インテル® Cache Acceleration Software (CAS)
NSG Storage Software

March 2015

Non-Volatile Memory Solutions Group

Legal Disclaimers

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.

Relative performance is calculated by assigning a baseline value of 1.0 to one benchmark result, and then dividing the actual benchmark result for the baseline platform into each of the specific benchmark results of each of the other platforms, and assigning them a relative performance number that correlates with the performance improvements reported.

SPEC, SPECint, SPECfp, SPECrate, SPECjbb, SPECvirt_sc, and SPECpower_ssj are trademarks of the Standard Performance Evaluation Corporation. See http://www.spec.org for more information.

Results have been estimated based on internal Intel analysis and are provided for informational purposes only. Any difference in system hardware or software design or configuration may affect actual performance.

Results have been simulated and are provided for informational purposes only. Results were derived using simulations run on an architecture simulator or model. Any difference in system hardware or software design or configuration may affect actual performance.

Intel does not control or audit the design or implementation of third party benchmarks or Web sites referenced in this document. Intel encourages all of its customers to visit the referenced Web sites or others where similar performance benchmarks are reported and confirm whether the referenced benchmarks are accurate and reflect performance of systems available for purchase.

Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. For more information, see Intel® Advanced Encryption Standard Instructions (AES-NI)

Intel® Hyper-Threading Technology Available on select Intel® Xeon® processors. Requires an Intel® HT Technology-enabled system. Consult your PC manufacturer. Performance will vary depending on the specific hardware and software used. For more information including details on which processors support HT Technology, visit http://www.intel.com/info/hyperthreading.

Intel® Turbo Boost Technology requires a Platform with a processor with Intel Turbo Boost Technology capability. Intel Turbo Boost Technology performance varies depending on hardware, software and overall system configuration. Check with your platform manufacturer on whether your system delivers Intel Turbo Boost Technology. For more information, see http://www.intel.com/technology/turboboost

No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer system with Intel® Virtualization Technology, an Intel TXT-enabled processor, chipset, BIOS, Authenticated Code Modules and an Intel TXT-compatible measured launched environment (MLE). Intel TXT also requires the system to contain a TPM v1.s. For more information, visit http://www.intel.com/technology/security. In addition, Intel TXT requires that the original equipment manufacturer provides TPM functionality, which requires a TPM-supported BIOS. TPM functionality must be initialized and may not be available in all countries.

Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, and virtual machine monitor (VMM). Functionality, performance or other benefits will vary depending on hardware and software configurations. Software applications may not be compatible with all operating systems. Consult your PC manufacturer. For more information, visit http://www.intel.com/go/virtualization.

Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor series, not across different processor sequences. See http://www.intel.com/products/processor_number for details. Intel products are not intended for use in medical, life saving, life sustaining, critical control or safety systems, or in nuclear facility applications. All dates and products specified are for planning purposes only and are subject to change without notice

Intel product plans in this presentation do not constitute Intel plan of record product roadmaps. Please contact your Intel representative to obtain Intel's current plan of record product roadmaps.

