Why You Should Read This Document

This planning guide provides information to help you build the case for moving mission-critical workloads from legacy proprietary systems such as RISC/UNIX* to Intel® Xeon® processor-based solutions running Linux* or Windows* operating systems.

- A brief summary of evolving data center challenges that impact mission-critical workloads
- An overview of Intel server-based technology innovations that make Intel Xeon processor-based solutions an excellent choice for mission-critical computing environments
- Practical guidance for building the business case for the migration of targeted mission-critical workloads
- Steps for building a solid project plan for migration of mission-critical RISC/UNIX systems to modern, high-availability systems, including assessing the particular workload, conducting a proof of concept, and moving to production
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IT Imperatives: Deliver New Services Fast and Lower TCO

Today, IT is being asked to provide new services much faster, more cost-effectively, with better security to protect sensitive data, and with increased reliability. Budgets are often flat or, at best, modestly increased. For mission-critical workloads—those most important to the business—this has meant having to use valuable funds on high-uptime and high-availability solutions that run on expensive, closed-platform systems such as RISC/UNIX®. Without the required availability and performance, the cost benefits and lower total cost of ownership (TCO) of less-expensive, open-platform servers were out of reach.

In recent years, server innovations have made it possible to meet service level agreements (SLAs) for availability while reducing both capital and operational expenses. Aging proprietary systems—difficult and costly to maintain and upgrade—can now be migrated to more cost-effective, standardized Intel® Xeon® processor-based solutions running Linux® or Windows® operating systems. These newer systems combine lower costs with the performance and availability that IT needs to support mission-critical environments as well as implement key initiatives such as virtualization, cloud computing, and big data analytics. In addition, a wider ecosystem of mission-critical and business intelligence software is now available for x86 architecture.

Purpose of This Guide

While more and more systems are being considered mission critical (e-mail, SharePoint® servers, and so on), this planning guide focuses on the workloads that are the lifeblood of a company: those that require the highest uptime and shortest response time. This document provides IT managers with a practical approach to modernizing their data centers by evaluating and planning the migration of mission-critical systems to Intel® Xeon® processor-based solutions running Linux® or Windows® operating systems.

The Mission-Critical Migration Landscape

Many businesses today continue to run critical applications and store important data in legacy closed-platform silos. The acquisition cost of these systems has always been high, and customers typically are not able to choose hardware and software independently. Over time, ongoing operating costs have continued to escalate. Maintaining the hardware and applications—and finding skilled support resources to help manage SLAs—all contribute to these costs. More importantly, legacy environments may not align to long-term business strategies that call for highly flexible, scalable, and adaptable solutions running in a smaller, more efficient IT environment.

Intel Xeon processor-based solutions have been a viable alternative to proprietary systems such as RISC/UNIX for some time now. They offer the mission-critical capabilities and uptime required to run your most critical environments at a fraction of the cost of legacy systems. Moving mission-critical applications to one of the newer solutions based on x86 architecture provides a common compute platform for traditional enterprise applications, as well as for important initiatives such as cloud computing and big data analytics.

Multiple options exist for migrating your mission-critical applications from legacy servers to more modern, standardized solutions. Organizations have a choice of operating systems and a few key deployment models, including bare-metal solutions running Linux or Windows operating systems, a partially or fully virtualized environment, or direct cloud implementations.
Addressing Key IT Challenges

Intel Xeon processor family innovations combined with improvements in Linux and Windows operating systems fully support stringent mission-critical uptime and response-time requirements, and have done so for some time. These solution offerings enable IT managers to adopt a cost-effective strategy to support their mission-critical needs. They also offer a common compute platform to provide the flexibility to enable faster services delivery.

An increasing number of IT shops understand the benefits of migrating to Intel Xeon processor-based solutions running Linux or Windows operating systems, and are actively modernizing their enterprise environments to run on lower-cost industry-standard server solutions. For example, Madrid Health Service in Spain completely replaced its RISC architecture with Intel Xeon processor E7 family-based servers running the Red Hat Enterprise Linux operating system, gaining a one-year return on investment and a fivefold performance increase. In addition, the health service was able to optimize data center space and costs over the previous RISC systems by 80 percent.

