Hybrid ODD
ODD with SSD Cache

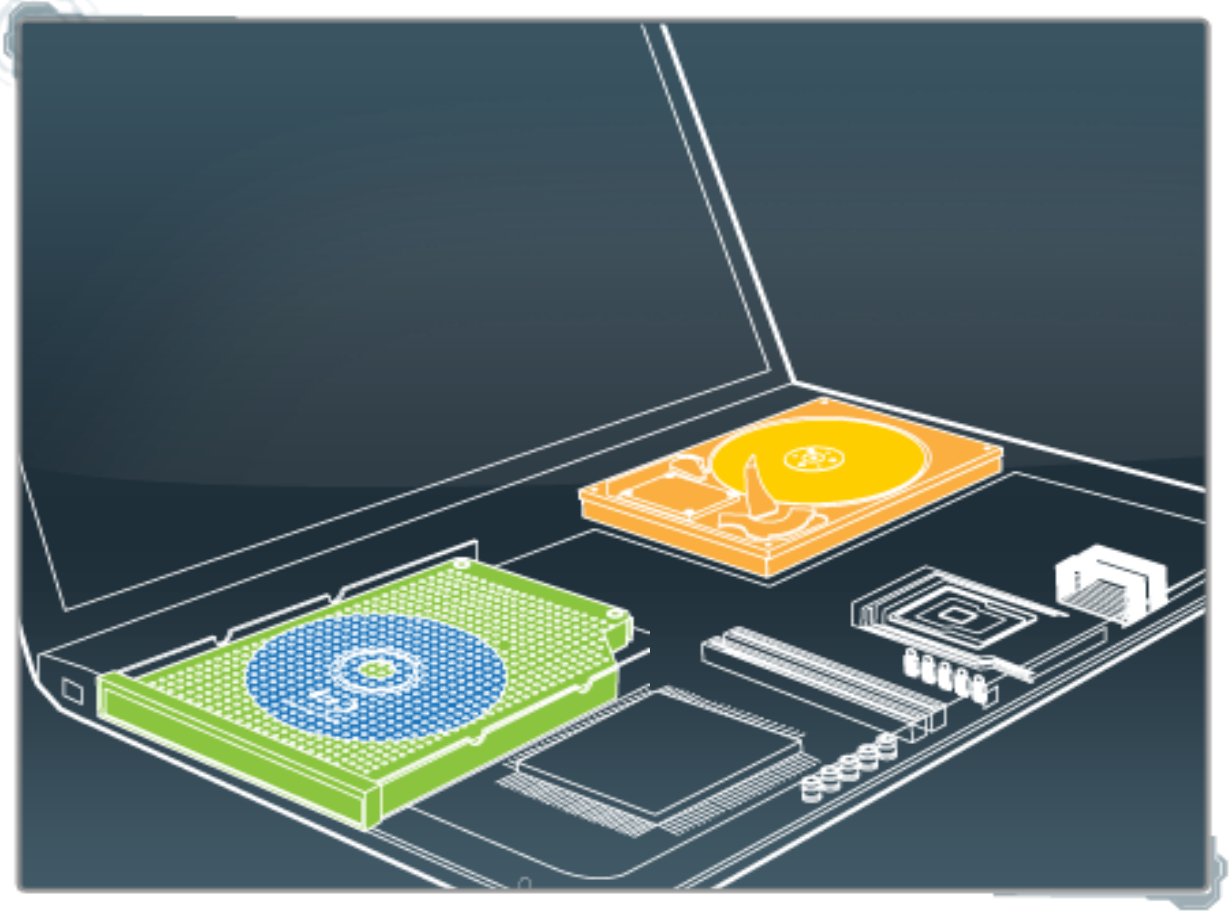
Bob Chang / NOVACHIPS

bobchang@novachips.com

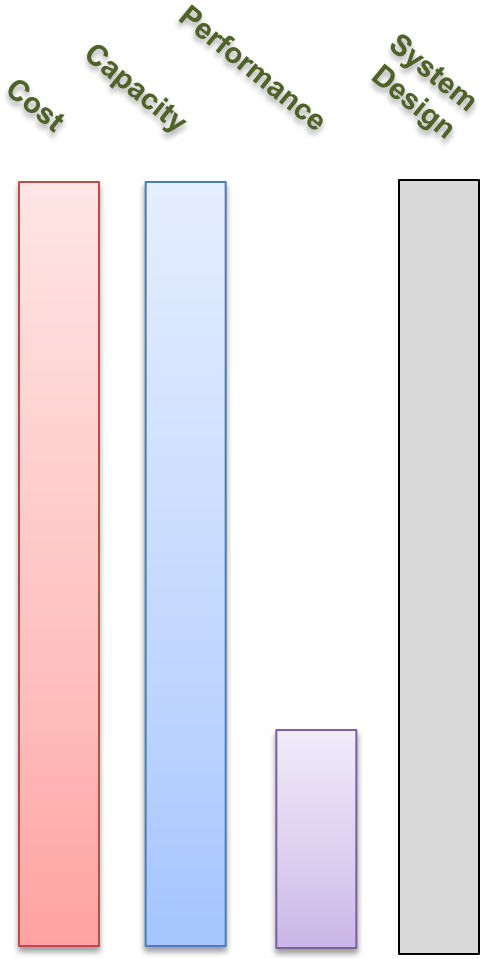
Today's Laptop Solutions

Laptop with HDD

2 Spindle based on standard laptop form factor



[Higher is Better]