Non-Volatile Memory Solutions Group

インテル® Cache Acceleration Software & インテル® Data Center SSD

インテル® Data Center
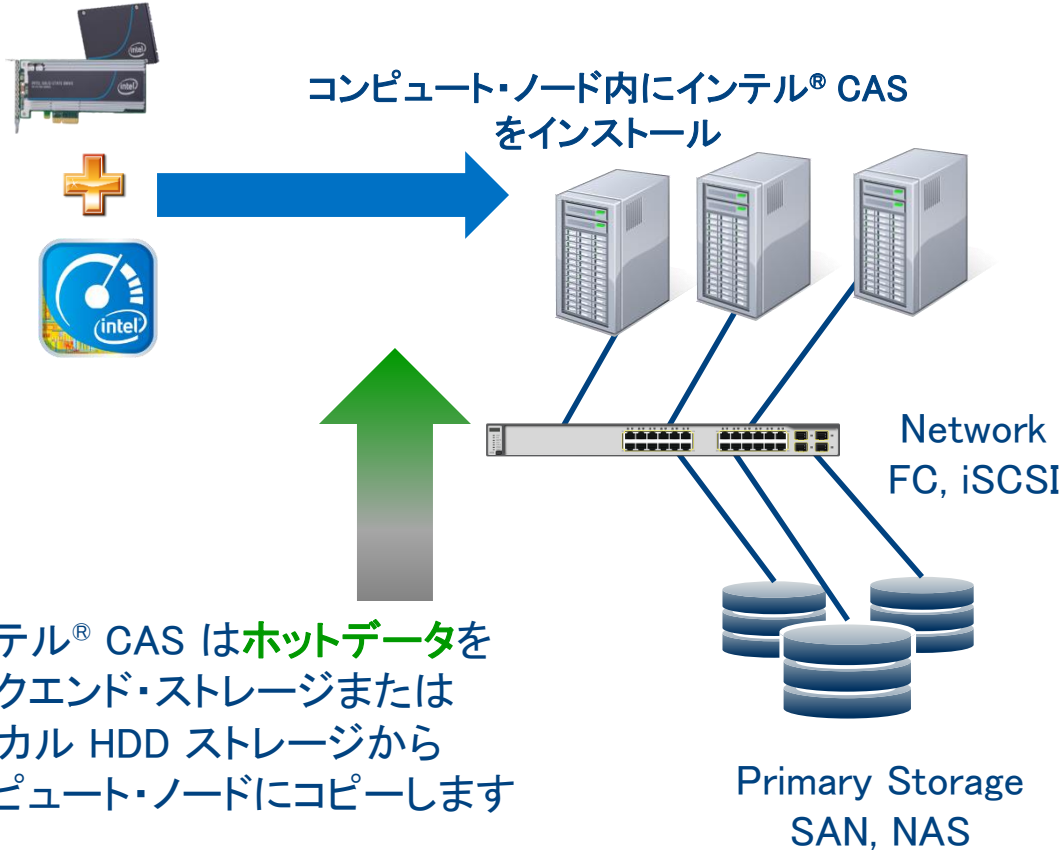SSD P3700/P3600

インテル® Cache Acceleration
Software（CAS）

データセンターを高速化... 既存のアプリケーション, SAN, または NAS の変更は必要ありません
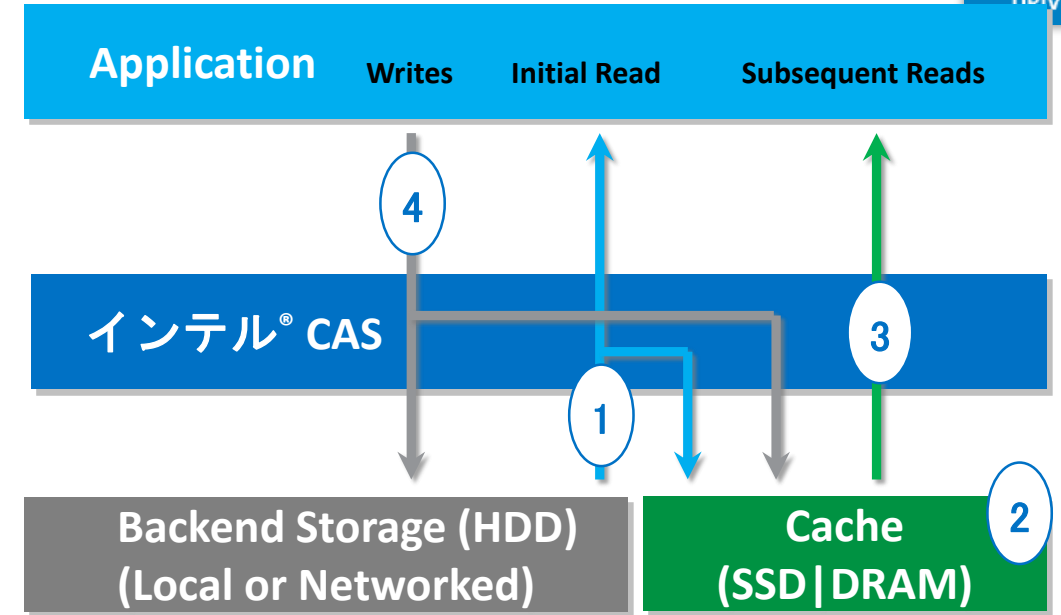
インテル® Cache Acceleration Software (CAS) 概要

