E-Disk®

제품소개

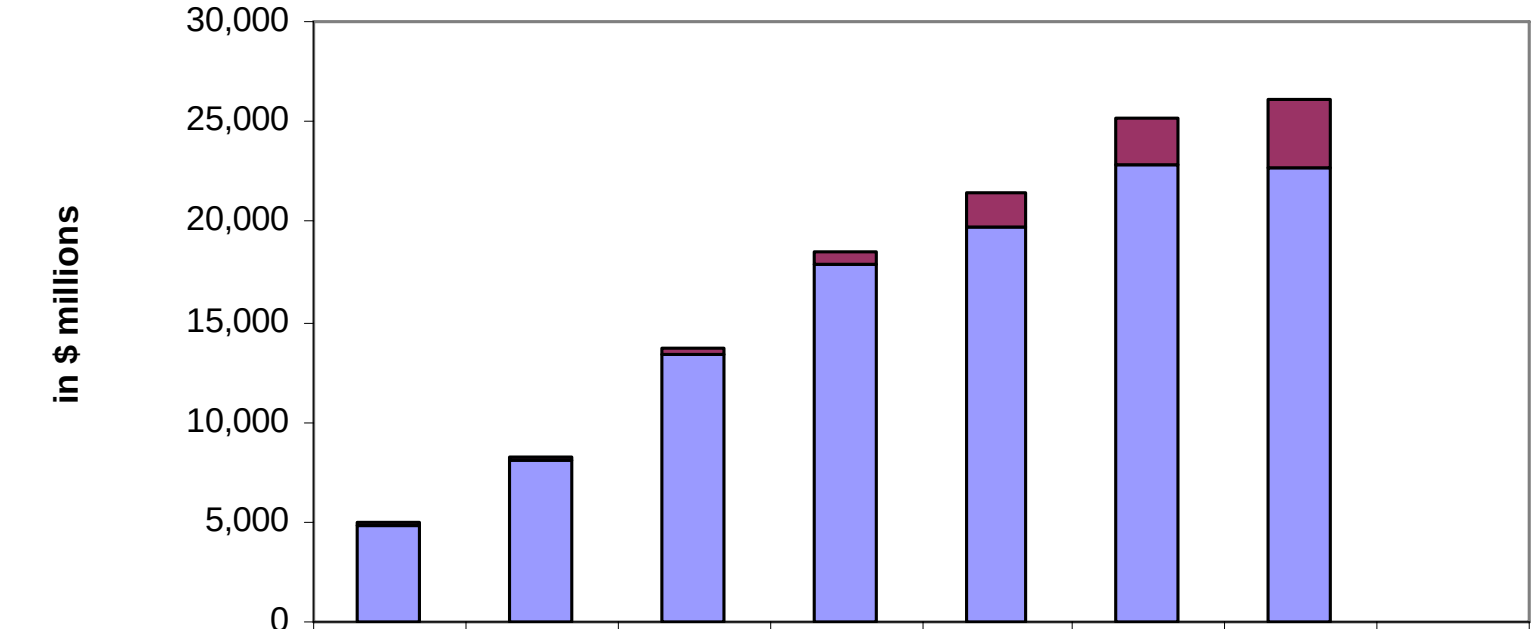
2005년 11월

BiTMICRO®
ULTIMATE STORAGE SOLUTIONS™

제조사 소개

- **1995**년 설립, **1999**년 첫 제품 출시
- **Solid-state disk**에서 최고의 제품인 **E-Disk®** 생산
- **5**개의 제품 라인과 **20**개 이상의 제품 생산
- **25**개이상의 나라들에 **200**개이상의 고객
- **8**개의 **U.S.** 특허와 **4**개의 특허출원중

반도체 저장장치 시장

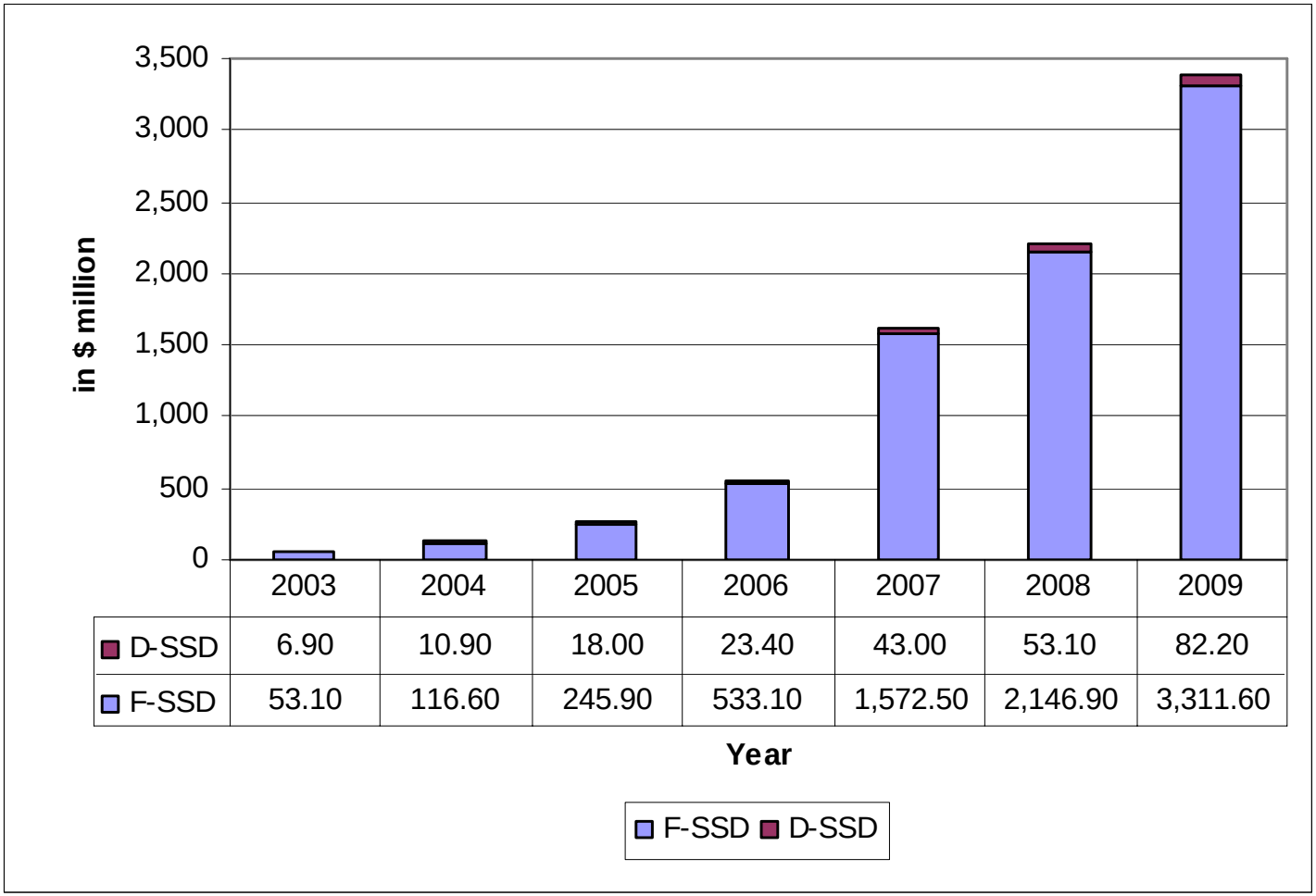


	2003	2004	2005	2006	2007	2008	2009	CAGR
Solid State Disks	60	127	273	573	1,644	2,242	3,457	96.5%
Flash Cards	4,872	8,154	13,437	17,951	19,732	22,868	22,633	29.2%

전체 반도체 저장장치 시장 ***(2004-2009)***

Source: Web-Feet Research 2005

전체 SSD 시장 (2003 – 2009)

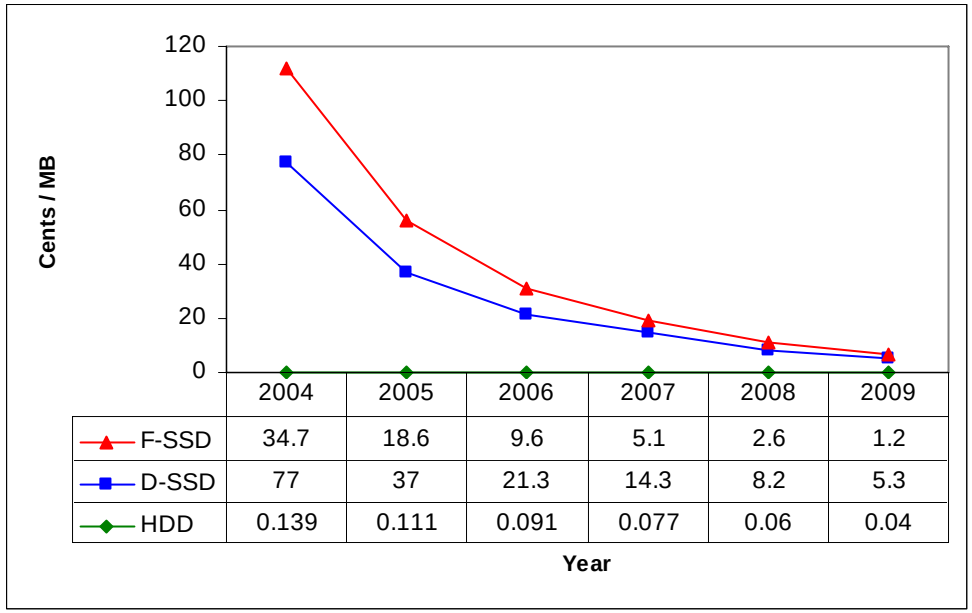


	2003	2004	2005	2006	2007	2008	2009
D-SSD	6.90	10.90	18.00	23.40	43.00	53.10	82.20
F-SSD	53.10	116.60	245.90	533.10	1,572.50	2,146.90	3,311.60

SSD Total Demand in Units Source: Web-Feet Research 2005

SSD Market Drivers

- 경제적 측면
  - 저장장치 가격의 지속적인 감소



	2004	2005	2006	2007	2008	2009
F-SSD	34.7	18.6	9.6	5.1	2.6	1.2
D-SSD	77	37	21.3	14.3	8.2	5.3
HDD	0.139	0.111	0.091	0.077	0.06	0.04

Source: Web-Feet Research 2005

  - 대량 거래
  - 정보와 온라인 데이터의 지속적이고 폭발적인 증가
- 저장장치 동향
  - 기억장치에 대한 지속적인 수요를 기초하여 규정과 요구에 대한 수용을 새롭게 구현 함으로써 기업 저장 관점이 변화되고 있다.

