Perhaps the greatest single payoff from hybrid hard drives - one which Microsoft often completely overlooks - may come in the power department. Up to this point in history, hard disk drives have been defined by the consistency of their spinning. Now, for the first time in the history of the component, a hard drive's platters will be triggered to *power down* while the drive is still active and accessible. Reads and writes can still take place from the cache during these down periods, then almost like an optical disc drive, the platters can be brought back up to speed when necessary, perhaps as seldom as once every ten minutes, according to the targets to which Samsung's Barnetson refers.

"It's the fastest Flash in the world," he boasted, "so it makes tremendous sense that it reads faster than anything else, which allows you to do faster resume and boot times; and it writes faster than virtually any other Flash, which allows you to shut down and suspend your notebook faster."

Desktop computers would enjoy nominal power benefits, while notebook computers could find their battery life improving by leaps and bounds, all without modifications to the battery itself. But perhaps benefiting most from this new component would be *servers*, which utilize the broadest amount of storage of any computer category, and which could also be capable of fine-tuning hybrid drive power consumption rates, to make the most of the Flash cache.

It is an extremely appealing argument in favor of this bright, new technology. On the surface, there's no reason for anyone not to want it, and even its expected price premiums could be well justified. But even if Microsoft goes ahead and converts its suggestions to OEMs into *mandates*, will that be enough to jump-start an entirely new category of storage technology?

Or is that really the plan? While it's nice to be on the ground floor of a burgeoning new technology, it's also very nice - as Microsoft has learned over the years - to occupy the second, third, and fourth through thirty-ninth floors simultaneously. "Samsung, as a maker of flash memory and disk drives would love to see their technologies integrated in a cogent way, such as this," remarked Marc Farley, president of Building Storage, Inc., and author of the book *Building Storage Networks.* "As a second tier disk drive manufacturer, broad HDD technology acceptance could potentially leapfrog [Samsung] past Seagate, Western Digital, and Hitachi, to name a few. There is little doubt that Samsung would subsidize the cost of the Flash components, to do this. All the first-tier drive manufacturers are at a disadvantage if Samsung can pull this off."

Would Samsung have any viable competition if Microsoft were to arbitrarily declare hybrid HDDs a real, if not compulsory, market? TG Daily asked Mark Noblitt, manager for I/O market development at Seagate Technology, about the progress his company is making in ascertaining the market needs for hybrid HDD. "Currently, Seagate's taking a really close look at hybrid drives, looking at the benefit analysis. We're looking at what hybrid really has to offer, and we're looking at several areas: improvement in reliability, performance, and power savings and battery life...From a technology point of view, we're thinking that those benefits are real; we just need to underpin them at this time. We're in the research phase."

Noblitt agreed that Seagate - or most any other HDD manufacturer, for that matter - would have to forge a strategic agreement with a Flash memory producer, if it were to compete in the

hybrid HDD space with Samsung. But beyond that, he declined comment on all other matters regarding the progress of Seagate's research and various "underpinning" efforts.

Cost, as IDC program director for storage research Dave Reinsel pointed out, is an enormous factor in the consideration of companies in Seagate's position, not just because it would cost more to retool factories and integrate new technologies, but because of the value proposition itself: Almost by definition, a hybrid hard drive is a *replacement* device, and there is no replacement anywhere in business without cost. "Inventory management is another issue with HDD OEMs," stated Reinsel, along with "the issue of an end user replacing a 'traditional' with a 'hybrid' or vice versa."

But at the same time Samsung and Microsoft are looking to add Flash memory to the hard drive, Intel and Microsoft are aiming to add Flash to the motherboard, Reinsel pointed out. The implication here is, customers could perhaps perceive the infusion of Flash in the system as, to borrow a concept from Arlo Guthrie, one big cost rather than two littler ones, and could conceivably embrace the bigger cost as just easier to swallow. "Ultimately, it is a seamless technology improvement for the user," he said. "Adoption or acceptance by the user will be dependent on the end-benefits...[and] the benefits are not proven out."

Also, as Marc Farley pointed out, "Microsoft doesn't make the systems; companies like Dell and HP do, and they call the shots here. No PC manufacturer wants to increase the cost of their products compared to other vendors. So unless Samsung provides hard drives for the same or less money than their competition, there is a reasonable chance the manufacturers will not spec it into their systems, for fear of reducing their already razor-thin margins."

Farley explained that Seagate and others may have good cause to take their time "underpinning" the benefits Microsoft and Samsung are touting. Flash memory, he noted, wears out, perhaps after a million or so writes. "If the drive has a high duty cycle, how can you predict overall drive reliability?" In a server environment, he said, you might do this by reserving a segment of Flash memory - in a sense, a cache of the cache - for use in error correction. Whether Samsung would choose to do this with its own architecture remains to be seen. Furthermore, with Microsoft leading the development of operating system drivers for hybrid drives, the choice to implement such reliability features may not be Samsung's alone.

What's more, Farley said, Flash memory is perhaps slower than HDD, if not the same speed, in write cycles. "Performance-sensitive applications with heavy write activity will not see much of a performance advantage," he predicted. "In fact, they could even be slowed somewhat. There is no data on this yet. There is no question that it would be an advantage if boot information could be written and 'pegged' in Flash [*a term Microsoft has used*] to decrease boot time, but will people pay more for this? More importantly, will PC vendors try to make this a differentiator?"

If manufacturers refuse to go along with Microsoft's mandate, should that come, then that leaves Samsung pretty much on its own, in an industry unto itself. On the one hand, that sounds pretty good. But islands, especially in the geography of technology, lack a tendency to become continents under their own power. "Its doubtful that Samsung will be able to do this on the scale it needs to be done," remarked Farley, "but they have been amazingly successful in other technologies, such as LCD monitors, with being able to provide good technology at lower costs. Samsung is clearly a motivated behemoth."

As far as other similarly motivated behemoths may be concerned, Farley told us, "I think this is another example of Microsoft trying to overcome the shortcomings of its own technology by trying to force an invention of some new technology in other parts of the industry. It probably won't work, for financial reasons. I for one, just wish Microsoft could figure out how to make their software better without asking us all to take risks on new unproven technologies from a single source vendor."

So suppose you're a manufacturer with a technology that could change the dynamics of the whole computer industry. You get the solid endorsement of the one supporting manufacturer that really counts. Within a year, there could even be a requirement that your technology be included in computers, in order for them to receive special certification. Conceivably, you should have it made. But in this strange business you've chosen to deal in, you realize you might not gain the acceptance of the public unless the benefits of your technology have been proven to the satisfaction...of your own competitors. And you need those competitors in order for the public to accept your product as part of a real and viable market. When you're just trying to carve out a name for yourself and a new market you can call your own, sometimes working with Microsoft and working with the broader ecosystem of computing can seem like two separate universes.