使用例

コンピュート・ノード内にインテル® CAS をインストール

Network
FC, iSCSI

Primary Storage
SAN, NAS

インテル® CAS は**ホットデータ**を
バックエンド・ストレージまたは
ローカル HDD ストレージから
コンピュート・ノードにコピーします

既存のアプリケーションを高速化
(データベース, 分析ツール, 仮想化, …)

ソフトウェア アーキテクチャ

Application Writes Initial Read Subsequent Reads

インテル® CAS

**Backend Storage (HDD)
(Local or Networked)**

**Cache
(SSD|DRAM)**

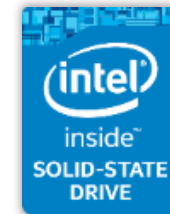1. 最初の読み込みでは、データをバックエンド・ストレージから読み込み SSD のキャッシュにコピーします
2. 次の読み込みでは、データを DRAM システムメモリーへ移動します
3. 以降の読み込みでは、ハイ・パフォーマンスな DRAM や SSD スピードで返す
4. すべてのデータをバックエンド・ストレージとキャッシュの両方に同期化して書き込み

intel
inside™
SOLID-STATE
DRIVE

インテル® CAS の使用例

データベース　　特定のデータベース、テーブル、またはデータファイルをキャッシュ

仮想化　　キャッシュデバイスとして SSD を使用して IT インフラを拡大（VMware と Hyper-V）
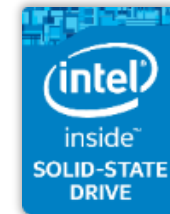
**ホスティング &
クラウド**　　特定のホスト・アプリケーションを高速化

ビッグデータ　　キャッシュレイヤとして SSD を追加してビッグデータ、分析ツール、Hadoop* ワークロードを高速化

*Other names and brands are property of their respective owners
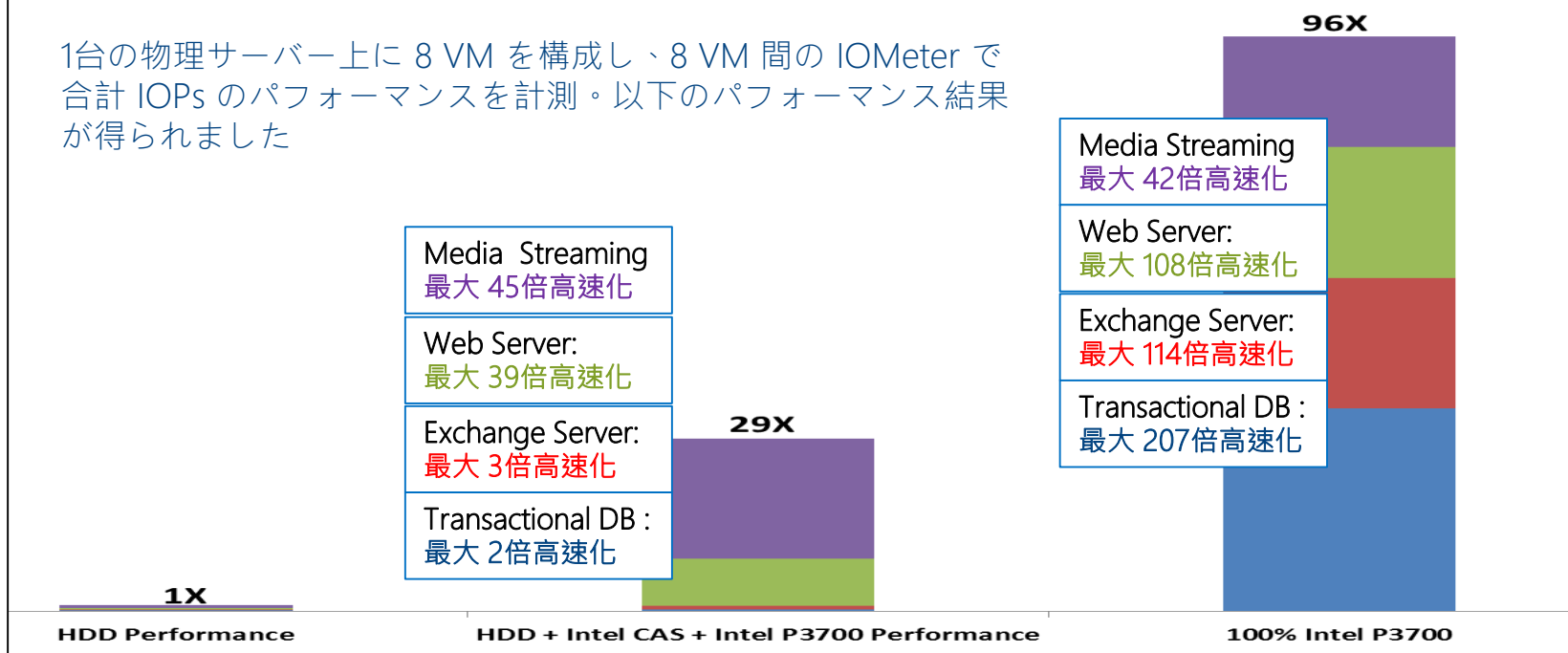
VMware* 5.5 と NVMe サーバーの仮想化