Business and Technical Benefits

Moving mission-critical workloads from legacy systems to Intel Xeon processor-based solutions running Linux or Windows operating systems can reduce overall capital expenditures for servers, overall solution costs, and your data center footprint. The latest Intel Xeon processor-based systems also offer savings in operating expenses from reduced power consumption, cooling, and support costs.

Intel Xeon processor-based solutions running Linux or Windows software deliver fast ROI because of:

- High reliability, availability, and serviceability (RAS) features
- Efficiency, flexibility, and overall performance of software, hardware, and support options
- Far more affordable pricing structure based on volume economics

Even more important, decreased planned and unplanned downtime means that business stays up and running.

Technical benefits of migrating to x86 architecture include:

High performance. Large memory support, fast scan operations and transactional workload performance, and multi-core and multi-thread processing available in today’s Intel Xeon processors support the most data-demanding mission-critical applications. Intel Xeon processors also provide leadership per core performance, increased core counts, and support for four-socket and greater systems.

Highly reliable RAS features. The failure of a key business application can easily cost hundreds of thousands to millions of dollars an hour. Intel Run Sure Technology and other RAS capabilities available on the Intel Xeon processor E7 family are built into the silicon to keep mission-critical workloads delivering data and services. These capabilities are designed to increase uptime via diagnosis and recovery from system and memory management failures or errors.

Virtualization capabilities. IT managers are increasingly taking advantage of virtualization capabilities to improve system capacity and utilization. The ability to partition servers and set up virtual machines creates a significant opportunity for organizations to consolidate servers and workloads, creating a highly flexible configuration setup while maintaining better control over applications and databases. Partitioning and virtualization enable high utilization of resources and consolidation across processor, memory, and I/O and provide security, isolation, and sharing benefits.

Greater flexibility of the IT environment. Migration can greatly improve the flexibility of your IT environment, allowing IT managers to quickly adapt to short-term business demands. For example, a virtualized environment offers better load balancing, opportunities for application development and testing, speedy provisioning, and improved system maintenance. In addition, Intel architecture is built on open industry standards, giving businesses more hardware, software, and service options and enabling faster innovation and competitive pricing models.

Intel® Xeon® Processor E7 v3 Family: New Performance Leaps

As compared to previous-generation Intel® Xeon® processor E7 family-based servers:

- Up to 40 percent average performance gain for key workloads
- Up to 72 percent performance gain for analytics workloads
- Up to 6 times performance improvement for in-memory transactional workloads with new Intel Transactional Synchronization Extensions (Intel TSX) optimizations
- Up to 68 percent additional floating point operations with Intel Advanced Vector Extensions
- 2.0 (Intel AVX2) optimizations

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**Decreased data center footprint.** Fewer servers handling more workloads can help to reduce the overall data center footprint and reduce the energy required to keep them operating. By deploying on the latest Intel Xeon processors, organizations can realize significant savings in space, power, and cooling requirements.

**Common platform.** Migration to a common platform across workloads and deployment models can help reduce management overhead and improve the ability of IT managers to meet their SLAs, reduce operating costs, and focus on innovation instead of maintenance.

**Accelerating Innovation: Intel Processor-Based Mission-Critical Solutions**

Server innovations have made data center modernization even more attractive in recent years. This is due in part to the significant focus placed on supporting mission-critical computing across the solution stack. From the processor level to the application layer, Intel and its partners are working together to build ever more robust and interoperable mission-critical solutions that take advantage of the latest CPU performance, reliability, and scalability features.