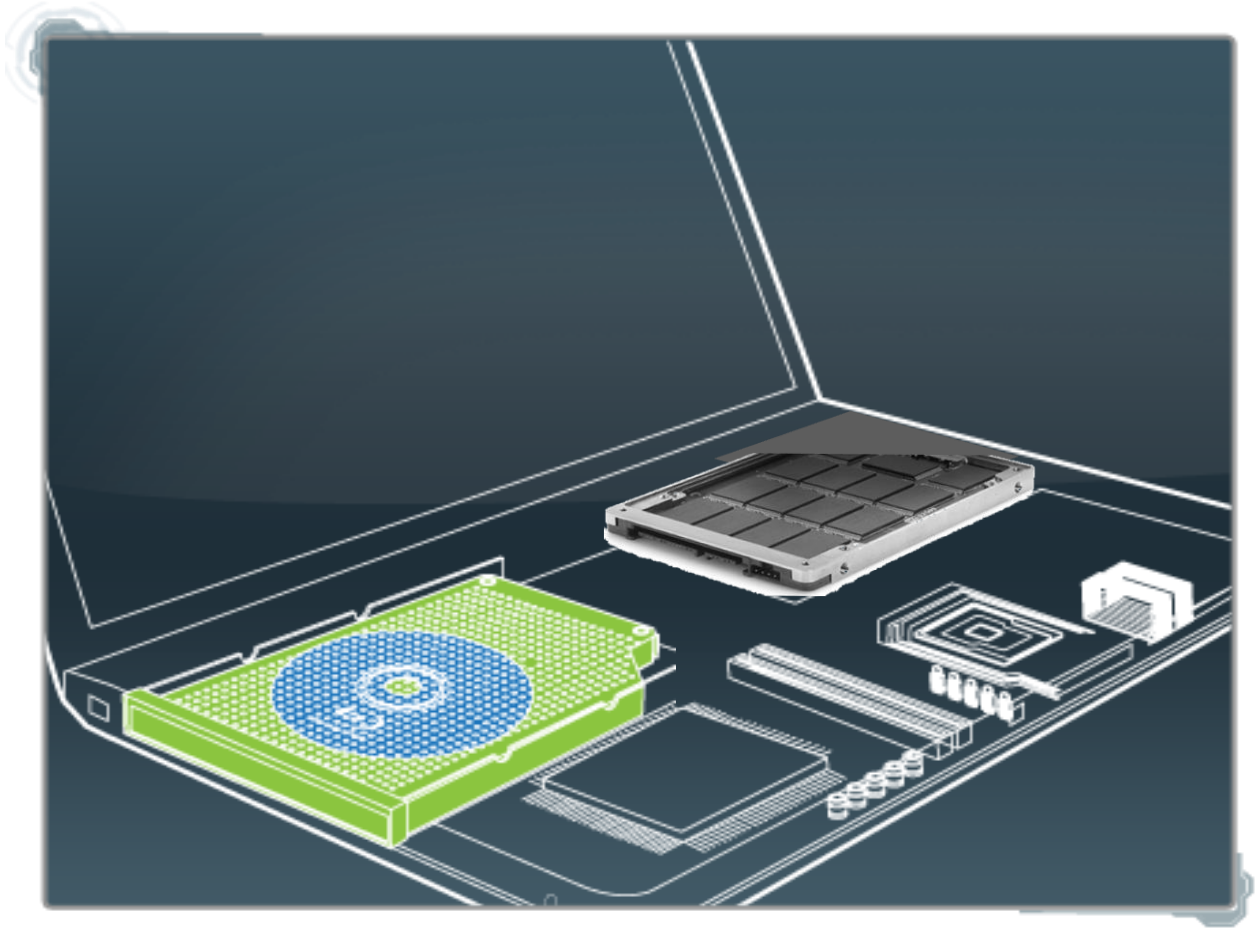


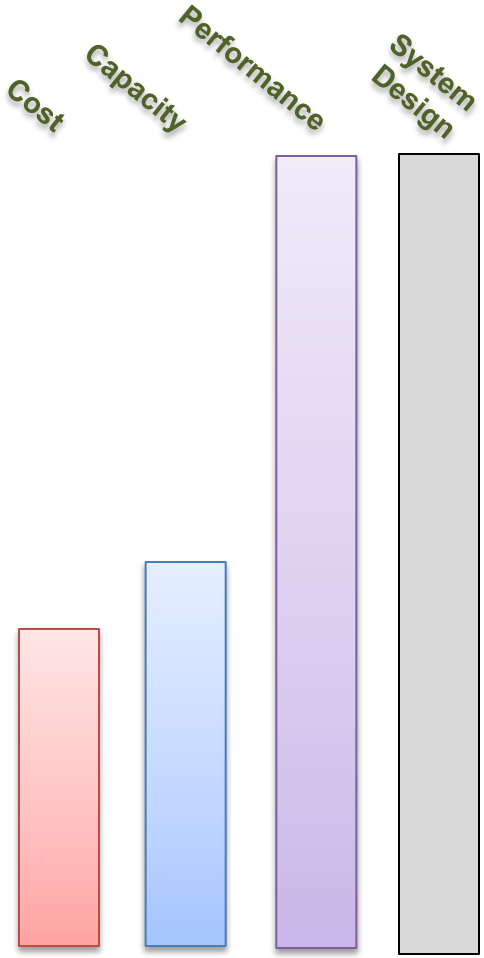
Today's Laptop Solutions

Laptop with SSD Replacement

Performance goes up but cost and capacity are traded off

[Higher is Better]