キャッシュ ドライブとして インテル® CAS & インテル® P3700 SSD の利点: 複数の仮想化のワークロードのパフォーマンスを向上

VMware* 5.5 Performance: Intel® CAS and Intel® P3700

■ 4K OLTP ■ Exchange 2010 data (EDB) ■ Web Server ■ Windows Media Player

1台の物理サーバー上に 8 VM を構成し、8 VM 間の IOMeter で合計 IOPs のパフォーマンスを計測。以下のパフォーマンス結果が得られました

Media Streaming
最大 45倍高速化

Web Server:
最大 39倍高速化

Exchange Server:
最大 3倍高速化

Transactional DB :
最大 2倍高速化

Media Streaming
最大 42倍高速化

Web Server:
最大 108倍高速化

Exchange Server:
最大 114倍高速化

Transactional DB :
最大 207倍高速化

96X

29X

1X

HDD Performance

HDD + Intel CAS + Intel P3700 Performance

100% Intel P3700

テクノロジー・デモンストレーション: インテル® P3700 NVMe SSD キャッシュデバイスとインテル® CAS を使用してストレージ & I/O インテンシブ ワークロードを高速化

Intel technologies may require enabled hardware, specific software, or services activation. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as IOMeter, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.
*Other names and brands may be claimed as the property of others

Non-Volatile Memory Solutions Group

すべてのテストで共通の構成項目:
Dual Intel® Xeon E5-2680 @ 2.70GHz, 96GB DDR3,
Vmware 5.5*, Intel® 2600 GZ Server
合計 8 VM :
Microsoft Server 2008R2, 8GB DDR3, 2 Cores
VM の起動ワークロード:
  2 x 4K OLTP (100% random, 67% Rd/ 33% Wr, 4K),
  2 x Exchange 2010-EDB (32K:90%/73%read,   32K:7%/100%read, 32K:3%/100%write)
  2 x Web Server (100% Random, 100% Read, 4K:43%, 8K:30%,
      16K:4%,32K:9%,64K:10%,128K:2%,512K:2%)
  2 x Windows Media Player (100% Seq, 100% Read, 32K)

構成 1- ベースライン HDDs
Seagate 1TB SATA 7.2K RPM HDD for OS & App
LSI MegaRAID SAS 9271-8i HBA, Driver: 6.705.5.0
8ea Seagate 146GB 15K RPM SAS in RAID 5 for Data

構成 2 – HDDs + Intel CAS with Intel SSD
Seagate 1TB SATA 7.2K RPM HDD for OS & App
LSI MegaRAID SAS 9271-8i HBA, Driver: 6.705.5.0
8ea Seagate 146GB 15K RPM SAS in RAID 5 for Data
Intel P3700-800GB NVMe SSD as Caching Device
Intel CAS Linux release 2.6.0 (WT-RO) caching IOBW.tst file

構成 3 – Intel PS3700 SSD
Seagate 1TB SATA 7.2K RPM HDD for OS & App
Intel P3700-800GB NVMEe SSD for Data , not utilizing 8ea
Seagate 15K RPM drives/LSI MegaRAID HBA

