blocks across all of the disks in the set. Because it reads and writes data from/to several drives at once, it's able to do it very quickly. 200MB/sec quickly.

Transfer rates are fast enough to play up to 8 DV25 video streams simultaneously, making it an ideal solution for video editing. It also supports simultaneous playback of 5 HDV, 4 DVCPRO HD, 2 8-bit SD, or 2 10-bit SD streams. The simultaneous playback of multiple layers of video in real-time in Final Cut Pro, Premiere and Xpress is *guaranteed*.

Since our work packs us into small, gear-lined room, straining to hear each breath and footstep, it's worth noting that the G-Raid includes a thermo-regulated, whisper-quiet, smart cooling fan.

It really is so quiet that I can hear editors weeping for joy.

Even if it weren't gorgeous, this drive would still be an essential piece of equipment. Maybe overkill for a production office, but right at the heart of any editing room. But it is really that good-looking. Housed in a titanium casing (made to look at home perched on any Mac Pro), the entire line of drives could teach elegance to Apple. I want this designer to do my living room. Or at least my luggage.



SECURE & ALWAYS AVAILABLE

Even the best of drives can't keep our data safe from disaster. Or can they?

For sure, we all live in fear that our data will disappear one day. It happens to everyone sometime. I lived through it last month – Vista "updated" overnight and apparently ran off with my data. Fortunately, there were backups, but I can (sadly) assure everyone that endless piecemeal "backups" do NOT solve all the problems.

When you're working in an edit room, even a single down drive could mean irretrievable setbacks. At best, there's the loss of lots of expensive time. At worst, I can't even bear to think of it.

Fortunately there's a solution. And even more fortunately, it's a very elegant one.



Datto ZR1000 has a single abiding goal in life – to watch your back. Or your data's back, but that's much the same for us.

This network drive provides one TB of local AND off-site storage PLUS local RAID 1 redundancy. (Meaning that every bit of your data is mirrored for added safety.)

Okay, I just introduced three major concepts in that last paragraph.

1. A big, fat drive. That's nice.
2. A big, fat drive that writes your data twice so there's always a copy that writes your data twice so there's always a copy. Even nicer.
3. And a big, fat drive that ALSO stores your data OFF-SITE just in case. Not once, but twice. Nicest of all.

There are dual Gigabit Ethernet interfaces to connect the drive to your network. And software on the network drive automatically connects to Datto on the internet. At which point all your data is copied to Datto's secure servers. Twice. One copy is kept on the East coast; another on the West. These people are more paranoid than my mother.

If your system should crash and burn – if half the country should crash and burn – Datto can deliver all your stored data and settings on a brand new device within 24 hours. No added charge.

This dual on-site/off-site backup is the most worry-free solution imaginable. The Datto drive's *sole purpose* is backing up and securing vast quantities of data. It's designed for people whose lives depend on the work that's on their computers. After AVID and FCP, this is the most edit-room-friendly device I've ever found.

It's not just a great drive, it's a whole solution.

Here's another thing you'll love. The DattoZ uses the ZFS file system which creates "snapshots" of your work. Created by Solaris, ZFS (*Zettabyte File System*) makes it possible to access previous versions of files (similar to Apple's Time Machine). No special software, no additional commands. Just create, revise and create again. It's ALL saved for you.

ZFS does much more, too, all good for your data, trust me. Or don't and look it up on Wikipedia. Just be glad that it's here, knowing that it's helping keep your data safe. Very safe.

Datto provides network attached storage (in geek-speak, that's a NAS device) that can collect the data from every computer on the network. The drive is infinitely scalable (meaning that it can be virtually any size). According to Austin McChord, Datto's creator and company founder, the company has already built 50TB systems for customers.