In a survey of 200 IT managers in the United States, respondents have migrated, on average, half of their mission-critical data center infrastructure from RISC/UNIX systems to Intel Xeon processor-based systems running Linux or Windows operating systems.¹⁰

**Performance and price.** Ongoing performance improvements in the Intel Xeon processor continue to accelerate. Plus, the volume economics of Intel technology-based processors translate to measurable and remarkable improvements in price performance. Today, Intel Xeon processor E7 v3 family performance can help modernize your data center to reduce operational expenses and meet the demands of a growing business. Compared to a typical five-year-old installed base of servers, Intel Xeon processor E7 v3 family-based servers deliver up to 17 times the throughput at one-fifth the cost per virtual machine (VM)⁴,¹¹ and provide a 9:1 consolidation with a 23-month return on investment payback.⁴,¹²

**Partitioning (workload management).** The ability to partition servers offers considerable operational and cost advantages for mission-critical workloads. With partitioning, you have greater ability to consolidate servers, share or isolate resources as needed, merge production and test environments, or run integrated clusters. This means better resource utilization, faster deployments, more reliable services, and more flexible resource management.

**Uptime.** A strong commitment to and focus on RAS provides significant improvements at the silicon level. In fact, within the Intel Xeon processor E7 family, major features have been added in the last three processor generations, each leading to improvements in overall availability. Further, Intel has worked closely with its partner ecosystem to enable solutions to take advantage of CPU RAS features, resulting in significant advantages for mission-critical deployments.

The Intel Xeon processor E7 v3 family features Intel Run Sure Technology with resilient memory and system technologies such as self-healing. Solutions running on this latest Intel Xeon processor and running Linux or Windows operating systems are designed to reduce downtime by enabling continued operation in case of component failure.

**Data integrity and security.** Data encryption is an important way to protect data. Typically, performance penalties force IT managers to encrypt only the most important data. The Intel Xeon processor E7 family encourages pervasive encryption by reducing those associated performance penalties with Intel Data Protection Technology (with Advanced Encryption Standard New Instructions [AES-NI]).¹³ The latest release of this processor also has a digital random number generator for greater quality, performance, access, and security via Intel Data Protection Technology (with Secure Key).

**Operating system.** Linux capabilities make a strong case for moving mission-critical systems to Intel Xeon processor-based solutions running the Linux operating system. The Red Hat Enterprise Linux operating system includes scalability, security capabilities, mission-critical-level RAS, and energy efficiency features.¹⁴

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**Reliability Critical to Business**

The Intel® Xeon® processor E7 v3 family comes with Intel Run Sure Technology³ to deliver world-class availability and uptime. This technology:

- Enables the system to diagnose and recover from previously fatal errors
- Helps ensure data integrity within the memory subsystem, thus helping the system run reliably over a longer period of time and reducing the need for immediate service calls
**Database innovation and change.** Database technology innovations related to scale-up workloads and in-memory databases for mission-critical applications provide faster, better ways to manage data. Industry-leading mission-critical database and business intelligence solutions are available on Intel Xeon processors.

**Application.** Traditional mission-critical solutions are increasingly optimized to make use of the more modern standards-based solution stack. Examples include the availability of business management suites running on Intel Xeon processor-based servers from SAP, and billing and customer relationship management (CRM) solutions from leading telecom ISV Amdocs.

Additionally, major electronic medical records systems from vendors such as Epic and Cerner have optimized their solutions for modern x86 servers and operating systems.

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**In-Memory Databases for Scale-Up Workloads**

The Intel® Xeon® processor E7 v3 family includes these database innovations to accommodate scale-up workloads and in-memory databases:

- **Large memory capacity:**
  - Four- and eight-socket configurations with up to 1.5 terabytes (TB) of memory per socket for up to 6 TB or 12 TB of memory per server
  - Scalability up to 32+ socket systems by using a third-party (OEM) node controller
- **Support for both DDR4 and DDR3 synchronous dynamic random-access memory (SDRAM) for fast transfer rates to help run expanding workloads**
- **Exceptional performance for transactional workloads with Intel Transactional Synchronization Extensions (Intel TSX)² over previous-generation processors**
- **Accelerated scan operations with Intel Advanced Vector Extensions 2.0 (Intel AVX2)²**
- **Performance for single- and multi-threaded applications, including scale-up high-performance computing and technical applications**
- **Extra capacity and flexibility for storage and networking connections with integrated PCI Express® (PCIe®) 3.0 ports, which improves bandwidth and supports PCIe-based solid-state drives**
- **Forty advanced reliability, availability, and serviceability (RAS) features designed for 99.999 percent (five nines) uptime and improved data integrity for mission-critical analytics workloads, including Intel Run Sure Technology²**
- **Broad, open, industry-standards-based ecosystem of leading partners that offer solutions optimized to run on Intel architecture, including in-memory databases for advanced analytics, and transaction-intensive workloads such as enterprise resource planning (ERP), online transaction processing (OLTP), and customer relationship management (CRM)**
Build the Case for Migration: Eight Steps

Data center modernization, especially the migration of mission-critical systems to newer technologies, can be an ongoing, long-term series of projects. Building a strong case for migration, and continuing to showcase the advantages to IT and the business, is one of the most important aspects of a migration project. The following steps will help you create a solid business case for moving forward.

**Step 1: Understand and Align Goals**

There are many drivers for migrating from legacy deployments to Intel Xeon processor-based solutions. Identify your business and technical goals for your specific migration effort.

Things to consider:

- Are business units demanding faster and better service?
- In particular, are business units demanding new digital services that drive new data-driven insights?
- Do you need to:
  - Refresh aging infrastructure?
  - Improve performance?
  - Reduce space?
  - Standardize or virtualize your infrastructure?
  - Get the latest versions of database, operating system, or application software to take advantage of new mission-critical capabilities?
- Has your proprietary legacy system become increasingly costly to support? Are the existing servers fully depreciated?
- Are your hardware vendors making support for the infrastructure less of a priority due to the age of the technology?
- Can processes and resource utilization be improved with migration?
- Are you having difficulties finding skilled resources to staff maintenance for your aging infrastructure?
- What support do you need from your vendors as you modernize?

**Step 2: Define the Scope**

Identify the applications, servers, storage, networking, data centers, and other components that will be included in your migration. Keep it simple; the broader the scope, the greater the complexity. Broader scopes can be tackled as a series of prioritized subprojects.

**Step 3: Define Your Success Criteria**

Include key criteria—quantitative where possible—that are important for success. For example, your criteria could include reducing the TCO by a specific percentage, or handling a certain number of transactions per second within a specified average time.

**Step 4: Quantify and Track Business Value (ROI and TCO)**

Develop models to help you evaluate the potential return on and business value of your migration project. You can automate this process using applications off the shelf or as a service. These assessments provide you with the information you need in order to gain buy-in from project stakeholders.

Intel has used tools by Alinean to demonstrate the ROI from upgrading an existing RISC server infrastructure to Intel Itanium® or Intel Xeon processor-based servers. The tool also compares the TCO of a proposed Intel technology-based server solution with comparable new RISC-based alternatives. Results are created from a simulated customer environment plus industry research metrics and financial calculations contained in the Alinean* ROI Analyst* software.

**Step 5: Identify and Engage Stakeholders**

To ensure project success, it’s important to identify the stakeholders who can influence project objectives or the success of the outcomes. Bring them into the project as early as possible to learn their pain points, enlist their help in defining objectives, and agree on where the best opportunities for migration exist. This input and buy-in is crucial for helping gain the budgetary support to proceed.
Step 6: Assess Your Existing Environment and Understand the Workload

Perform a detailed assessment of your existing environment to determine migration requirements and identify potential risks. Take a balanced approach. Analyze your current situation carefully to ensure that no major requirements or risks are overlooked. In addition:

- Review and explore your existing solution documents, application options, and hardware options from your preferred vendor.
- Compile an equipment and application inventory of your existing environment. This can be done either manually or with licensed software that automatically discovers assets. Determine which existing hardware and software components you would like to continue using in the new environment.
- Determine your current hardware configuration and data capacity by partition.
  - Memory (size and usage)
  - CPUs (speeds and load profile, including virtual CPUs)
  - Network (number of links and speeds)
  - Required disk input/output performance (IOPs)
  - Storage requirements
- Create a profile of the application that will be migrated.
  - Memory (size and usage).
  - CPUs (speeds and load profile, including virtual CPUs).
  - Network (number of links and speeds).
  - Required IOPS.
  - Storage requirements.
- Is the application a modified commercial off-the-shelf (COTS) application?
- Does the application contain significant amounts of custom code developed specifically for the legacy operating system in combination with a COTS application?
- Is the application completely custom built for the company? Were modifications made to the operating system (usually to the libraries) to meet the requirements of the application?
- Is there an intent to rewrite the application or to purchase a COTS application to meet the functionality requirements?
- How is it being used, how does it operate, and what are the application dependencies and external linkages?
- What are the data sources, the data flow, the size of the data, and the application’s memory requirements? What is the peak number of concurrent users (not just the named users)?
- For custom applications, evaluate the size and complexity of the code. Do you have access to the source code, documentation, vendor libraries, and developer resources?
- Identify any middleware products in use.
- Assess the high-availability architecture. What tools and software are in use? What high-availability components will be migrated?
- Evaluate the data to be migrated. Will you be using the same database application or a new one? Is the data in binary format?
- Decide whether the deployment is a traditional enterprise app, virtualized, or via private cloud.
- How will provisioning and orchestration be handled?
- What security is in place to protect data, applications, platform, and infrastructure?
- Document critical solution requirements for storage, servers, the network, and SLAs.
  - What are your SLA requirements (by partition, if applicable), including the availability requirements?
  - What is the downtime that will be required for migration?
  - What are your response-time requirements?
- Consider backup and disaster recovery solutions, as well as the production environment.
- Assess the security environment of the existing solution. Understand how security is implemented so you can reimplement a similar solution or architect a new one. To ensure that the security is adequate, review security policy updates for the application and your organization.
**Step 7: Determine Feasibility and Identify Risk**

Based on all the information you have collected, assess the feasibility of your migration and identify potential risks:

- Is the migration feasible from a technical standpoint?
- Can you meet requirements for performance, scalability, reliability, availability, security, and data integrity?
- Do you have the experience and skill set available to conduct the migration on staff, or do you need to engage outside vendors to assist?
- Can you integrate the new solution efficiently into your operational environment?
- Do you have the stakeholder support and funding needed to complete the project?

**Step 8: Decide How to Proceed**

Revisit your TCO and ROI analyses to be sure they remain on track. Weigh the expected gains against the risks associated with the project to determine if it makes sense to proceed with your migration plan.

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**Success Stories: Mission-Critical Workloads and Intel® Xeon® Processor-Based Solutions**

As you develop your business case, consider how these companies benefited from moving mission-critical workloads to the latest Intel® Xeon® processor environments.

**Applied Innovations**

Web hosting services provider Applied Innovations moved to advanced processor architecture to launch its next generation of infrastructure-as-a-service (IaaS) offerings. Using the Intel Xeon processor E7-4890 v2 product family in four-socket servers running the Windows Server* 2012 R2 operating system with Hyper-V* technology enabled Applied Innovations to run more workloads and support more customers on a smaller footprint. Cloud infrastructure was consolidated by more than 80 percent, and the company expects to reduce power, cooling, and real-estate costs by two-thirds and licensing costs by one-third.

**Trapezoid**

Trapezoid uses Intel Xeon processor E7 family-based servers to increase the density and analytics performance of Trust Visibility Engine, a software-as-a-service cloud security offering. Trapezoid tested the capabilities of Intel Xeon processor E7 family-based servers as the foundation for infrastructure architecture that could support a scalable, multitenant environment with an increasing analytical workload. The Intel Xeon processor E7 family also enables Trapezoid to capitalize on Intel Platform Protection Technology (with Trusted Execution Technology [TXT]) to verify the identity and integrity of server hardware and software to track workloads.
Migration to x86 Architecture: Six Steps

While every situation is different, successful migration requires a careful, methodical approach based on best practices. The following steps outline a practical approach for IT managers as they embark on their mission-critical deployment projects.

