Hyperscale Customers Scale Up Performance without Scale-out Costs
The Holy Grail Of Hyperscale

Fusion ioMemory™ ioScale® solution gives hyperscale companies the ability to scale performance without the infrastructure and operating costs associated with conventional hard disk and SSD-based systems. Based on the same technology used in the Fusion ioMemory® ioDrive product, its low-latency design gives hyperscale companies’ customers a consistent high-performance experience. At the same time, reliability features like Adaptive Flashback® increase server uptime and reduce failure points within servers, reducing maintenance costs. In addition, Fusion ioMemory ioScale is purpose-built for hyperscale environments, delivers 410GB to 3.2TB of flash memory.

Real-World Customers With Real-World Results

This document provides examples of SanDisk® hyperscale customers who have used Fusion ioMemory solutions to increase performance, while shrinking their data center footprint and infrastructure costs. For example:

• BrainPad shrank its pay-per-click system footprint by 50%, while speeding data analytics processing 29X.

• Pandora reduced its caching tier footprint by 40% and increased server workload capability 7-8X.

• Rakuten slashed its search footprint by over half. The solution costs $4 million less than the closest competitive bid.

• Dwango achieved a 4:1 footprint consolidation and eliminated 1600 disk node maintenance and failure points.

• CyberAgent reduced its footprint by more than half, while realizing an immediate 100% ROI over the cost of a minimal upgrade to its previous system.

• Drecom realized 4:1 server consolidation, while completely eliminating service interruptions that used to affect users.

• Mixi reduced the number of servers in its database tier 10:1, from several hundred to a few dozen, and still improved overall database performance.

25 years of storage innovation

At SanDisk®, we’re expanding the possibilities of data storage. For more than 25 years, SanDisk’s ideas have helped transform the industry, delivering next generation storage solutions for consumers and businesses around the globe.

The performance results discussed herein are based on internal testing of Fusion ioMemory products. Results and performance may vary according to configurations and systems, including drive capacity, system architecture and applications.

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The Company
BrainPad, Inc. provides Web-based data mining, business analytics, operational research, and mathematical solutions for businesses.

The Challenge
Design an easier to maintain system, while also increasing analysis processing speeds and database response times for data sets too large to cost-effectively hold in memory.

The Fusion ioMemory™ Solution

50% smaller pay-per-click system footprint

33% smaller product recommendation system footprint

29x faster aggregate data analysis

30x product recommendation batch jobs

Software
- Business Intelligence Consumer
- L2Mixer™ Pay-per-click Application
- PostgreSQL 9.0.4
- EXT3
- CentOS 5 64-bit
- VSL®
- Fusion ioMemory Solutions

Infrastructure

System Before

System After

3 x ioDrive Duo 1.28TB card

“The ioDrive® cards improved performance so much that we can now meet the most demanding customer SLAs.”
Tsuyoshi Inoue,
Chief Engineering Architect
BrainPad, Inc.
“Our total frequently accessed music cache now holds 10 times the songs it used to, which both enhances existing user experience and gives us plenty of headroom for future growth.”

Aaron Porter,
Director of System Administration
Pandora

The Company

Pandora is personalized radio, combining the attributes of “original” radio and magnifying them with a combination of proprietary personalization technology and Internet technology—enabling a level of personalization and discovery for each and every individual.

The Challenge

Expand cache capacity to deliver seamless customer experience, while slowing scale out to minimize hardware costs and maintenance.

The Fusion ioMemory™ Solution

40% smaller server footprint

OPEN SYSTEMS
work with existing VARs and Resellers

10x more cache per server

7x workload capability per server

Software

<table>
<thead>
<tr>
<th>Pandora End Customers</th>
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</thead>
<tbody>
<tr>
<td>Caching Application</td>
<td></td>
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<tr>
<td>EXT4</td>
<td></td>
</tr>
<tr>
<td>Debian Linux</td>
<td></td>
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<tr>
<td>VSL®</td>
<td></td>
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<tr>
<td>Fusion ioMemory Solutions</td>
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Infrastructure

<table>
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<tr>
<th>System Before</th>
<th>System After</th>
<th>40% Consolidation</th>
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The performance results discussed herein are based on internal Pandora testing and use of Fusion ioMemory products. Results and performance may vary according to configurations and systems, including drive capacity, system architecture and applications.

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The Company

Rakuten is an innovative full-line Internet services organization that operates one of the largest online shopping sites in the world. It needed to maintain acceptable performance levels for its search platform, even as transaction numbers grew daily.

The Challenge

Reduce scale-out search system’s hardware, space, power, and maintenance costs without sacrificing performance.