핵심 특허기술

- **ASICs**
  - 플래쉬 메모리 장치들을 사용하여 만들어진 견고하고 전기능의 ASIC 구조와 FlashBus™
- **Firmware**
  - 데이터 블록 관리(캐싱, 데이터 복구, wear-leveling 과 에러검출)를 포함한 임베디드 운영 시스템
- **Software**
  - 구성과 진단 유틸리티
- **Device Packaging(장치 포장)**
  - 표준구조상에서 유연한 용량을 제공하는 내구적이고 특별한 설계
- **Growing Patent Portfolio**
  - 예측처리 알고리즘과 전기와 반도체 순환 디자인, 데이터 보안, 플래쉬 메모리 성능과 데이터관리

강화된 데이터 보안

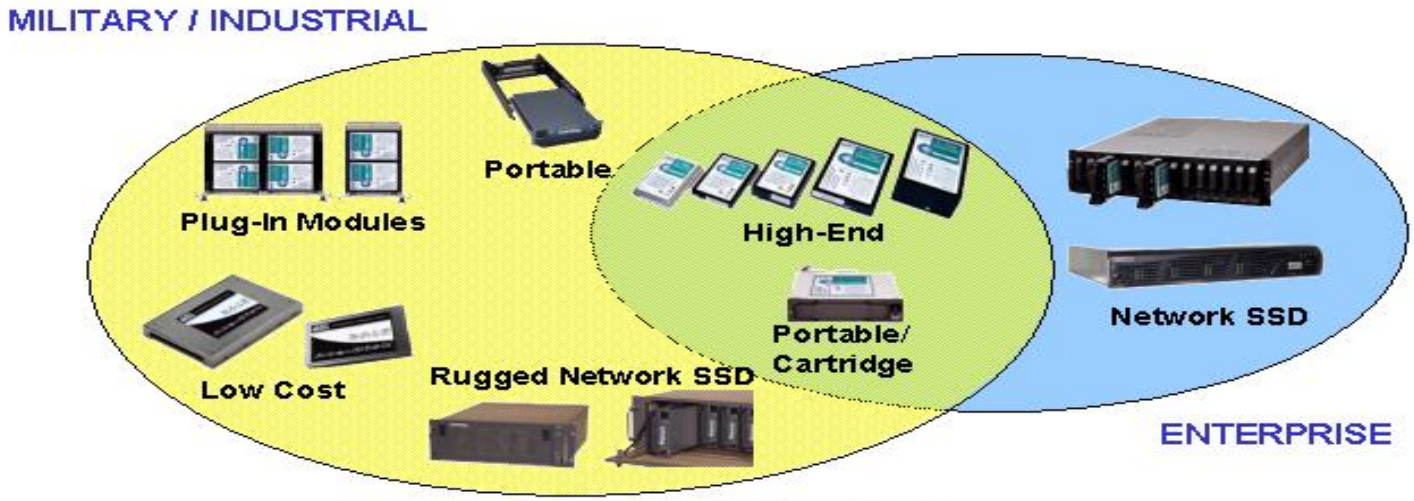
PowerGuard® Unit

- 예기치 않은 전원 중단과 실패동안 변형과 손실로부터 **E-Disk** 시스템과 데이터 파일의 보호
- 사용자 명령으로 데이터를 완전히 삭제하는 것을 용이하게 한다.

E-Disk® 반도체 저장장치 소개

- 경쟁에서의 이점:
  - 플래쉬 기반의 비휘발성
  - 최고의 신뢰성과 내구성
  - 수명연장을 위한 확장된 데이터 균등 저장(wear-leveling)
  - 높은 IOPS 와 전송율
  - 표준 폼 펙터 (2.5” or 3.5”)
  - 고용량 (up to 155GB on 3.5”)
  - 낮은 열과 소음 발생
  - 낮은 전력 소비 (≥ 2.8 watts)
  - 산업표준 인터페이스

성과: 시장과 제품군



다섯개의 제품군과 **20**개이상의 제품

우량 고객층


HEIM SYSTEMS GMBH
THALES
BOEING
Forever New Frontiers
LOCKHEED MARTIN
We never forget who we're working for™
CISCO SYSTEMS
THE AEROSPACE CORPORATION
SOLECTRON.
L3
communications
Marines
The Few. The Proud.
Honeywell
HARRIS
Raytheon
NASA
The United States Navy
NORTHROP GRUMMAN
GENERAL DYNAMICS
Strength on Your Side™
THE UNITED STATES ARMY

E-Disk® Applications – 국방

- 상용화된(COTS)기술을 이용하고 있는 군사, 우주항공과 항공전자공학 응용 분야

- 응용
  - 지휘통제시스템, 고속데이타기록기, 통신 시스템, 지상운송, 무기추적시스템, 휴대용 컴퓨터, 우주왕복선
- 고객
  - Lockheed Martin, Raytheon, NASA, BAE, TRW, Saab, General Dynamics, Harris, Boeing, Racal, Litton, Northrop Grumman, APTI, DY4, Innovative, L3 Communications, Eaton, NY State Thruway, Rockwell, SRI, National Instruments, NOAA, Orbital, Elta Israel, DPW, VMetro, Battelle, Targa, Thales, CIA, FBI, DoE, DoD (US, Israel, UK, Canada, Germany, NATO, et al) ...

E-Disk® Applications – 산업

- 외부에서의 극심한 환경에서 견디는 내구성, 대단한 신뢰성과 성능표준을 스몰 폼팩터의 형태로 보여줌
- 응용
  - 전기통신시설, 광대역 통신, 송유관 감시, 제조업, 자동차산업, 의료시스템, 에너지 산업, 화력 및 원자력 발전
- 주요 고객
  - 3Com, Agilent, Ciena, Cisco, Mitsubishi, Hitachi, NKK, Avnet, Korea Telecom, Ericsson, Samsung, Ixthos, Nayna, National Instruments, Ayax, Compaq, Daimler-Chrysler, Intel, BF Goodrich, Barco, Transneft Oil Pipeline, Siemens, Nortel, Turkish Embassy, Indian Embassy