**Step 1: Assess the Load on Your Current Servers**

Assess the load on your current servers in detail so you can determine an appropriate configuration for proof-of-concept (PoC) testing. Preliminary server sizing will help you determine the appropriate configuration. Application performance can differ greatly in moving from one architecture to another, and only performance testing on similar platforms truly provides you with an accurate performance estimate (at this stage, you only need a reasonable preliminary estimate to support your test requirements). Your PoC will provide you with the details you need to size your production server.

Determining memory and disk space for your test server is fairly straightforward, since the requirements will be very similar to your legacy infrastructure; however, both architectural and generational differences need to be considered, including the numbers of cores, threads, cache, instructions per clock cycle, and other factors. Performance-monitoring tools available in most UNIX operating systems can help with this task. Alternatively, you can add the Solaris® sysstat package of tools to measure key performance and identify bottlenecks or use a sizing tool to assist with your estimations.

**Step 2: Identify Compelling Pilot Opportunities**

The pilot sets the stage for future migration efforts. Identify your best first application to migrate based on a current business need that can position the organization for an early win. And while low-hanging fruit may be an attractive option, it may not offer the strategic traction you’ll need to convince business units of the importance of continued migration efforts. A business unit that is known for its willingness to embrace change and willingly shares its IT successes across the organization is a good target for mission-critical migration.

**Step 3: Develop Proof of Concept (Pilot)**

All complex or mission-critical migrations should include a PoC to verify that the application can run in the new environment as well as to determine how it performs. The PoC also helps you optimize configurations to maximize performance and establish the preliminary process for production migration.

For the PoC, you’ll need to ensure that you’ve made necessary provisions for migration testing, including making sure that you have staff from the appropriate business unit available to see the testing through. Make sure that you’ve verified the physical location of the server(s) and the database that will be used for test migrations. You’ll also need to make provisions to test the application performance on the target hardware and ensure that you lock down any changes to the application during migration.

At this stage, you should also complete a more thorough evaluation for your server sizing. A variety of factors impact server platform selection and sizing:

- Initial measured average utilization
- Maximum utilization target
- Peaks in demand
- Workload growth projections
- Relative capacities of two-socket and four-socket servers
- Advanced considerations, including clustering and failover
Step 4: Evaluate Your Solution Architecture

Once you have finished the PoC, you will have determined that the application can run on the hardware, and you will feel confident that SLAs can be met. Now take a step back and reconsider broader issues, including the scalability and availability of the solution. Several additional issues should also be considered:

Robust hardware. With most migrations, you automatically gain performance, scalability, and RAS when you replace older equipment with newer, more robust hardware. You can add to these advantages by configuring new systems with redundant components, such as power supplies, disk drives, and fans. The Intel Xeon processor E7 family is designed specifically for mission-critical environments and provides advanced support for data integrity and system resilience at the silicon level.

Clustering. You can reduce the effects of failure on your migrated environment by using high-availability clustering software, which is available as an option in leading Linux distributions. A redundant server is deployed to take over the duties of the main server in the event of failure. While failover is not instantaneous, it is automatic. Clustering software limits the effects of failure on overall system availability.

Horizontal scaling. With horizontal scaling, increased workloads are handled by adding servers rather than increasing the size of individual servers. This can be an excellent approach for presentation layer services, which tend to scale well across multiple servers through workload balancing. If a server fails, its workload automatically fails over to the remaining servers, providing high availability as well as scalability. Two-socket servers based on the Intel Xeon processor E7 family support larger memory footprints and include robust support for high availability and data integrity. Adding automated provisioning and maintenance tools keeps overhead management low as the solution expands.

Vertical scaling. In a vertically scaled architecture, the application resides on a single server. As workloads grow, performance is scaled by adding resources to the server or upgrading to a larger system. Mature or single-purpose applications that exhibit a high degree of scalability are appropriate to consider for vertical scaling.