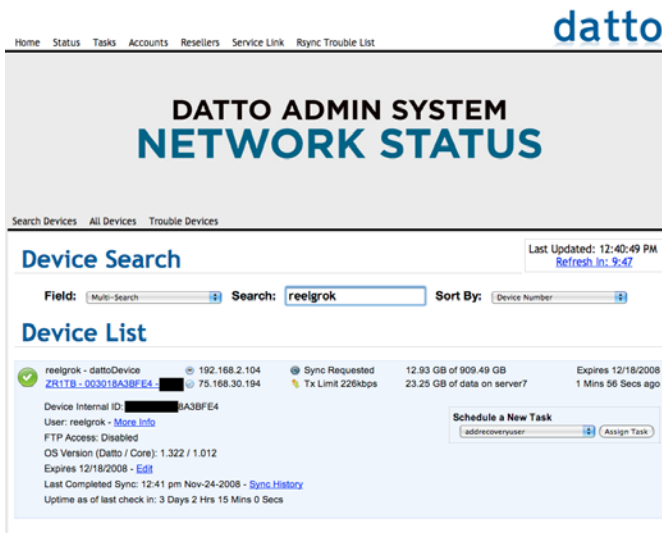
Every change that's made anywhere on your network is saved in duplicate. But though Datto can see and track whatever *happens* on a drive, it can never see any specific information. Private data is safe, hidden

behind a hash of the user's password.

The 9-pound units are fully transportable, from one network to another, from one edit suite to another. Or locked to one specific location. Because each drive has a unique "fingerprint," a stolen drive can be found as soon as it's hooked up to a network. *At which point, Datto can destroy all the information on it remotely.* (Keeping its various off-site backups safely secured, of course.)

Should that happen, Datto will copy the most current backup information and ship it out on a new drive. All within 24 hours.

Anything that happens on the drive can be tracked and daily versions are automatically stored. Or the timing of backups and "snapshots" can be configured by the owner.



Beyond that, the entire process is automatic. And totally seamless.

In our slack corporate culture, it's reassuring to have my call for help returned by the owner of the company. And to receive regular emails like this.

Your datto with hostname of dattoDevice has been inactive for 48 hours, it was last seen at 2008-12-03 04:00:46

Amazingly, all that technical prowess comes without overhead. My initial installation of the NAS drive took less than five minutes. After that, moving the Datto from one network to another required plugging in a cable. Period. The Datto Z runs happily under any operating system. So far, so good. In fact, all good.

Despite rumors to the contrary, we all know that all that goodness can't be free. Or particularly cheap. The 1TB Datto ZR1000 costs \$1149. At first glance that may seem a hefty price tag, but unlike off-the-shelf drives, the Datto includes a 5 year hardware warranty, both local and off-site storage, local RAID-1 redundancy, dual gigabit Ethernet ports, local and remote snapshots of ever-changing work, secure data encryption, free access to customer support, off site backup for an entire network of computers, Windows Active Directory Support and a replacement drive within 24 hours in the event of data loss.

Those aren't idle add-ons. All those features are part of the drive's *raison d'être*. Its DNA.

Great drive and system though it is, there's still a piper to be paid. The Datto's tune is off-site data storage. For which you'll have to spend \$100 a month or \$1000 a year (although you could bring costs down to half that for concurrent backup on a single mirror). Bigger drives, of course, carry pricier tags.

Were I planning to use this drive for my own stills, an infrequent video and my love-letters to Alicia, I'd opt for lower-end pricing. (Unfortunately, I can't opt for NO end, though there's talk of a drive that functions without its internet connection.) Or maybe I don't need all that security for personal papers.

But if I were thinking of budgeting post, even on a relatively low-budget film, there'd be no question which option I'd choose. On every film we do, our work is mission-critical. And downtime can destroy a good show. Even adding the cost of extra storage for a full edit room with fat data files, any show would come out far, far ahead if it could factor out disaster.

For me, it's a no-brainer. When I have to deliver a completed job, there are no excuses. The Datto ZR1000 is the no-excuses solution. That's worth everything.



tiny and accessible

SanDisk 16GB Micro SD

www.sandisk.com

MSRP: \$99



live storage

SanDisk Extreme IV CompactFlash Card

[http://www.sandisk.com/Products/Catalog\(1002\)-Imaging_Cards.aspx](http://www.sandisk.com/Products/Catalog(1002)-Imaging_Cards.aspx)

MSRP: \$300; Street Price from \$190



inside the computer

Barracuda 7200.11 SATA 3Gb/s 1.5-TB Hard Drive

www.seagate.com/www/en-us/products

Street Price from \$104



massive and mobile

G-RAID3, Quad Interface, Storage to 3TB

<http://www.g-technology.com/Products/G-RAID3.cfm>

MSRP: \$599



secure and available

Datto ZR1000 Local and Off-Site Storage

http://store.dattobackup.com/products/Datto_ZR1000-7-3.html

MSRP: \$1149 + Service

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