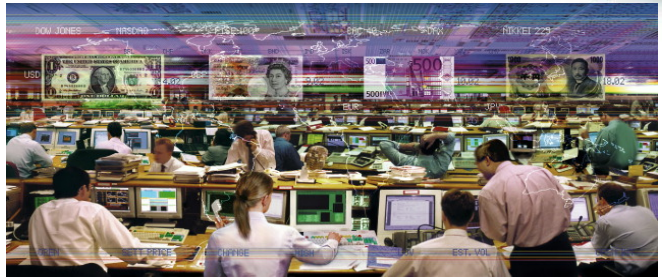




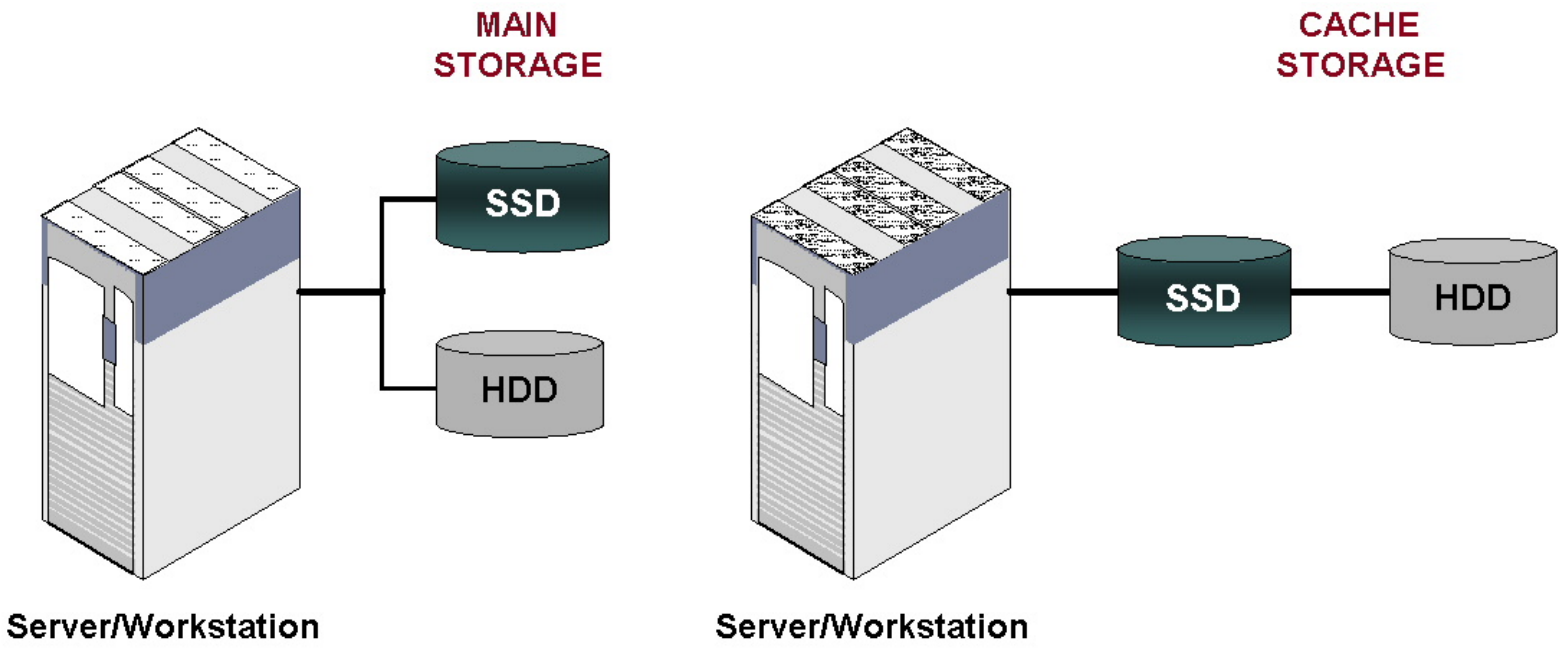


E-Disk® Applications – Enterprise

- 기업 컴퓨팅 시스템들간의 고성능에 대한 요구의 형태로 보여줌
- 응용
  - 온라인트랜잭션처리(OLTP),정보보안, 인터넷 가속장치, 가상저장장치, Web or E-mail 캐싱, 데이터웨어하우스와 데이터 마이닝, SAN(Storage Area Networks), NAS(Network Attached Storage)
- 고객
  - Fedex, Unigen, Barco View, Guidant, Exxon Mobil, Southwire, ICS Advent, Avnet, Clarity, APTI, Dell, Walt Disney, Microsoft, IBM, Motorola, Sony, International Monetary Fund