Step 5: Rehearsal

Ensuring a successful switchover to the new solution requires careful preparation. A rehearsal migration can help you improve upon and streamline the process you used in your pilot effort. By evaluating and reordering your process, developing scripts to automate necessary processes, and carefully examining data migration steps, you can gain knowledge and experience to help ensure a smooth production migration. Be sure to document these steps and test the solution for QA and acceptance. More importantly, you should be prepared to repeat the rehearsal migration as necessary until you are confident about proceeding.

Step 6: Production

At this point, you should have full confidence in your new solution and the migration process.

- Use your rehearsal documentation to develop a tight project plan.
- Schedule an optimal maintenance window and notify all affected business units.
- Rebuild the target server and finalize all premigration steps.
- Execute the production migration as rehearsed.
- Conduct QA and acceptance.
- Cut over or run in parallel until you receive sign-off.
- Document each step that was completed.
In addition to the resources already cited in this paper, check the following for further interesting content.

**Web Sites**

For additional resources about:
- Data center: [intel.com/centerofpossibility](http://intel.com/centerofpossibility)
- Data center optimization: [intel.com/datacenteroptimization](http://intel.com/datacenteroptimization)
- Mission-critical solutions: [intel.com/missioncritical](http://intel.com/missioncritical)
- Intel Xeon processor E5 family: [intel.com/xeone5](http://intel.com/xeone5)
- Intel Xeon processor E7 family: [intel.com/xeone7](http://intel.com/xeone7)

**Intel® Xeon® Processor E7 v3 Family—Product Overview (video)**
Watch this animation to discover what the Intel Xeon processor E7 v3 family offers your data center: leadership performance, world-class uptime and availability, and scalability to handle any workload.

**Accelerate Big Data Insights with the Intel® Xeon® Processor E7 v3 Product Families**
A product brief describing the features and capabilities of the Intel Xeon processor E7 v3 product family that relate specifically to analytics and mission-critical computing environments.

**Real-Time Analytics for Real Business Advantage: The Transformative Power of In-Memory Computing**
Gain new insights from real-time analytics and mission-critical solutions running on the Intel Xeon processor E7 v3 family.

**Intel® Xeon® Processor E7 v2 Family and Intel® Run Sure Technology (video)**
An animation describing how the Intel Xeon processor E7 v2 family with Intel Run Sure Technology adds RAS features to increase uptime and data integrity. (2:58 minutes)

**Peer Research: Mission-Critical Workload Migration**
This report describes key findings from a survey of 200 IT professionals in the United States about mission-critical workloads. The report includes detailed findings about the data center modernization landscape, enterprise migration plans, the drivers compelling organizations to migrate mission-critical workloads, and the challenges and benefits of doing so.


3. Intel technologies’ features and benefits depend on system configuration and may require enabled hardware, software, or service activation. Performance varies depending on system configuration. Check with your system manufacturer or retailer or learn more at intel.com.

4. 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.

5. 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.

6. Up to 1.4x average performance increase claim based on generational scaling of comparable 4x Intel Xeon processor E7-8890 v3 compared to E7-4890 v2 geometric mean average across 12 benchmark results (est. SPECint* _base2006 1.06x, STREAM 1.07x, est. SPECfp * _base2006 1.09x, Est. SPECfp_rate_ base2006 1.16x, SPECint_rate base2006 1.16x, Brokerage OLTP tps 1.25x, Warehouse OLTP tpm 1.39x, Server Consolidation VM 1.39x, LINPACK 1.66x, SAS New Mixed Analytics* 1.72x, and SAP HANA* SP59 with Intel TSX OLTP tpm 6x). See intel.com/performance/datacenter for more details. (Up to 12.9 times increase versus five-year old systems.)