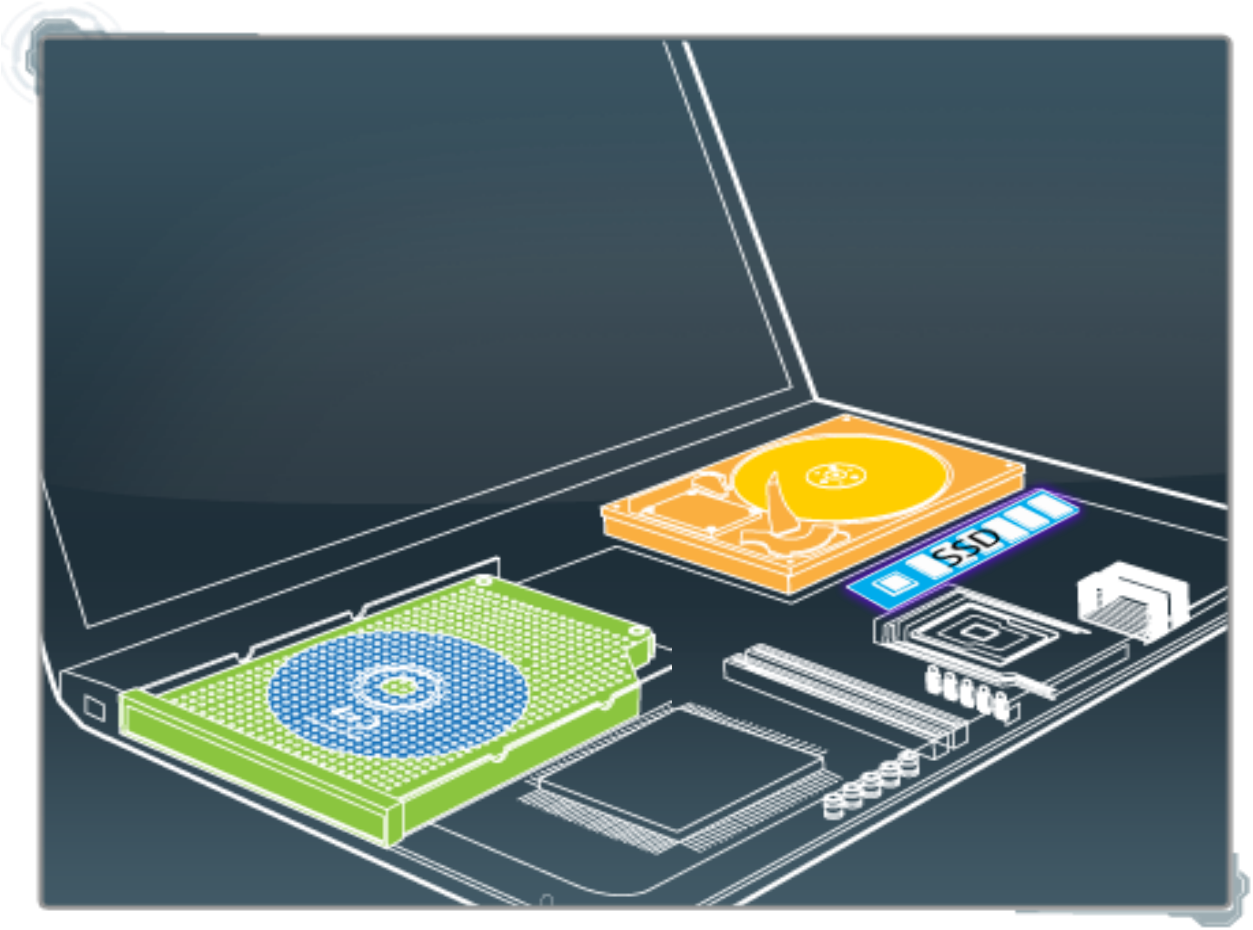


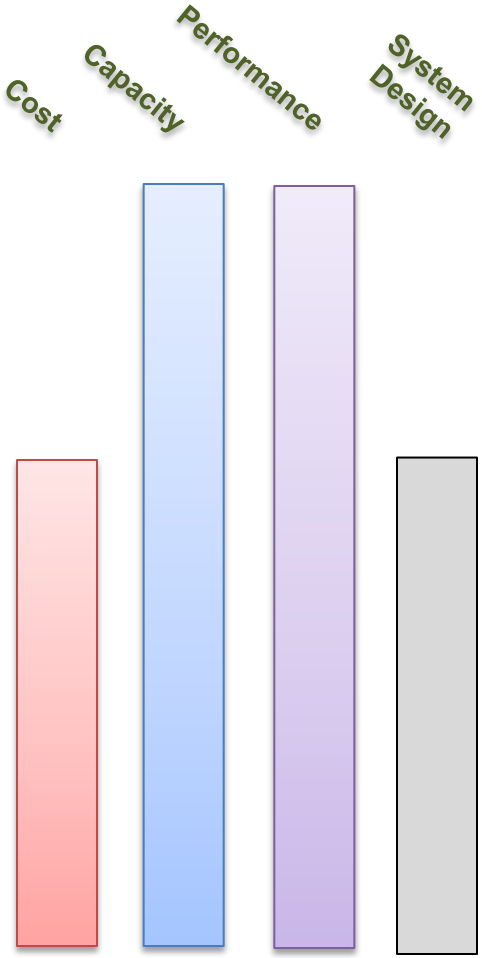
Today's Laptop Solutions

Laptop with Dual Drive Solution

Performance gain with small amount of SSD but requires system design changes

[Higher is Better]



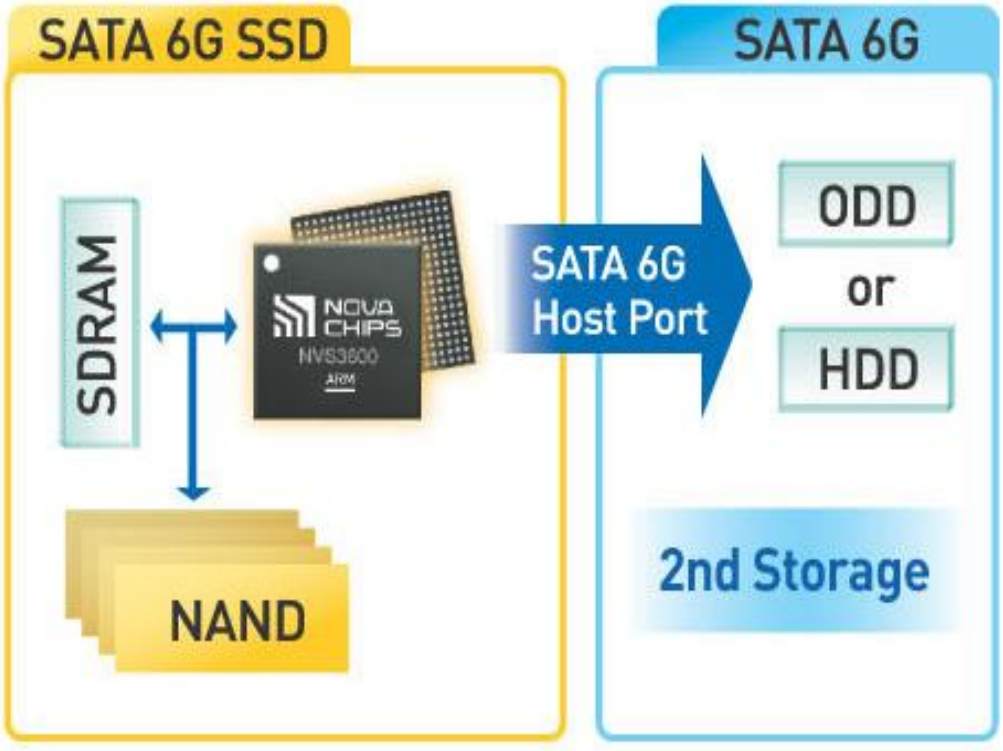


Hybrid Solution for Market Needs

SSD Controller with port multiplier can merge 2 medias into one

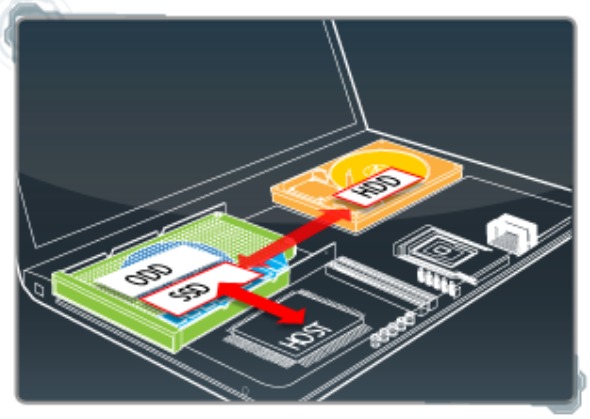
Small amount of SSD within ODD to eliminate design complexity and cost within system