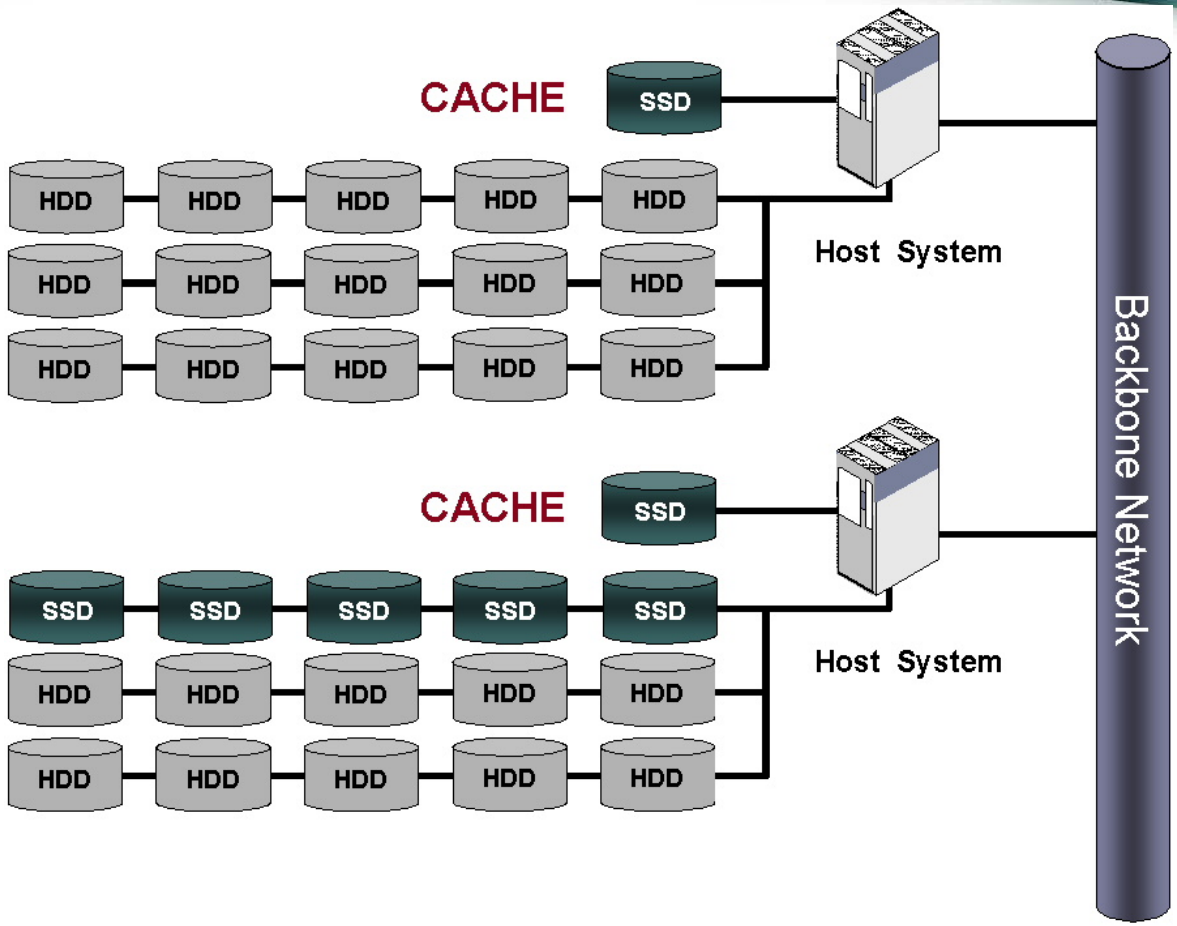


E-Disk® Applications – DAS



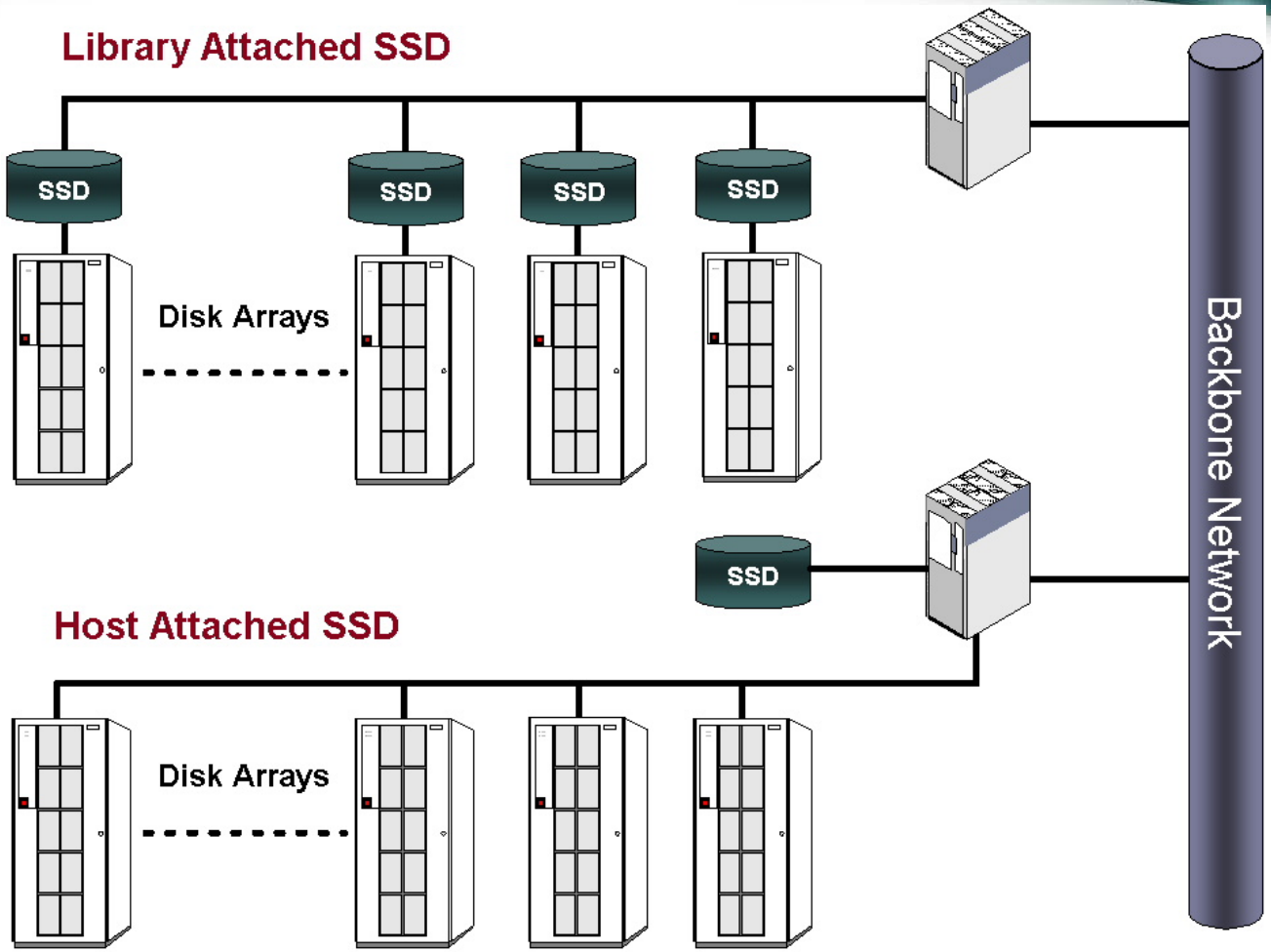
E-Disk® in DAS Configurations

E-Disk® Applications – RAID



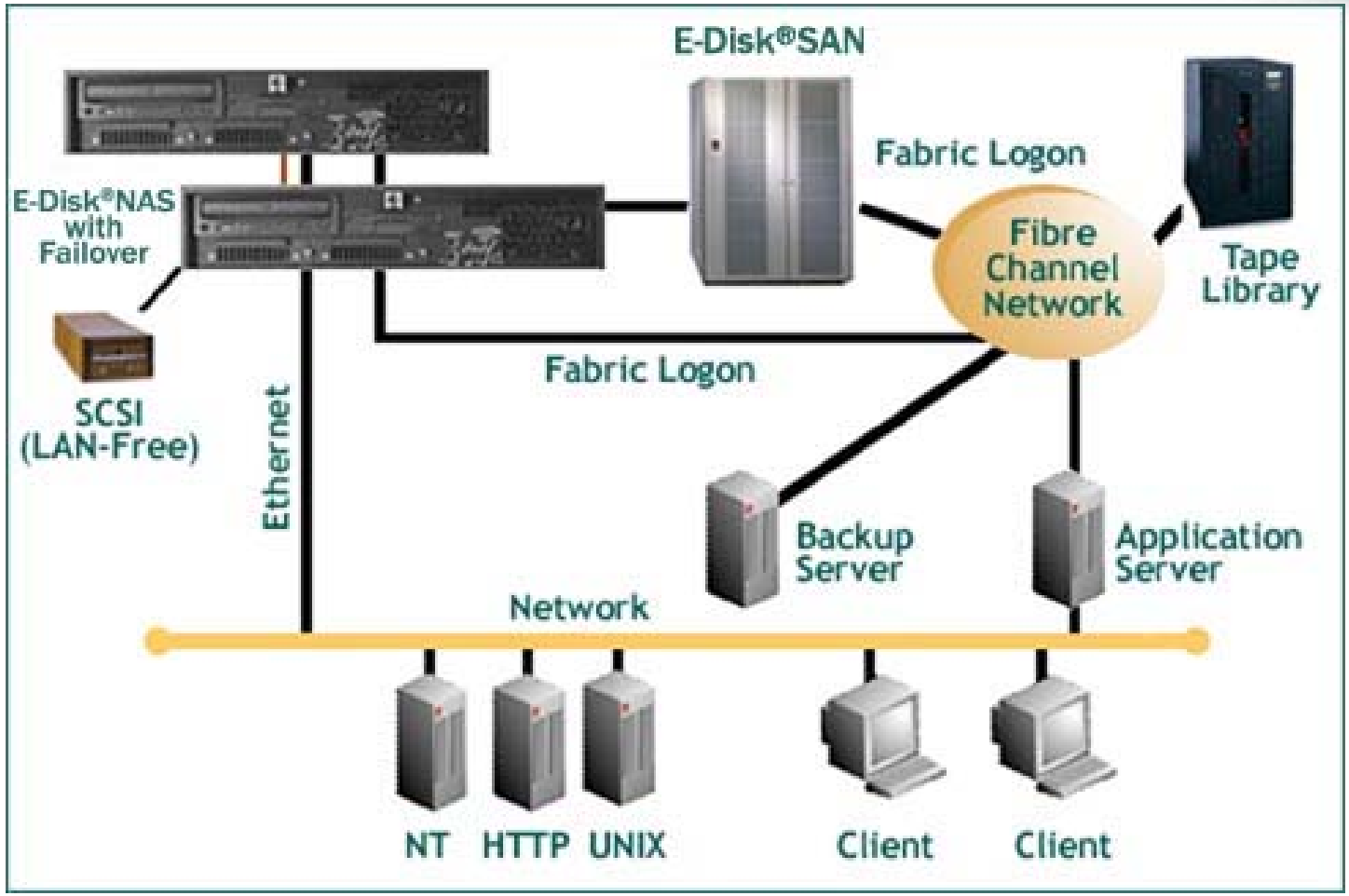
E-Disk® in RAID Configurations

E-Disk® Applications – Data Warehousing



E-Disk® in Datawarehousing/Mining

E-Disk® Applications – Networks



E-Disk® SSD 제품 소개

E-Disk® 제품특징

- 현저한 I/O 성능
  - 현재의 하드디스크보다 10-15배 빠른 랜덤 IOPS
  - 현재의 하드디스크보다 100배 빠른 엑세스 시간
- 산업 표준
  - 기능상 하드디스크와 같은 형태의 구조와 컨넥터와 인터페이스
  - ATA/IDE, SCSI와 Fibre Channel 지원
  - 운영시스템에 독립적이며, 드라이버가 필요 없음.
  - 부팅가능
- 고용량 저장장치
  - 고밀도 플래쉬 메모리 (2Gbit)와 우리의 특화된 FlashBus™ 구조와 포장 기술이 같은 형태에서 고용량 디스크 드라이브를 만듬
    - 2.5” 구조: 75.8 GB 까지
    - 3.5” 구조: 155.6 GB 까지
- 저 소비 전력
  - ≥ 2.8 watts

E-Disk® 제품특징 (계속)

- 내구성
  - 극한 고도, 충격, 습도와 온도 하에서도 지속적인 운영
    - MIL-STD-810 C and E 인증
    - 특허된 포장기술로 같은 구조형태에서 고용량 디스크 드라이버 공급
- 신뢰성
  - 데이터 보존성 증가,시스템 성능 최적화와 높은 장치 수명
    - Reed-Solomon Error Correction Code (RS ECC) 사용
    - 데이터 에러율에서 산업표준인 10^{-20} bits 보다 백만배 높음
    - 대부분의 전원장애의 경우에서 데이터와 FAT(file allocation table) 손실 또는 손상 비율을 줄임.
    - 플래쉬 메모리에 마모균일화(Wear leveling)와 메모리 세정(memory scrubbing) 소프트웨어를 사용하여 최적화
- 보안
  - 옵션인 PowerGuard® 기능과 DataSentinel™ 은 전원 성능저하나 실패의 문제시 시스템의 정지가 일어날 때 완벽한 데이터 복구기능을 한다.
  - 전문적이고 상당히 기밀에 관련되는 어플리케이션들을 위해 securErase® 는 심지어 외부전원이 인가되지 않거나 전원의 복구 시 복구 뿐만이 아니라 데이터의 말소도 쉽게 한다.

E-Disk® 성능

Interface	IOPS	Burst (MB/sec)	Sustained (MB/sec)	Access (µsec)
SCSI Narrow	5,000	20	18	100
SCSI Wide	9,500	40	34	48
Ultra320 SCSI	11,700	320	44.4	42
IDE / ATA	16,000	66.6	28	68
Fibre Channel	9,500	400/200*	68	42

400MB/sec (Full Duplex); 200MB/sec (Simplex)

E-Disk® 신뢰성

Data Integrity	10 Years (minimum)
Read Endurance	Unlimited
Erase/Write Endurance*	5.1 GB E-Disk: 137 years
	@ 100 GB Erase/Write per Day
Operating Temperature	-60 to +95 Degrees Celsius
Operating Shock	1250 Gs for ATA; 1500 Gs for SCSI and FC
Operating Vibration	16.4 Gs RMS
MTBF	2 million hours
Preventive Maintenance (Transparent to Users)	Patented Wear Leveling
	Proprietary Automatic Bad Block Remapping
	Proprietary Flash Memory Scrubbing
	Proprietary Reed Solomon ECC
	9 Random Bytes Detection per 512 Bytes
	6 Random Bytes Correction per 512 Bytes
	10^{-20} Read Bit Error Rate
	Will NEVER miscorrect 3 Random Byte errors
Brown-Out Data Protection	DataSentinel with or without PowerGuard®

E-Disk® MTBF

- 25º C환경에서 10년동안 운영시의 신뢰성

Number of Boards	512 Mbit Flash Chip			1024 Mbit Flash Chip		
	Capacity (MBytes)	MTBF (Years)	Reliability in 10 Years	Capacity (MBytes)	MTBF (Years)	Reliability in 10 Years
1	2,048	213	95.66%	4,096	211	95.63%
2	5,120	193	94.96%	10,240	192	94.96%
3	9,216	163	94.04%	18,432	163	94.04%
4	13,312	140	93.12%	26,624	140	93.12%
5	17,408	123	92.21%	34,816	123	92.21%
6	21,504	110	91.31%	43,008	110	91.31%
7	25,600	99	90.41%	51,200	99	90.41%
8	29,696	90	89.53%	59,392	90	89.53%
9	33,792	83	88.65%	67,584	83	88.65%
10	37,888	77	87.79%	75,776	77	87.79%