7. Claim based on SAS Mixed Analytics workload measuring sessions per hour using SAS Business Analytics* 9.4 M2 on Red Hat Enterprise Linux 7. Configurations: 1) Baseline: 4S Intel Xeon processor E7-4890 v2, 512 GB DDR3-1066 memory, 16x 800 GB Intel SSD DC S3700, scoring 0.11 sessions/hour. 2)Up to 1.72x more sessions per hour: 4S Intel Xeon processor E7-8890 v3, 512 GB DDR4-1600 memory, 4x 2.0 TB Intel SSD DC P3700 SSDs + 8x 800 GB Intel DC S3700 SSDs, scoring 0.19 sessions/hour. See intel.com/performance/datacenter for more details.

8. Claim based on SAP* OLTP internal insert and select tests measuring transactions per minute (tpm) on SUSE® Linux Enterprise Server 11 SP3. Configurations: a) Baseline 1.0: 4S Intel Xeon processor E7-4890 v2, 512 GB memory, SUSE Linux Enterprise Server 11 SP3, SAP HANA 1 SP8 scoring 14,327 tpm. b) Up to 1.8x more tpm: 4S Intel Xeon processor E7-4890 v2, 512 GB memory, SUSE Linux Enterprise Server 11 SP3, SAP HANA 1 SP9 scoring 26,139 tpm. c) Up to 2.7x more tpm: 4S Intel Xeon processor E7-8890 v3, 512 GB memory, SUSE Linux Enterprise Server 11 SP3, SAP HANA 1 SP9—Intel TSX disabled scoring 39,330 tpm. d) Up to 6x more tpm: 4S Intel Xeon processor E7-8890 v3, 512 GB memory, SUSE Linux Enterprise Server 11 SP3, SAP HANA 1 SP9—Intel TSX enabled scoring 89,619 tpm. See intel.com/performance/datacenter for more details.

9. Claim based on Intel Optimized MP LINPACK (MPL) workload, running Red Hat Enterprise Linux (RHEL)—internal technical reports (TR) #25, #178. Configurations: 1) Baseline 1.0: 4S Intel Xeon processor E7-4890 v2, RHEL 6.4, 512 GB DDR3-1333 memory, MPL 11.1.1 using 75000 problem size; Score: 1247. 2) 4S Intel Xeon processor E7-8890 v3, RHEL 7.0, 1 TB DDR4-1600 memory, MPL 11.2 using 220000 problem size; Score: 2105. See intel.com/performance/datacenter for more details.

11. Up to 17x throughput gain vs. 5-year-old servers for VM consolidation claim using internal virtualized consolidation workload scoring application throughput score @ given number of VMs. Configurations include: 1) 1-Node, 4 x Intel Xeon processor X7460 with 192 GB total memory on VMware ESXi* 4.1 Update 2 using Guest OS RHEL6.4-64bit. Data source: Request number: 1392. Scoring 94.28 @ 6 VMs. 6) 1-Node, 4 x Intel Xeon processor E7-8890 v3 with 1024 GB 1024 GB on VMware ESXi 6 Update 1 using Guest OS RHEL6.4-64bit. Data source: Request number: 232. Scoring 1603 @ 90 VMs. Up to one-fifth the cost per VM based on estimated hardware costs including acquisition costs, memory, storage, and networking (no S/W) of the old system at $31K ($5166/VM) to the new configuration at $101.5K ($1127/VM).

12. Up to 9:1 consolidation with a 23-month ROI payback claim based on estimated SPECint_rate_base2006 results assuming a scenario of 100 each 5-year-old 4-socket servers using Intel Xeon processor X7460 scoring 274 each compared to 11 each comparable Intel Xeon processor E7-8890 v3-based servers scoring 2650 each. The 23-month ROI payback is based on an initial investment of $645,786 with a net savings of $742,126 for a 115% ROI and 40% IRR when purchasing each server at an estimated street price of $56,228 for with $1505 installation and disposal cost per server providing 81% savings of power/cooling and lower management costs with 89 fewer deployed servers in this scenario. See intel.com/performance/datacenter and http://estimator.intel.com/serverroi/ for more details.

13. Intel technologies’ features and benefits depend on system configuration and may require enabled hardware, software, or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

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