Enabling Right Solution for Market

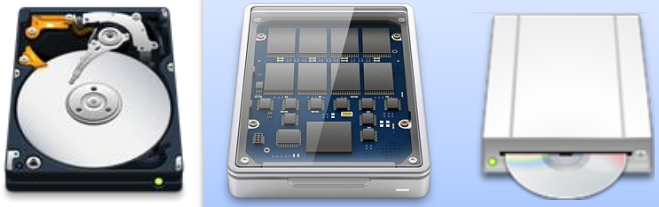


Dual-drive Solution for SSD Caching

Product Scheme



Port Multiplier

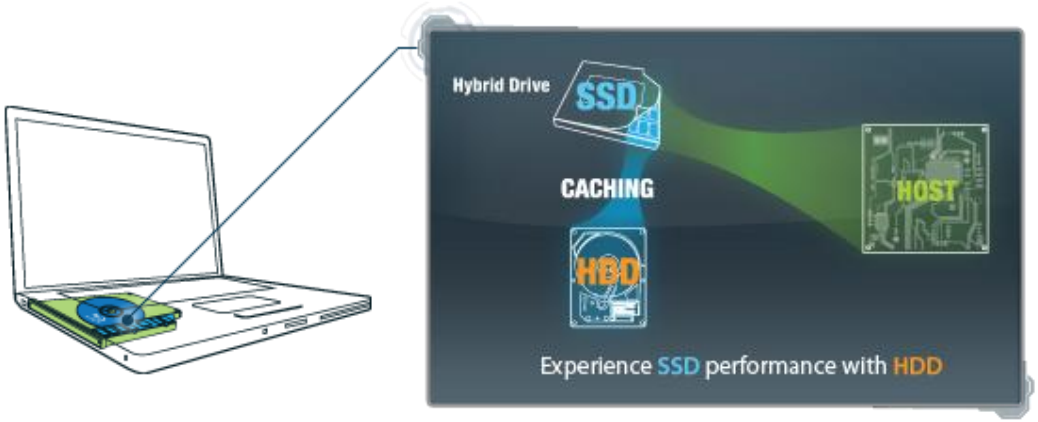


Hybrid SSD Usage – NV Cache

Boost up HDD performance by using SSD as a read cache

Concept

Using SSD as Read cache by storing read-only files by host cache control (own device driver).
Taking advantages of faster transfer rate and seek-less (SSD), and better data longevity (HDD).



Performance Simulation (vs HDD)

Boost Up!

PC Booting Time
50~60% Fast

Multitasking Time *
8x ~ 10x Fast

Game Loading Time **
2x Fast

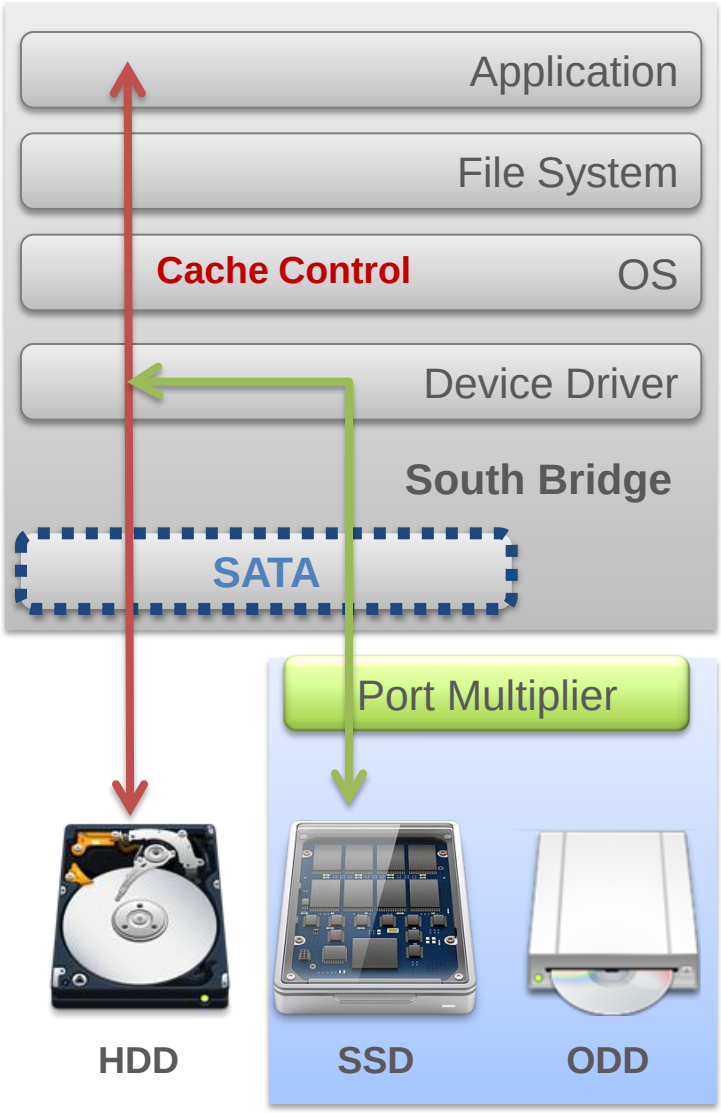
SSD Caching Solution: HDD Booster

What is HDD Booster?

To speed up HDD performance by using SSD as a read cache managed by HLDS own device driver

What is the user benefit?