@ Bellcore Issue 6, Method I, Case 3, Quality Level II

E-Disk® Erase/Write Endurance

디스크 평균 수명*

@ 100 GBytes Erase/Write per Day

Number of Boards	512 Mbit Flash Chip		1024 Mbit Flash Chip	
	Capacity (MBytes)	Erase/Write Endurance in YEARS	Capacity (MBytes)	Erase/Write Endurance in YEARS
1	1,024	27	2,048	55
2	5,120	137	10,240	274
3	9,216	247	18,432	493
4	13,312	356	26,624	712
5	17,408	466	34,816	932
6	21,504	575	43,008	1,151
7	25,600	685	51,200	1,370
8	29,696	795	59,392	1,589
9	33,792	904	67,584	1,808
10	37,888	1,014	75,776	2,027

*NOTE: BiTMICRO Test Result shows E-Disk® Erase/Write Endurance (cache disabled); 15 x more the value if enabled

Certifications

- Agency Certification
  - Safety — UL 1950, CSA 22.2 950-M95, and TUV Bauart
  - EM Immunity — EN 50082-1 : 1997
  - EM Emissions — FCC Part 15 Subpart B Class B, and EN 55022 : 1994 Amend 1&2 Class B
- OEM Certification
  - Shock and Drop Tests — DO - 160D (Aviation Standards)
  - Random Vibration — DO - 160D (Aviation Standards)
  - Storage Temperature — DO - 160D (Aviation Standards)
  - Temperature Cycling — DO - 160D (Aviation Standards)
  - Nuclear EM Pulse — US Military Standards
  - Lightning Surge — European Aviation Standards
  - Cosmic Radiation — NASA (in-process)
- Third Party Certification (Quanta Lab)
  - Operating Shock — MIL-STD-810C
  - Operating Vibration — MIL-STD-810E, Method 514.4-21

Advanced E-Disk® Features

데이터 감시

- 저 전압과 전압저하 검출
  - 중요한 부분 아래에서 전압저하 직전에 주변기기에 쓰는 것을 정지시킨다.
- Redundant Pre-Write
  - 예약된 많은 메모리 블록이 스크래치패드로서 내부 변환 테이블을 위해 사용된다
- Concurrent Multiple Write
  - 낮은 전압으로 데이타에 대한 위험도와 FAT 파손을 줄입니다.
  - "윈도우의 취약점"이나 윈도우 장치가 기록시 시간 단축
- 사용자 프로그램 기능 특징
  - 캐쉬 지연 타이머를 통한 기록
  - 플래쉬 캐쉬 크기
  - Cache-on-Write Disable
- 모든 E-Disk® 제품에 표준 기능 적용

PowerGuard®

- 옵션으로 특화된 하드웨어와 펌웨어 유필리티는 우수한 내부 전원 소스를 포함
- E-Disk 캐시에서의 모든 데이타는 비 정상적인 전원 중단상에서 데이타의 손실이나 깨지는 것없이 플래시 메모리에 저장되는 것을 보장한다.
- E-Disk® 에서 빠르고 완벽하게 모든 데이터를 안전하게 지운다.

MODEL	Features
PowerGuard I - Save Mode	Flushes Cache Data to Flash, Plus Option for “Instant Erasure”* of Flash Data (External Power Required)
PowerGuard II - Erase Mode	Save Mode, Plus Option for Power Down Erase
PowerGuard III - Standby Mode	Erase Mode, Plus Extra Internal Power to Extend Decision Time to Erase or Keep Flash Data

* - 포함되지 않은 PowerGuard I 에서 만 기본으로 이용할 수 있다. 실시간으로 지우는 것은 고객의 요청으로 PowerGuard I ATA E-Disks에 포함시켜서 사용할 수 있다.

securErase®

- 비휘발성 메모리의 각 블록에서 데이터의 모든 흔적들을 지우는 펌웨어 유틸리티(레벨링을 하고 있는 통계자료 제외)
  - 높은 기밀성 데이터를 관리하는 어플리케이션에서 요구되는 디스크로부터의 모든 데이터를 빠르고 완전히 복구 할 수 없게 끔 지우는 곳에 적용된다.
  - With PowerGuard® 2 (Erase Mode): 시스템 정지상에서 즉각적인 실행, 시작시 자동 재개
  - With PowerGuard® 3 (Standby Mode): 수동적인 작동으로 즉각적인 실행 시작시 자동 재개
- Fast Full Erase Times
  - Approx 16 secs (using 1 Gbit flash) per memory board
  - Approx 33 secs (using 2 Gbit flash) per memory board
  - By default, 3 boards can be erased simultaneously (i.e. 33 secs for 3.5” U320 40GB)
- Standards Compliance
  - NISPOM DoD 5220.22-M
  - NSA 130-2
  - Air Force AFSSI 5020
  - Army 380-19
  - Navy NAVSO P-5239-26

E-Disk® Technology vs. DRAM-SSD

특징	Relative Factor vs D-SSD	장점
낮은 전력 소비	3x	비휘발성 메모리는 많은 전력 공급, 백업 배터리, 특별한 쿨링 시스템의 필요성을 제거했다.
견고성	3x	MIL-STD-810, E compliant, 독창적인 패킹 기술이 심한 기온, 충격, 습도와 온도 조건하에서도 운영 가능하도록 한다.
높은 용량	10x	본질적으로 높은 플래시 메모리와 독창적인 FlashBus 구조와 패킹 기술이 같은 형태 안에서 높은 용량의 디스크 드라이브를 만든다.
신뢰성	3x	독창적인 Reed-Solomon Error Correction Code(RS ECC), wear leveling, 플래시 메모리의 사용을 최적화 시킨 memory scrubbing 소프트웨어가 증가된 데이터 무결성과 최적의 시스템 성능과 오랜 디바이스 수명을 보장한다.
데이터 보안	3x	독창적인 DataSentinel 데이터 보호는 데이터와 FAT(File Allocation Table) 손실과, 전원 실패시의 중복 현상을 줄여준다. DataSentinel과 함께 PowerGuard는 전원 손실 혹은 실패시에 안전하게 전원을 내림으로써 데이터의 회복성을 보장해 준다. 특별하고 심히 민감한 응용 프로그램들에 대해서 securErase 기능이 외부 전원 공급의 부재 혹은 전원 재 충천시에 데이터의 회복을 보장해 준다.
높은 가용성	2x	Hot-swappable(SCSI, Level 4)는 서버나, 스토리지 호스트 시스템의 재부팅없이 유리하고 관리해 준다.
비휘발성	N/A	외부 배터리나 이중화된 전원 공급이 필요하지 않는다.

E-Disk®SAN vs. Traditional DRAM-Based SSD

E-Disk®SAN

DRAM Based

- **Competitive Advantages**
  - Non-volatility:
    - ✓ Flash is inherently non-volatile
    - ✓ DRAM requires backup batteries and disks.
  - Price:
    - ✓ Capacity: $/MB
    - ✓ I/O: $/IOPS
  - Footprint: 589GB max in 2 rack-unit enclosure vs. 64GB max in 3 rack-unit enclosure
  - Power conservation: ~188 watts vs. 350 watts per enclosure
  - Data integrity: 10^{-20} error rate vs. 10^{-14} error rate

E-Disk® Technology vs. Other Flash-SSD

특징	Relative Factor vs Other Flash SSDs	장점
견고성	**1.5x**	Mil-STD-810 C와 E-compliant와 독창적인 패킹 기술이 심한 습도, 충격, 기온 하에서도 운영 가능하도록 해 준다.
신뢰성	**3x**	독창적인 Reed-Solomon Error Correction Code(RS ECC), wear leveling, 플래시 메모리의 사용을 최적화 시킨 memory scrubbing 소프트웨어가 증가된 데이터 무결성과 최적의 시스템 성능과 오랜 디바이스 수명을 보장한다.
데이터 보안	**3x**	독창적인 DataSentinel 데이터 보호는 데이터와 FAT(File Allocation Table) 손실과, 전원 실패시의 중복 현상을 줄여준다. DataSentinel과 함께 PowerGuard는 전원 손실 혹은 실패시에 안전하게 전원을 내림으로써 데이터의 회복성을 보장해 준다. 특별하고 심히 민감한 응용 프로그램들에 대해서 securErase 기능이 외부 전원 공급의 부재 혹은 전원 재 충천시에 데이터의 회복을 보장해 준다.
높은 성능	**2x**	본질적으로 높은 플래시 메모리와 독창적인 FlashBus 구조와 패킹 기술이 같은 형태 안에서 높은 성능 디스크 드라이브를 만든다.
진보된 인터페이스 지원	**2x**	듀얼 포트 Fibre Channedl(FC-AL)을 사용한 최대 2 Gbits/s의 시스템 인터페이스 속도 지원
높은 가용성	**2x**	Hot-swappable(SCSI, Level 4)는 서버나, 스토리지 호스트 시스템의 재부팅없이 유리하고 관리해 준다.