The Fusion ioMemory™ Solution

6x performance density

1/2 hardware, rack space, and power and cooling costs

$4 million less than closest competitive bid

Software

<table>
<thead>
<tr>
<th>Customers Searching Products</th>
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</thead>
<tbody>
<tr>
<td>Microsoft FAST ESP</td>
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<tr>
<td>Microsoft SQL Server</td>
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<tr>
<td>NFTS</td>
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<tr>
<td>Windows (Unknown)</td>
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<tr>
<td>VSL®</td>
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<tr>
<td>Fusion ioMemory Solutions</td>
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</tbody>
</table>

Infrastructure

<table>
<thead>
<tr>
<th>System Before</th>
<th>System After</th>
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</table>

“Fusion ioMemory™ completely freed our search platform from the I/O bottleneck. Now, adding processing power and improving application queries will produce real results.”

IT Professional, Rakuten
The Company
Dwango’s Co. Ltd.’s Nico-Nico Douga service is a popular Japanese video-sharing site with 1.5 million paid subscribers and over 26 million registered users. It is one of the most visited websites in Japan.

The Challenge
Consolidate the hardware footprint of its caching tier to cut costs, while maintaining a good user experience.

The Fusion ioMemory™ Solution

ELIMINATED
1600 disk-node maintenance and failure points

4:1 server consolidation

Business intelligence job times reduced from
DAYS TO HOURS

Tetsuya Sato,
Infrastructure Manager
Nico-Nico Douga, Dwango

“SanDisk® has made what we once thought impossible a reality. The ioDrive® cards have become a major contributor to a paradigm shift to support Dwango’s next level of growth.”

"Software"

Online Video Viewers
Video-serving Application
Various Open Source Databases
Various File Systems
Various Open Source Operating Systems
VSL®
Fusion ioMemory Solutions

"Infrastructure"

<table>
<thead>
<tr>
<th>System Before</th>
<th>System After</th>
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<tr>
<td></td>
<td>2 x ioDrive cards 1.28TB per server</td>
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The Company
CyberAgent is one of Japan’s largest Internet and media companies. It maintains a social network platform called Ameba, which hosts its popular Metaverse game, called “Ameba Pigg,” where users create an avatar and live a virtual life.

The Challenge
Expand cache capacity to deliver seamless customer experience, while slowing scale out to minimize hardware costs and maintenance.

The Fusion ioMemory™ Solution

2:1 rack space consolidation

PREDICTABLE and linearly scalable performance

2x more performance from 8 servers than previous 96 server system

100% ROI immediately, on savings over minimal upgrade

Software

| Ameba Pigg Gamer | Ameba Pigg Application | CyberAgent KVS DB | MySQL 5.0 for KVS Data Store | EXT3 | CentOS 5.4 64-bit | VSL® | Fusion ioMemory Solutions |

Infrastructure

System Before

| 96 x custom-built servers | 36 U |

System After

| Master | Slave | Multiple Master Configuration |

96 x custom-built servers

The performance results discussed herein are based on internal CyberAgent testing and use of Fusion ioMemory products. Results and performance may vary according to configurations and systems, including drive capacity, system architecture and applications.

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The Company
Drecom, an entertainment Web services provider, is the leading supplier of social gaming applications for mobile devices in Japan.

The Challenge
Maintain high performance to ensure user retention, while consolidating servers to reduce costs. Improve replication speeds to increase availability.

The Fusion ioMemory™ Solution

2:1 server consolidation

20x faster update queries

ELIMINATED service interruptions to end users, even under heavy traffic

“The ioDrive® performance greatly lowered response times, which really improves the end-user experience. It also scales very well, so users no longer get ‘server busy’ messages when traffic is high or a game gets popular. We have plenty of headroom to continue adding new applications.”

Yusuke Saito,
IT Architect, Drecom

Software

| Mobile Social Network Gamer |
| Mobile Social Networking Games |
| MySQL 5.5 |
| EXT4 |
| Debian Linux 6.0 |
| VSL* |
| Fusion ioMemory Solutions |

Infrastructure

System Before

MySQL Master
MySQL Slave
MySQL Backup

System After

The performance results discussed herein are based on internal Drecom testing and use of Fusion ioMemory products. Results and performance may vary according to configurations and systems, including drive capacity, system architecture and applications.
The Company
mixi, Inc. (pronounced “Mikushi”) is Japan’s largest social networking site, with over 26 million users. Operating since 2004, it has pioneered a space that now includes companies like Facebook.

The Challenge
Reduce database tier’s capital and operating costs, while eliminating service interruptions for end users.

The Fusion ioMemory™ Solution

10:1 server consolidation

75% reduction in floor space costs

80% lower power and cooling costs

“We reduced the number of servers in our system to 1/10th, from several hundred to a few dozen. Even with such significant consolidation, the overall database system speed increased.”

Yoshitaka Yabusaki, Application Operation Group Chief, mixi Inc.