Faster PC booting time, multitasking, game loading by just changing ODD to HyDrive



HDD Booster Performance Comparison

Time Checking Benchmark Test

Testing Criteria

Booting : Shutting Down the system and reboot

Multitasking : Launch 10 programs simultaneously

Game Loading: Launch a heavy game

Testing Solutions

HLDS* Hybrid ODD with 8GB MLC NAND

HDD: Western Digital* 500GB 7200 rpm

SSD: Intel* V40 40GB

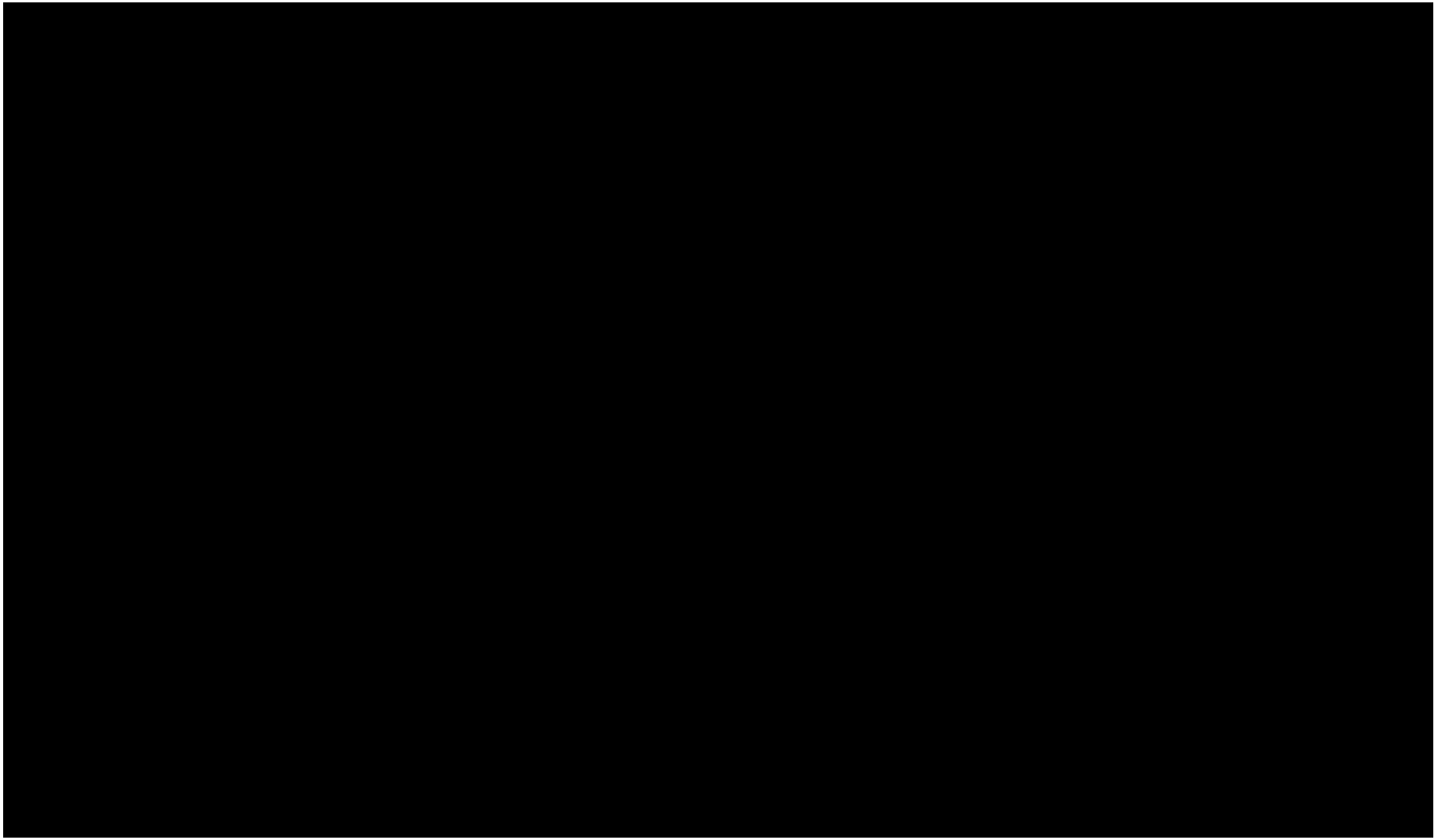
40GB SSD + Western Digital* 500GB 7200 rpm + Smart Response

Seagate Momentus XT* 320GB

Test conditions – DT PC

PC	INTEL Z68
CPU	Intel Core i5 520M 2.4GHz
Memory	8GB
HDD	Western Digital 500G 7200rpm
SSD	Intel V40 40GB
AHCI Driver	v.10.1.0.1008
HDD Booster	v.0.0.5.1