High-End E-Disk® SSD Products

ATA/IDE, SCSI and Fibre Channel

E-Disk® ATA/IDE

Increased High Speed Networking

+ Operating System Independent
+ Up to 16,000 IOPS
+ 100 to 68 µsec access time

Facilitate Quick Data Transfers

+ 16.7 to 66.6 MB/s Burst R/W Rate
+ 14 to 28 MB/sec Sustained R/W Rate

High Storage Capacities

+ 2.5-inch: 256 MB to 75.8 GB
+ 3.5-inch: 2048MB to 147.5GB

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 1,250 Gs Operating Shock
+ – 60 to + 95 ºC
+ 2 Million Hours MTBF
+ 120,000 feet Altitude

Industry Standard IDE Interface

+ No Device Driver Required
+ IDE to UDMA66 Support
+ Completely bootable

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®
+ Write Protect

MODELS:

2A16, 2A33, 2A66
3A16, 3A33, 3A66

E-Disk® SCSI Narrow

Increased High Speed Networking

+ Operating System Independent
+ 1,500 to 5,000 IOPS
+ 0.25 to 0.1msec access time

Facilitate Quick Data Transfers

+ 5 to 20 MB/s Burst R/W Rate
+ 4.5 to 18 MB/sec Sustained R/W Rate

High Storage Capacities

+ 2.5 -inch: 256 MB to 73.7 GB
+ 3.5 -inch: 2048 MB to 147.5 GB

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 1,500 Gs Operating Shock
+ – 60 to + 95 ºC
+ 2 Million Hours MTBF
+ 120,000 feet Altitude

Industry Standard SCSI Interface

+ No Device Driver Required
+ SCSI to Ultra SCSI Narrow
+ Completely bootable

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®
+ Write Protect

MODELS:

2S5, 2S10, 2S20
3S5, 3S10, 3S20

E-Disk® SCSI Wide

Increased High Speed Networking

+ Operating System Independent
+ up to 9,500 IOPS
+ 48 µsec access time

Facilitate Quick Data Transfers

+ 40 MB/s Burst R/W Rate
+ up to 34MB/sec Sustained R/W

High Storage Capacities

+ 3.5-inch: 1024 MB to 147.5 GB

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 1,500 Gs Operating Shock
+ – 60 to + 95 ºC
+ 2 Million Hours MTBF
+ 120,000 feet Altitude

Industry Standard SCSI Interface

+ No Device Driver Required
+ Ultra SCSI Wide
+ Completely bootable

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®
+ Write Protect

MODELS:

3S40D, 3S40E

E-Disk® Ultra320 SCSI

Increased High Speed Networking

+ Operating System Independent
+ up to 11,700 IOPS
+ 42 µsec access time

Facilitate Quick Data Transfers

+ 320 MB/s Burst R/W Rate
+ up to 44 MB/s Sustained R/W

High Storage Capacities

+ 3.5-inch: 1024 MB to 155.6 GB

preliminary

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 1,500 Gs Operating Shock
+ – 60 to + 95 ºC
+ 2 Million Hours MTBF
+ 120,000 feet Altitude

Industry Standard SCSI Interface

+ No Device Driver Required
+ Ultra320 SCSI Wide
+ Completely bootable

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®
+ Write Protect

MODELS:

3S320

E-Disk® Fibre Channel

Increased High Speed Networking

+ Operating System Independent
+ up to 9,500 IOPS
+ 42 µsec access time

Facilitate Quick Data Transfers

+ 400 MB/s Duplex Burst R/W Rate
+ up to 68 MB/s Sustained R/W Rate

High Storage Capacities

+ 3.5-inch: 1024 MB to 155.6 GB

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 1,500 Gs Operating Shock
+ – 60 to + 95 ºC
+ 2 Million Hours MTBF
+ 120,000 feet Altitude

Industry Standard FC Interface

+ No Device Driver Required
+ 2 Gbit Dual Port
+ Completely bootable

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®
+ Write Protect

MODELS:

3F2

preliminary

Plug-In E-Disk® Modules

E-Disk® VME

E-Disk® VME – SCSI Narrow

Increased High Speed Networking

+ Operating System Independent
+ up to 5,000 IOPS
+ Less than 0.2 msec access time

Facilitate Quick Data Transfers

+ 10 to 20 MB/s Burst R/W Rate
+ 4.5 to 18 MB/sec Sustained R/W Rate

High Storage Capacities

+ 6U single slot: 256MB to 32.76GB

preliminary

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 20 Gs Operating Shock
+ – 40 to + 85 ºC
+ 500,000 Hours MTBF
+ 120,000 feet Altitude

Industry Standard Internal SCSI Interface

+ No Device Driver Required
+ SCSI to Ultra SCSI Narrow
+ Completely bootable

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®
+ Write Protect

MODELS:

6S10V, 6S20V

E-Disk® VME – SCSI Wide

Increased High Speed Networking

+ Operating System Independent
+ up to 9,500 IOPS (12,500 IOPS for U320 SCSI)
+ 48 µsec access time (42 µsec access time for U320 SCSI)

Facilitate Quick Data Transfers

+ 40 MB/s Burst R/W Rate
+ up to 320 MB/s Burst R/W Rate
+ 34MB/sec Sustained R/W Rate
+ up to 44 MB/sec Sustained R/W Rate

Highest Storage Capacities

+ 6U double slot (convection cooled): 1024 MB to 98.3 GB
+ 6U double slot (conduction cooled): 1024 MB to 81.9 GB

preliminary

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 20 Gs Operating Shock
+ – 40 to + 85 ºC
+ 500,000 Hours MTBF
+ 120,000 feet Altitude

Industry Standard Internal SCSI Interface

+ No Device Driver Required
+ Ultra SCSI Wide
+ Ultra320 SCSI Wide
+ Completely bootable

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®
+ Write Protect

MODELS:

6S40V, 6S320V

Portable E-Disk® Modules

E-Disk® Transit
E-Disk® SolidTape

E-Disk® Transit

- Portable SCSI flash solid state drive storage solution
- Rugged industry standard 5.25” module
- Ideal for applications requiring rapid, frequent swaps (high-cycle storage module insertion/removal)
- SCSI Disconnect Technology (true hot swap removal / insertion)

Half-Height

Low Profile

E-Disk® Transit

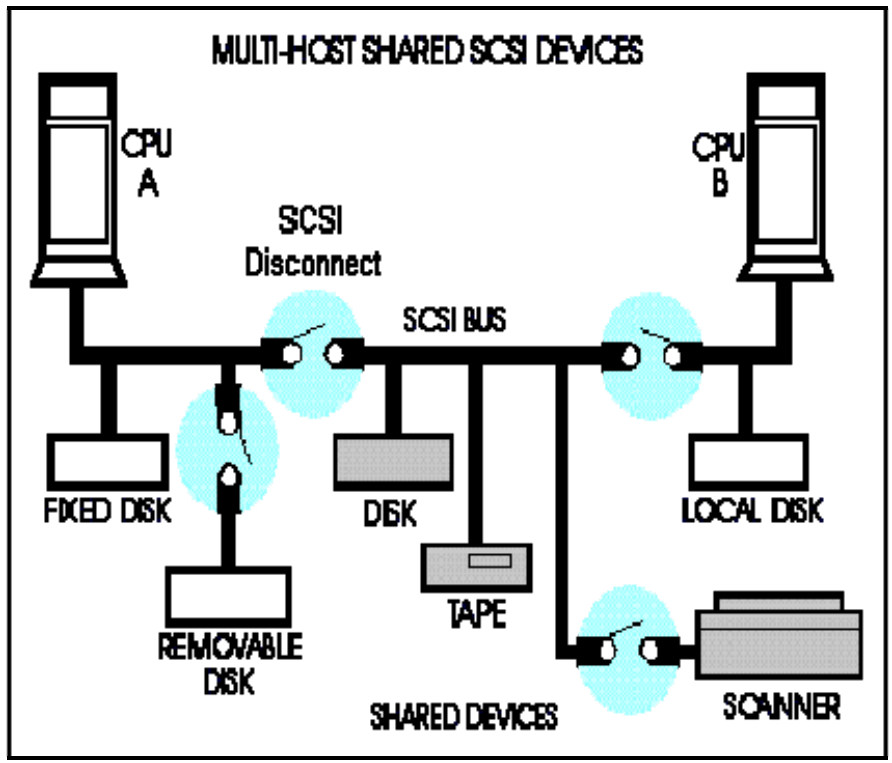
- All metal construction
- 100,000+ removal cycles
- 8-bit SCSI Fast and 16-bit SCSI Wide modules
- Shock isolated removable 3.5” SCSI drive modules
- User selectable SCSI ID in receiver
- LED Power and Select Indicators
- Drive Write-Protect option

Half-Height

Low Profile

SCSI Disconnect

- True hot swap-removal/insertion
  - 시스템의 전원 다운이나 공 회전 없음
  - 운영시스템에 종속적
- Drive isolation from the SCSI bus to allow power cycling and removal
  - All SCSI signals from the “public” SCSI bus are isolated and regenerated into an individual “private” SCSI bus for each drive
  - When start/stop switch of active drive is pressed, SCSI disconnect first isolates the private bus, then removes the drive’s power allowing the module to be safely swapped
  - Reinstalling the module and pressing start/stop switch in reverse: power is applied to the drive, then the private SCSI bus reconnects to the public bus only after the drive and private bus are stable and the public bus is idle
- Ensures bus and data integrity
- Supports all bus modes



E-Disk® Transit – SCSI Narrow & Wide

Increased High Speed Networking

+ Operating System Independent
+ 1,500 to 11,700 IOPS
+ 250 to 42 µsec access time

Facilitate Quick Data Transfers

+ 5 to 320 MB/s Burst R/W Rate
+ 4.5 to 44 MB/sec Sustained R/W Rate

Highest Storage Capacities

+ 5.25-inch Half-Height: 512 MB to 122.9 GB
+ 5.25-inch Low Profile: 512 MB to 57.3 GB