Intel 社にて 10/31/2014 にデータを集計

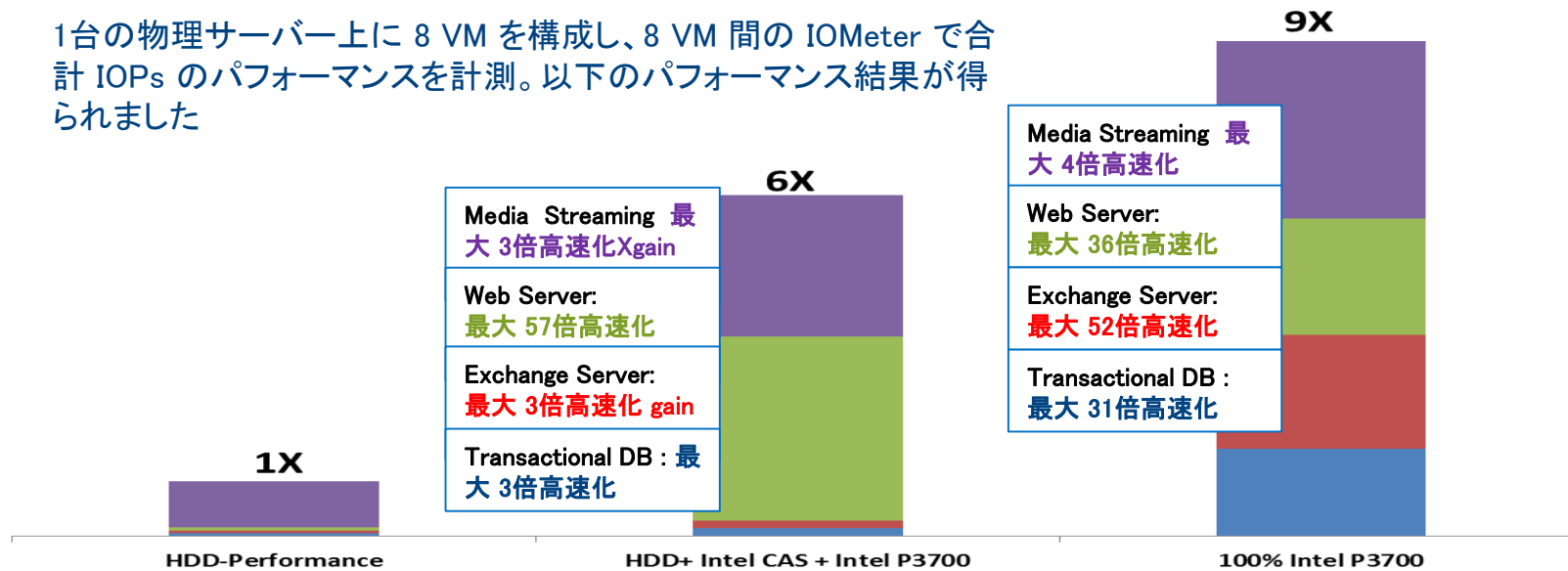# Microsoft* Hyper-V と NVMe サーバーの仮想化

キャッシュドライブとしてインテル® CAS & インテル® P3700 SSD の利点:
複数の仮想化のワークロードのパフォーマンスを向上

Microsoft® Hyper-V: Intel® CAS + Intel® P3700 Performance

- 4K OLTP
- Exchange 2010 data (EDB)
- Web Server
- Windows Media Player

1台の物理サーバー上に 8 VM を構成し、8 VM 間の IOMeter で合計 IOPs のパフォーマンスを計測。以下のパフォーマンス結果が得られました

6X

Media Streaming 最大 3倍高速化Xgain

Web Server: 最大 57倍高速化

Exchange Server: 最大 3倍高速化 gain

Transactional DB : 最大 3倍高速化

9X

Media Streaming 最大 4倍高速化

Web Server: 最大 36倍高速化

Exchange Server: 最大 52倍高速化

Transactional DB : 最大 31倍高速化

1X

HDD-Performance | HDD+ Intel CAS + Intel P3700 | 100% Intel P3700

すべてのテストで共通の構成項目:
Dual Intel® Xeon E5-2680 @ 2.70GHz, 96GB DDR3, Microsoft Hyper-V Server 2012R2, Intel® 2600 GZ
合計 8 VM:
Microsoft Server 2008R2, 8GB DDR3, 2 Cores
VMsの起動ワークロード:
- 2 x 4K OLTP (100% random, 67% Rd/ 33% Wr, 4K),
- 2 x Exchange 2010-EDB (32K:90%/73%read, 32K:7%/100%read, 32K:3%/100%write)
- 2 x Web Server (100% Random, 100% Read, 4K:43%, 8K:30%,16K:4%,32K:9%,64K:10%,128K:2%,512K:2%)
- 2 x Windows Media Player (100% Seq, 100% Read, 32K)