HDD Booster Performance Comparison Booting

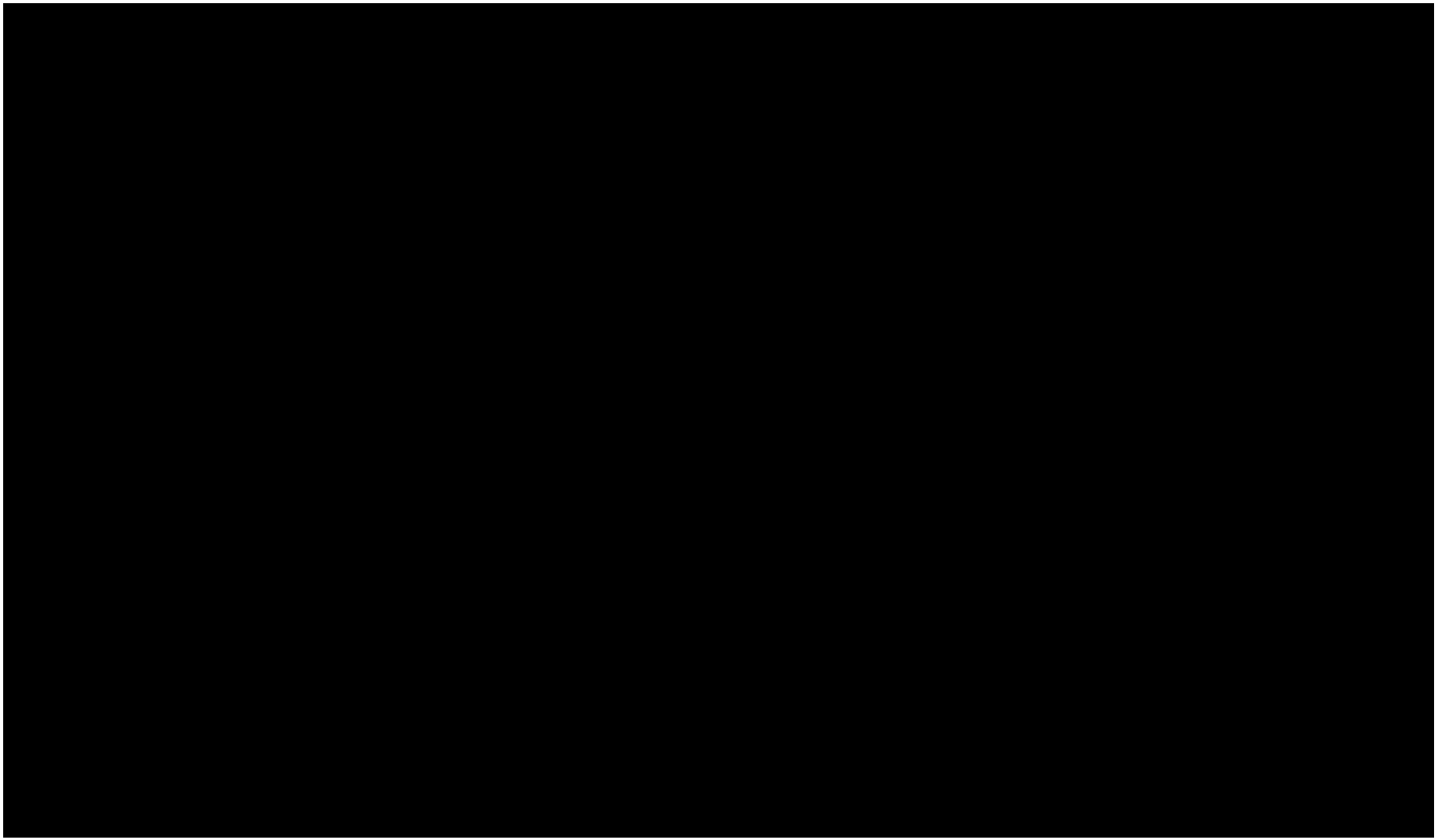


DEMO MOVIE: http://www.youtube.com/watch?v=mfxSBGw7wbU

HDD Booster Performance Comparison Multitasking

DEMO MOVIE: http://www.youtube.com/watch?v=mfxSBGw7wbU

HDD Booster Performance Comparison
Game Loading



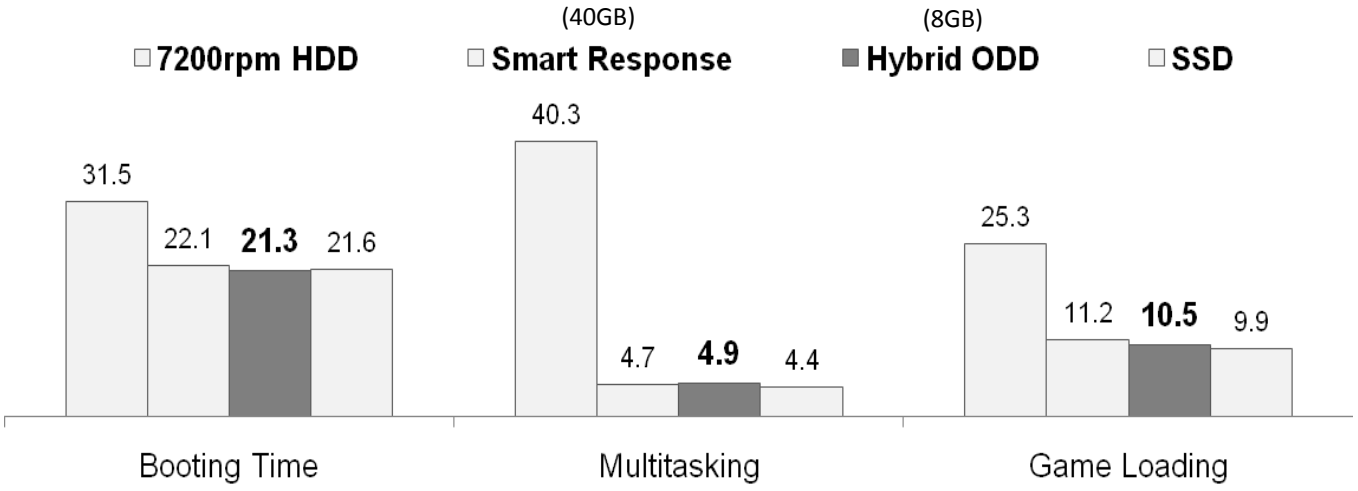
DEMO MOVIE: http://www.youtube.com/watch?v=mfxSBGw7wbU

HDD Booster Performance Result

Hybrid ODD with “HDD Booster (8GB)”

Offers cost competitiveness with the same performance level as SSD and other caching solutions

Time Checking Benchmark TEST



Unit : sec

Test conditions – DT PC

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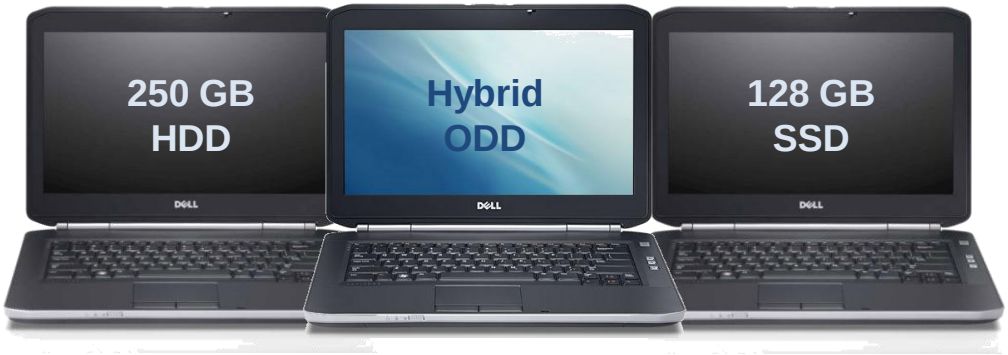
Price Simulation with Hybrid ODD



Processer	Intel® C (2.1GH	Processer	Intel® Core™ i3-2310M (2.1GHz, 3M Cache)	Intel® Core™ i3-2310M (2.1GHz, 3M Cache)
OS	Windows® 7 H	OS	Windows® 7 Home Premium 32-bit	Windows® 7 Home Premium 32-bit
Memory	2GB (1x DD	Memory	2GB (1x2GB) 1333MHz DDR3 SDRAM	2GB (1x2GB) 1333MHz DDR3 SDRAM
Display	14.0" HD	Display	14.0" HD (1366x768) LED	14.0" HD (1366x768) LED
ODD	8X DV	ODD	8X DVD+/-RW Hybrid ODD with 8GB SSD	8X DVD+/-RW Drive
HDD	250GB	HDD	250GB 5400RPM HDD	128GB Solid State Drive
Graphic	Intel ® H	Graphic	Intel ® HD Graphic 3000	Intel ® HD Graphic 3000
Battery	6 Cell (	Battery	6 Cell (60Wh) Battery	6 Cell (60Wh) Battery
Network Solution	Dell W (802.11	Network Solution	Dell Wireless™ 1501 (802.11 b/g/n) mini card	Dell Wireless™ 1501 (802.11 b/g/n) mini card
Retail Price		Retail Price	$1,253	$ 1,623