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ – 40 to + 85 ºC*
+ 2 Million Hours Drive MTBF
+ 120,000 feet Altitude
+ > 100,000 removal cycles
+ Shock isolated removable 3.5" E-Disk® SCSI drive modules

Industry Standard SCSI Interface

+ No Device Driver Required
+ Fast SCSI to Ultra-320 SCSI Wide
+ Completely bootable
+ User selectable SCSI ID in receiver, drive module remains autonomous

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®
+ Write Protect

Half-Height

Low Profile

E-Disk® SolidTape – ATA/IDE

Increased High Speed Networking

+ Operating System Independent
+ 100 to 68 µsec access time

Facilitate Quick Data Transfers

+ 16.7 to 66.6 MB/s Burst R/W Rate
+ 14 to 28 MB/sec Sustained R/W Rate

Highest Storage Capacities

+ 2.5-inch: 256 MB to 18.4 GB

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 1,250 Gs Operating Shock
+ – 25 to + 75 ºC
+ 2 Million Hours MTBF
+ 120,000 feet Altitude

Industry Standard Interface

+ No Device Driver Required
+ IDE to UDMA66 Support
+ USB and PCMCIA Interface Kits
+ USB and SCSI SolidTape Bays
+ Completely bootable

Data Security Features

+ DataSentinel
+ PowerGuard®
+ securErase®

PCMCIA

USB

Low-Cost Ace-Disk™ SSD Products

Ace-Disk™ ATA/IDE, Ace-Disk™ Module, Ace-Disk™ CompactFlash

Ace-Disk™ ATA/IDE

Increased High Speed Networking

+ Operating System Independent

Facilitate Quick Data Transfers

+ 8.3 MB/s Burst R/W Rate
+ 5.4 MB/s Sustained Read Rate
+ 3.8 MB/s Sustained Write Rate

Highest Storage Capacities

+ 2.5-inch: 64 MB to 4 GB

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 1,000 Gs Operating Shock
+ 15Gs Operating Vibration
+ – 40 to + 85 ºC
+ 1,000,000 Hours MTBF

Industry Standard IDE Interface

+ No Device Driver Required
+ IDE PIO Modes 0-2 Support
+ Completely bootable

MODELS:

2A8

Ace-Disk™ Module

Increased High Speed Networking

+ Operating System Independent

Facilitate Quick Data Transfers

+ 8.3 MB/s Burst R/W Rate
+ 4 MB/s Sustained Read Rate
+ 3.4 MB/s Sustained Write Rate

Highest Storage Capacities

+ 16 MB to 1.5 GB

Secure Features (Optional)

+ multi-level password protection
+ user configurable zones
+ zone capacity by user
+ others

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ 1,000 Gs Operating Shock
+ 15Gs Operating Vibration
+ – 40 to + 85 ºC
+ 1,000,000 Hours MTBF

Industry Standard IDE Interface

+ No Device Driver Required
+ IDE PIO Modes 0-2 Support
+ Completely bootable
+ Vertical/Horizontal Orientation
+ 40 or 44-pin connectors

Optional Accessories

+ Ace-Disk™Module Duplicator: hard copy from 1 source to 7 targets; supports Ace-Disk Module and Ace-Disk ATA/IDE

MODELS:

MA8

Ace-Disk™ Industrial CompactFlash

Increased High Speed Networking

+ Operating System Independent

Facilitate Quick Data Transfers

+ 8.3 MB/s Burst R/W Rate
+ Sustained Read Rate
  4.3 MB/sec
+ Sustained Write Rate
  3.3 MB/sec

Highest Storage Capacities

+ CF Type I: 32 MB to 2 GB

Unparalleled Operating Performance

+ Pure Solid State/Non-Volatile
+ Operating Shock 1000 Gs
+ Operating Vibration 15 Gs
+ – 40 to + 85 ºC
+ MTBF: 1 Million Hours

Industry Standard IDE Interface

+ No Device Driver Required
+ IDE PIO Modes 0-2
+ True IDE Mode / I/O Card Mode / Memory Card Mode

MODELS:

A0A

Network Attached E-Disk® Enclosures

Network Storage
(Commercial & Rugged)

E-Disk®SAN Fibre Channel JBOD

- Performance
  - Dual/Quad Fibre Loop architecture for performance (800 MB/Sec) and drive loop resiliency
  - Complete Optical Fibre Channel connectivity (host to drives)
  - Up to 100,000 IOPS
  - Up to 650 MB/s sustained reads
  - Up to 320 MB/s sustained writes
- Scalability
  - Number of Drives per Enclosure
    - Up to 12 E-Disk ® Fibre Channel Drives
  - Maximum Configurations
    - Up to 589 GB (49.1 GB x 12) per enclosure
- 19” rack mount – 2U
- Manageability
  - SES Compliant
  - Optional E-Disk® StorView management software

E-Disk®SAN S2F-J

E-Disk®SAN Fibre-to-Fibre RAID

- Performance
  - 2 Gb/s DUAL Fibre Channel host and disk support
  - Up to 4 direct host attachment
  - Up to 512 server connections in a switched environment
  - Dual controller--supports Active-Active processing
  - Up to 60,000 IOPS
  - Up to 300 MB/s sustained reads
  - Up to 180 MB/s sustained writes
- Scalability
  - Number of Drives per Enclosure
    - Up to 12 E-Disk ® Fibre Channel Drives
  - Maximum Configurations
    - Up to 589 GB (49.1 GB x 12) per enclosure
    - Up to 4.7 TB (57GB x 96) with 8 enclosures
- 19” rack mount – 2U
- Manageability
  - SES Compliant
  - Optional E-Disk® StorView management software
  - Remote/Local Storage Management
  - Host-based or Embedded StorView Local Manager

E-Disk®SAN S2F-Q
E-Disk®SAN S2F-R
E-Disk®SAN S2F-QE
E-Disk®SAN S2F-RE

Rugged E-Disk®SAN Fibre Channel JBOD

- Performance
  - Dual 1 Gbit Fibre Channel Loop architecture for performance (400 MB/Sec) and drive loop resiliency
  - Complete Optical Fibre Channel connectivity (host to drives)
  - Up to 50,000 IOPS
  - Up to 285 MB/s sustained reads
  - Up to 160 MB/s sustained writes
- Scalability
  - Number of Drives per Enclosure
    - Up to 6 E-Disk® Fibre Channel Drives
  - Maximum Configurations
    - Up to 688 GB (114.6GB x 6) per enclosure
- 19” rack mount – Rugged 4U

- Rugged
  - C4ISR deployed
  - Filtered air-cooled and RFI/EMI filtering
  - Hot-swappable drives in rugged carriers capable of more than 100,000 removal cycles

E-Disk®SAN S8F-J

E-Disk®SAN SCSI JBOD/RAID

- Performance
  - Transfer speeds up to 320 MB/sec per bus
  - Up to 1GB of cache memory
  - Up to 20,000 IOPS
  - Up to 111 MB/s sustained reads
  - Up to 126 MB/s sustained writes
- Scalability
  - Number of Drives per Enclosure
    - Up to 12 E-Disk ® SCSI Wide Drives
  - Maximum Configurations
    - Up to 688GB (57.3GB x 12) per enclosure
    - Up to 2TB (add'l 2 enclosures)
- 19" rack mount – 2U
- Manageability
  - SES Compliant
  - Optional E-Disk® AdminiStor Plus Global Storage management software

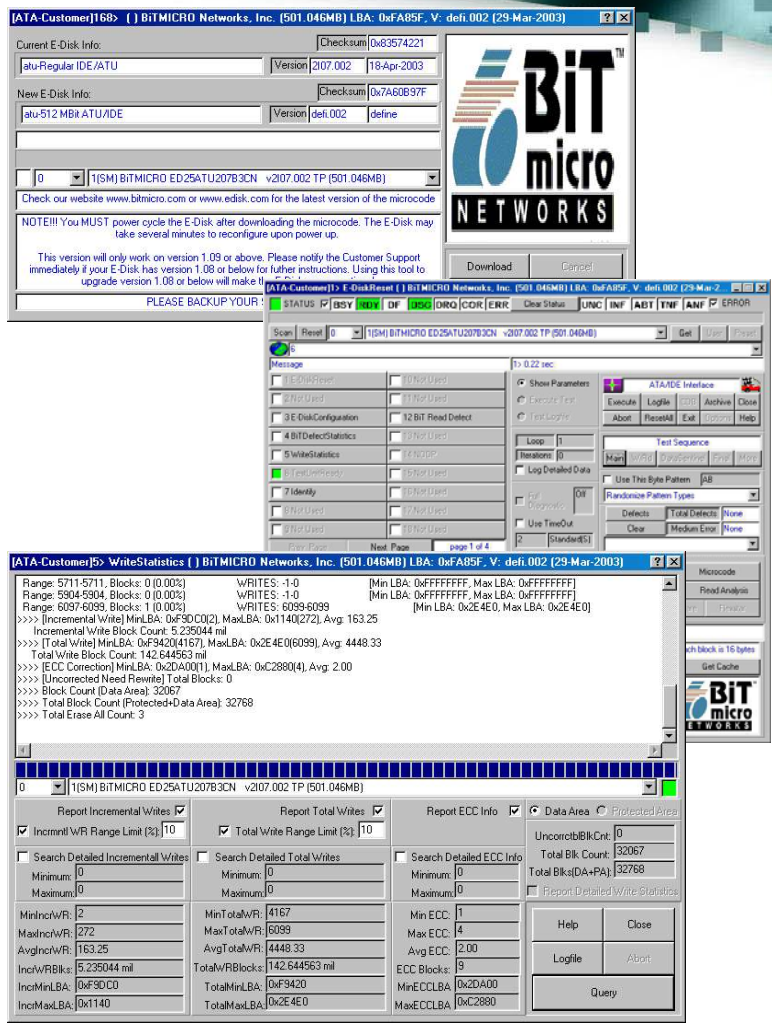
E-Disk®SAN S2S-J
E-Disk®SAN S2S-Q
E-Disk®SAN S2S-R