構成 1- ベースラインHDDs
Seagate 1TB SATA 7.2K RPM HDD for OS & App
LSI MegaRAID SAS 9271-8i HBA, Driver: 6.705.5.0
8ea Seagate 146GB 15K RPM SAS in RAID 5 for Data

構成 2 – HDDs + Intel CAS with Intel SSD
Seagate 1TB SATA 7.2K RPM HDD for OS & App
LSI MegaRAID SAS 9271-8i HBA, Driver: 6.705.5.0
8ea Seagate 146GB 15K RPM SAS in RAID 5 for Data
Intel P3700-800GB NVMe SSD as Caching Device
Intel CAS Linux release 2.6.0 (WT-RO) caching IOBW.tst file

構成 3 – Intel PS3700 SSD
Seagate 1TB SATA 7.2K RPM HDD for OS & App
Intel P3700-800GB NVMEe SSD for Data , not utilizing 8ea Seagate 15K RPM drives/LSI MegaRAID HBA

10/31/2014 にデータを集計

テクノロジー ・デモンストレーション: インテル® P3700 NVMe SSD キャッシュデバイスとインテル® CAS を使用してストレージ & I/O インテンシブ ワークロードを高速化

Non-Volatile Memory Solutions Group

Jetstress* と Exchange Server のワークロード

Microsoft Jetstress 2013 は Exchange Server のワークロードで、Microsoft Exchange をシミュレーションします

キャッシュドライブとしてインテル® CAS & インテル® P3700 SSD の利点:
より短時間で Microsoft Office Exchange Server Transactions を増加

Microsoft Jetstress 2013 Exchange Workload: I/O Transactions GAIN

- HDD: 1x
- Intel® CAS + Intel P3700: 12x
- All Intel® P3700: 18x

Microsoft Jetstress 2013 Exchange Workload: Read Latency Reductions

- HDD: (baseline)
- Intel® CAS + Intel P3700: 6x
- All Intel® P3700: 12x

すべてのテストで共通の構成項目:
Dual Intel® Xeon E5-2680 @ 2.70GHz, 32GB DDR3, Microsoft Server 2012R2, Intel® 2600 GZ, JetStress 2013 Exchange Server workloads, 1000Mailbox/200MB per mailbox, 197GB Database Size

構成 1- ベースライン HDDs
Seagate 1TB SATA 7.2K RPM HDD for OS & App
LSI MegaRAID SAS 9271-8i HBA, Driver: 6.705.5.0
4ea Seagate 146GB 15K RPM SAS in RAID 0 for Data

構成 2 - HDDs + Intel CAS with Intel SSD
Seagate 1TB SATA 7.2K RPM HDD for OS & App
LSI MegaRAID SAS 9271-8i HBA, Driver: 6.705.5.0
4ea Seagate 146GB 15K RPM SAS in RAID 0 for Data
Intel P3700-800GB NVMe SSD as Caching Device
Intel CAS Linux release 2.6.0 (WT-RO) caching IOBW.tst file

構成 3 - Intel PS3700 SSD
Seagate 1TB SATA 7.2K RPM HDD for OS & App
Intel P3700-800GB NVMEe SSD for used for Data, not utilizing 4ea Seagate 15K RPM drives/LSI MegaRaid HBA