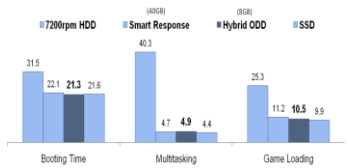
[Note]
• The prices of Dell Latitude E5420* are quoted from dell on-line shop on 2011 July 28
http://www.dell.com/kr/business/p/latitude-e5420/pd?refid=latitude-e5420&baynote_bnrank=0&baynote_irrank=9&~ck=dellSearch
• The price of Hybrid ODD is simulated

Hybrid SSD Value Proposition in Laptop

High Capacity

Space Saving

Faster Performance



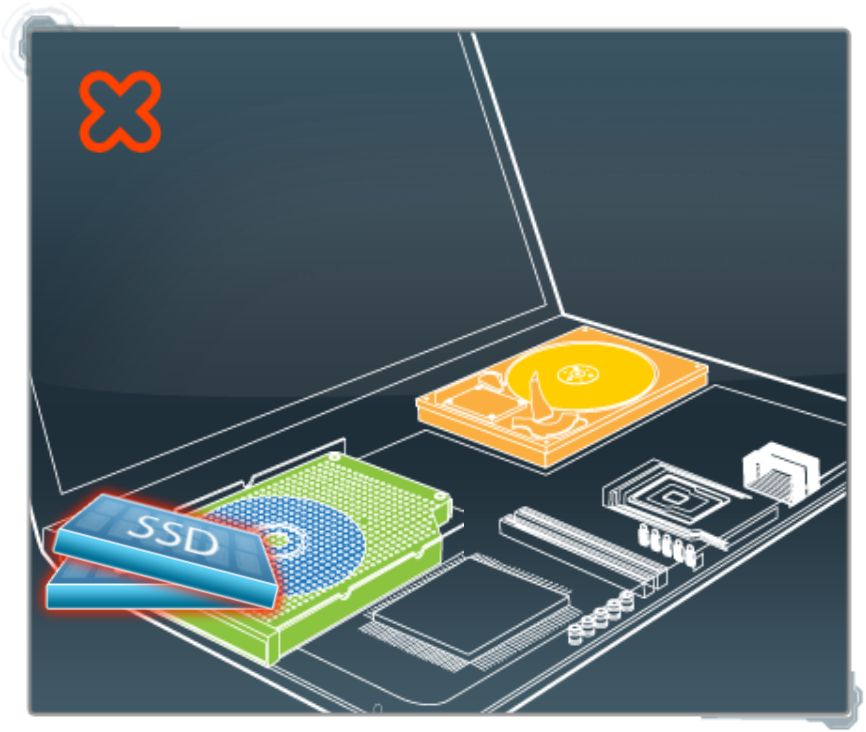
SSD Like Performance

Hybrid SSD Value Proposition in Laptop

Current Laptop

(2 Spindle based on standard laptop form factor)

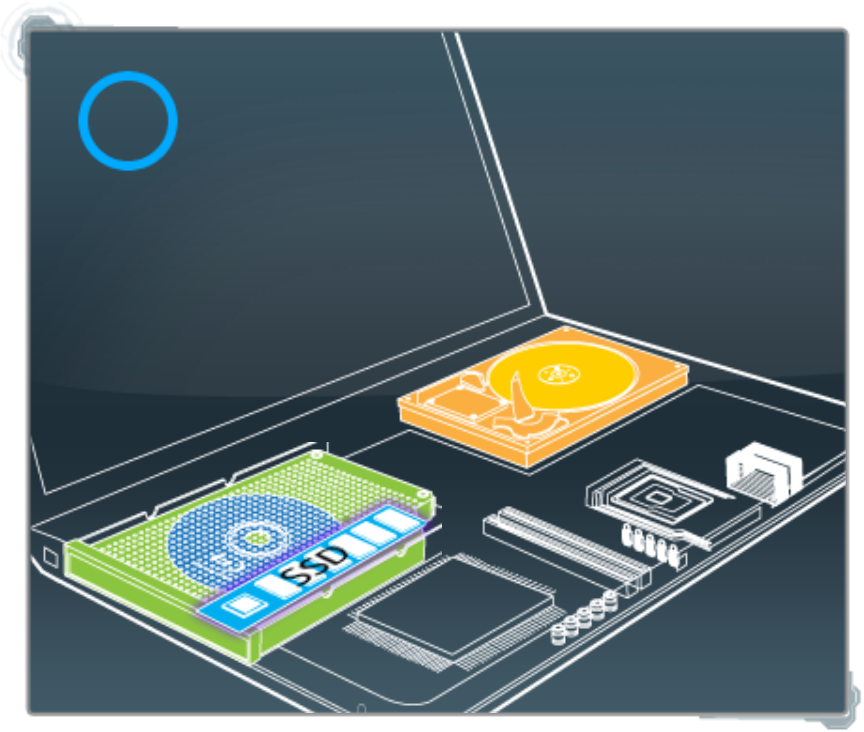
Couldn't take SSD in compact size,
then limited to performance enhancement



Newly created 3Spindle Laptop

(with Hybrid SSD)

Hybrid SSD makes it possible to integrate 3 storage

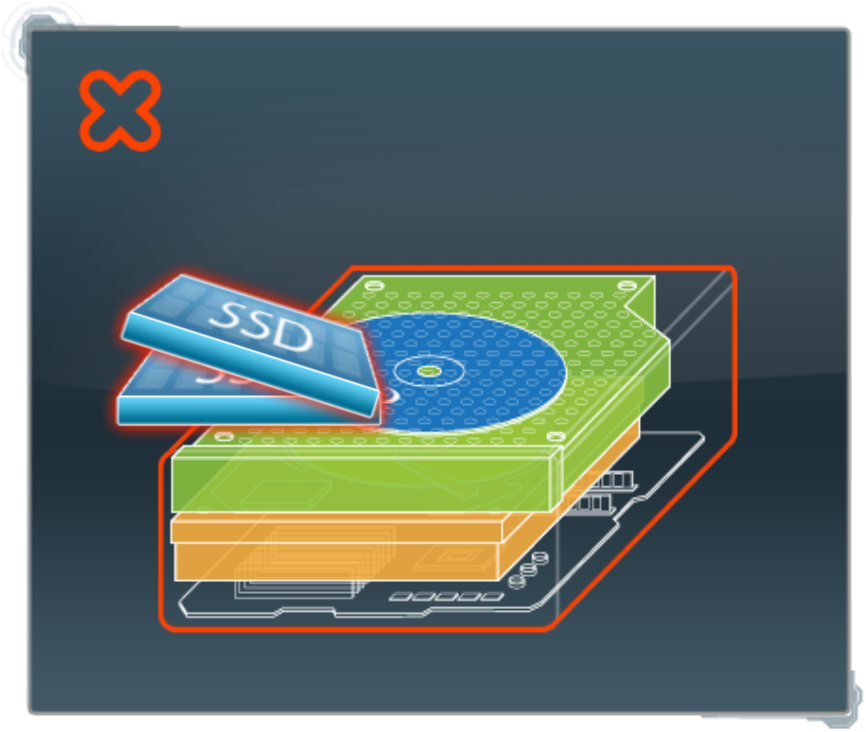


Hybrid SSD Value Proposition in Desktop

Current Mini PC

(2 Spindle ; HDD+ODD, on mini ITX form factor)