E-Disk® Software

E-Disk® Analyzer
E-Disk®SAN StorView
E-Disk® SafeCapacity-HotFile

E-Disk® Analyzer (EDA)

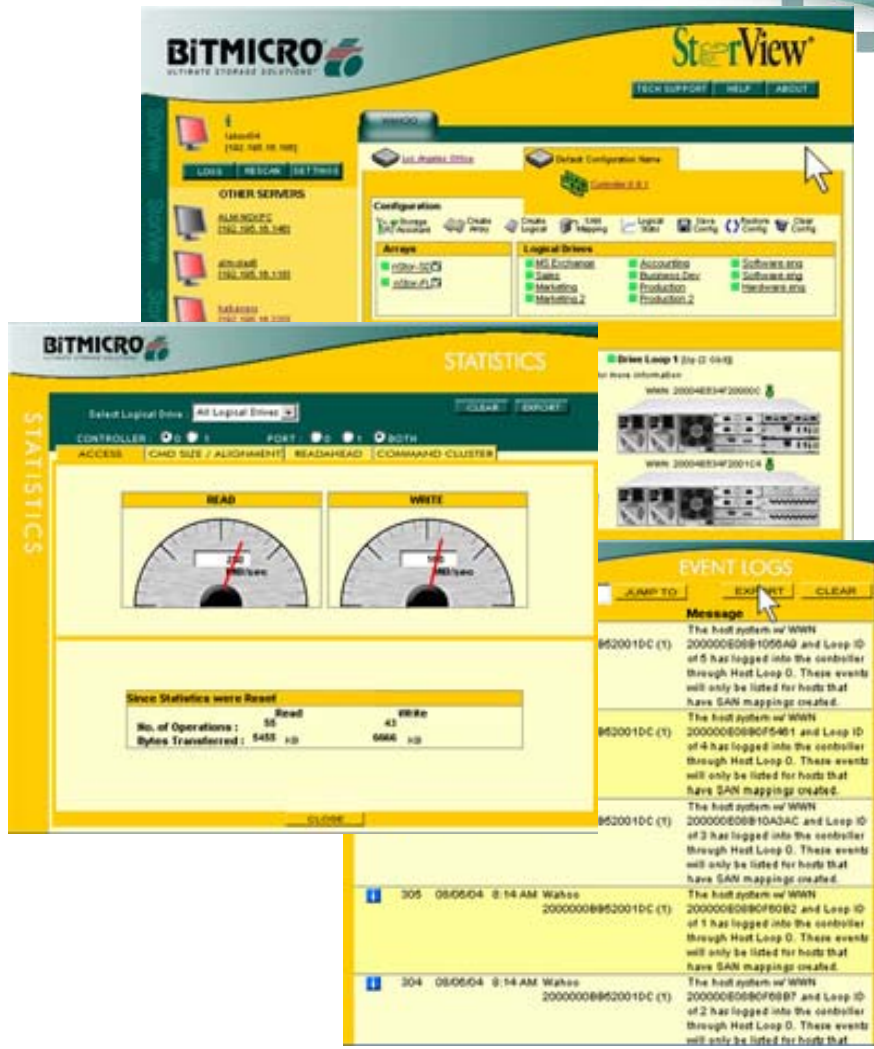
- 윈도우기반 Flash Analysis
- 개발 시스템
- 기능
  - 마이크로 코드 다운로드 – 사용자에서 E-Disk® 마이크로 코드 최신 버젼 업그레이드
  - 포맷 – E-Disk® low level format 수행
  - 모니터 캐쉬 – E-Disk® write/read 캐쉬성능 모니터
  - 구성 – 성능을 위한 E-Disk® 파라메타 사용자가 프로그램을 할 수 있으며 보다 더 신뢰성이 있다.
  - 쓰기 통계 보고서 – E-Disk® I/O write를 생성하고 성능 통계
  - Report on Defect Data – reports all defective Logical Block Address (LBA) in the E-Disk®
  - Reset Drive – performs SCSI bus reset
- OEM versions available
- UNIX and Linux versions under development



E-Disk®SAN StorView

Storage management software for BiTMICRO E-Disk®SAN Fibre Channel series

- Features
  - Highly visual and intuitive user interface, makes it easy to use and learn
  - HTML based allows it to work in any browser
  - Realistic animated images to resemble arrays for easy failed component location
  - View real-time SSD array performance and statistical data
  - Local or centralized network-based management and fault reporting
  - Automatic detection of servers on the net minimizes setup and support
  - Portable and operating system independent architecture.



E-Disk®SAN SafeCapacity-HotFile

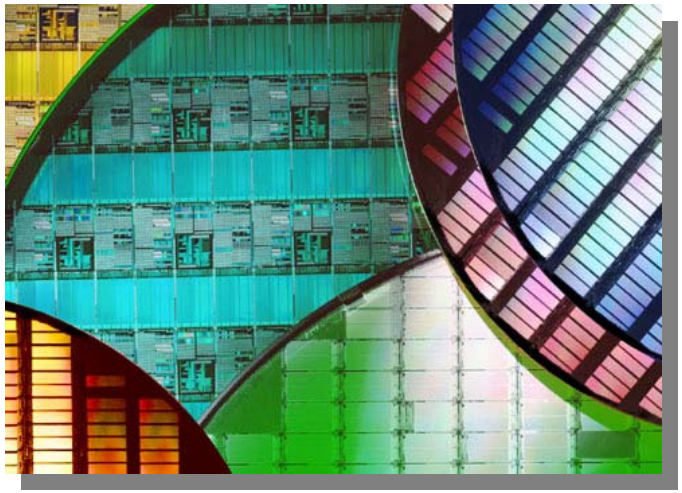
Storage capacity & performance management for networked environments

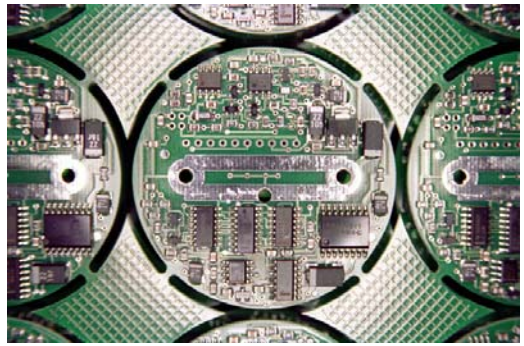
- Features & Benefits
  - Cost Savings
    - Avoids out-of-disk-space events
    - System administrators spend less time monitoring system capacity
    - Reduces over-capacity allocation of storage space
    - Increases the efficiency of existing storage space thereby reducing the need to add additional capacity
  - Maximizes Investment on SSD Technology
    - Also allows hot files to be available on solid-state disk, while less frequently used files can be automatically compressed and routed to less expensive and slower disks

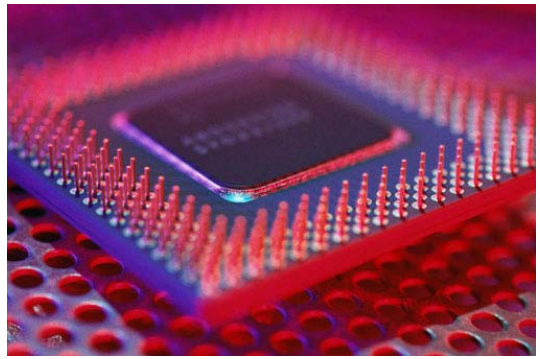
- Features & Benefits (cont'd)
  - Scalable
    - Automatically scales to any size file system environment and facilitates the expansion of user's storage facilities without unnecessary downtime
  - Support for all storage architectures
    - Network Attached Storage (NAS)
    - Storage Area Network (SAN)
    - SCSI over IP (iSCSI)
    - Direct Attached Storage (DAS)

SafeCapacity can save 20% to 45% over conventional hardware storage solutions.

E-Disk® Product Roadmap: a New Storage Layer







Next Generation E-Disk® Vision

- Affordable
- Unique, intelligent, scalable, highly secure and very high performance
- Ubiquitous (will be in handheld computers, removable media, personal computers, midrange and high-end computers, mainframes and most electronic appliances)
- It will complement and coexist with mechanical hard drives
- A new standard in storage hierarchy between Main Memory (DRAM) and Mechanical Disk will be created

Enabling Technology

- Leverage BiTMICRO's experience and expertise in designing ASIC System-on-Chip (SoC) device controllers and flash-memory specific firmware
- Employ the latest and emerging interconnect, software and semiconductor technologies in partnership with key industry leaders
- Deliver a scalable flash memory appliance having sufficient computing resources and interconnects to support devices in the targeted markets
- Transparent caching to complement and coexist with mechanical hard drives (Provides Extremely Low $/MB and $/IOPS)

Next Generation E-Disk® Technology

- Cost Effective
- High Performance (> 10x improvement)
- Security and Portability
- Scalability and Flexibility
- High Capacity and Density
- Low Power
- Versatile