10/31/2014 にデータを集計

Intel technologies may require enabled hardware, specific software, or services activation. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as JetStress 2013, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.
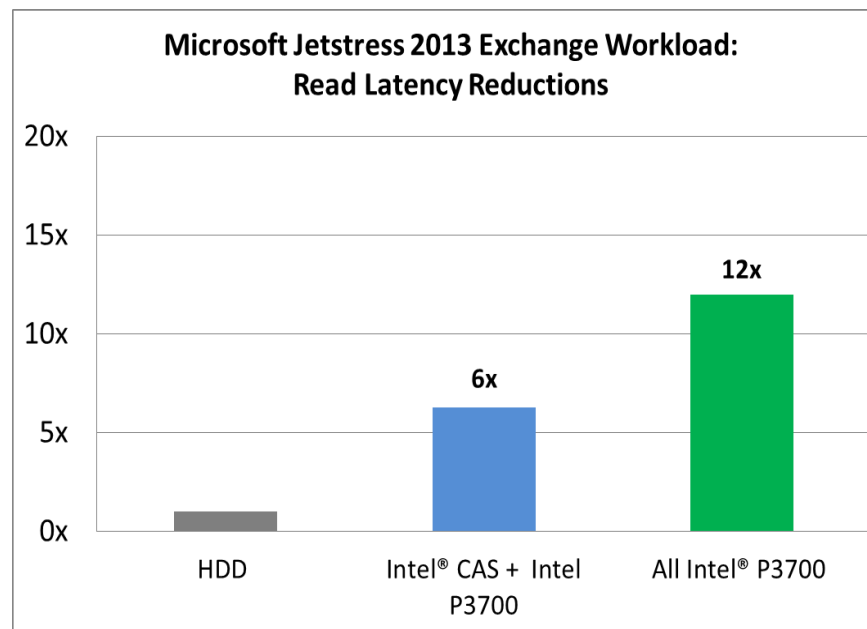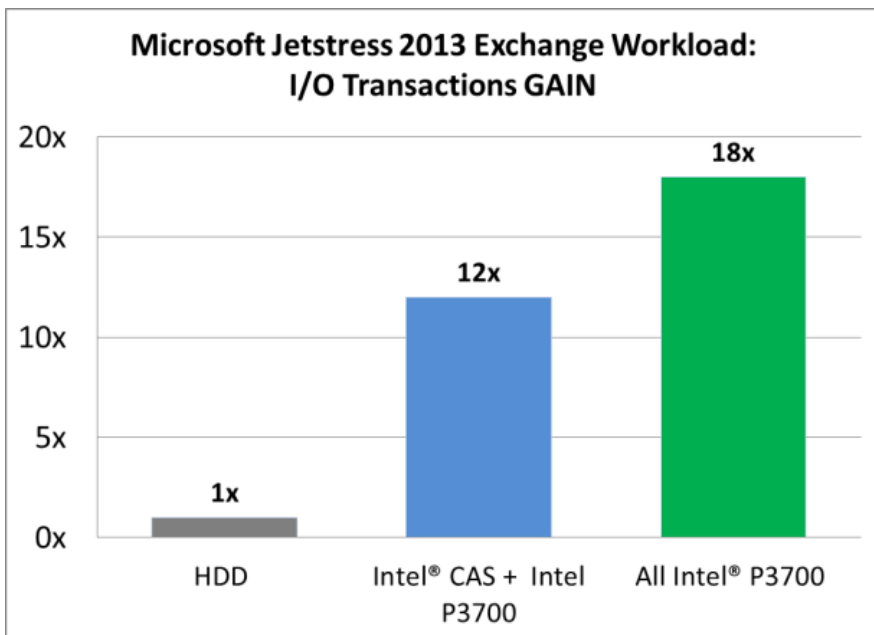 *Other names and brands may be claimed as the property of others

以下の Web サイトからリソースを入手可能です:

http://www.intel.com/content/www/us/en/software/intel-cache-acceleration-software-performance.html

Web サイトから入手可能なリソース:

ソフトウェア・ダウンロード:

- Intel® I/O Assessment Tool – How Intel® CAS can benefit you

- 30-Day Trial Software – Try Before You Buy

概要紹介ビデオ:

- Intel Caching Explained Animation

- Introduction to Intel® CAS

ケーススタディとブリーフノート:

- Accelerating Business Analytics with Intel ® CAS and Intel® Solid State Drives

- Accelerating Analysis and Simulation with Intel® CAS and Intel® Solid State Drives

- 3rd Party Performance Analysis Case Studies

- Intel® CAS Product Brief

- Intel® CAS Solution Brief