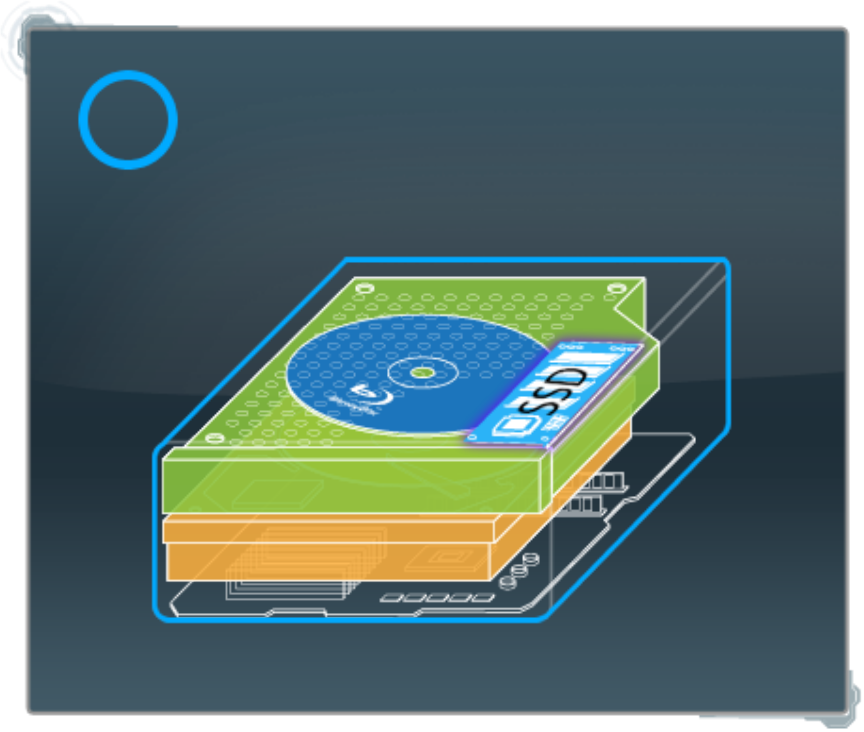
Couldn't take SSD in compact size,
then limited to performance enhancement



Newly created 3Spindle Mini PC

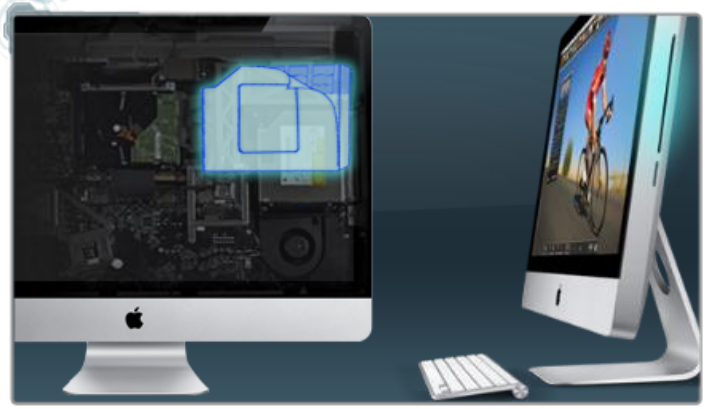
(with Hybrid SSD)

Hybrid SSD makes it possible to integrate 3 storage

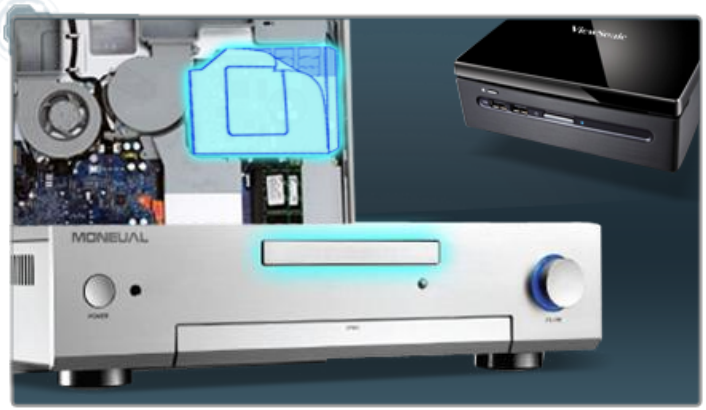


Hybrid SSD Value Proposition in Application

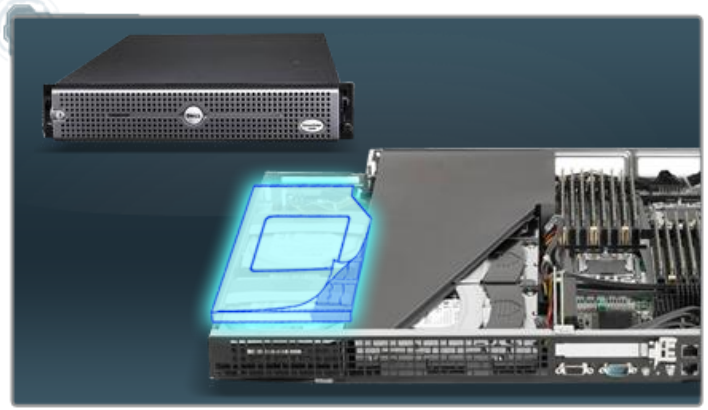
All-in-One PC



HTPC



Server



Hybrid SSD Value Proposition in Application

Notebook

BD Netbook

Thin Client

Tablet PC/Reader

Thank you

For Any Questions;
Please contact Bob Chang / NOVACHIPS Co., Ltd.

Email: bobchang@novachips.com