

# Maximize Data Center Flexibility Today and Tomorrow with Intel® Virtualization Technology (Intel® VT) FlexMigration Assist

White Paper  
Intel® Virtualization  
Technology (Intel® VT)

## Introduction

With the advent of virtualization technology, data centers worldwide have been going through a revolution in design. Virtualization enables multiple operating systems and applications, also known as virtual machines (VMs), to run concurrently on a single server without interfering with each other. Enterprise data centers first embraced virtualization as a method to consolidate multiple server applications onto fewer servers to increase utilization and reduce energy requirements. Today, emerging usage models focus on the ability to migrate workloads for load balancing and optimal utilization of data center resources for business continuity.

As enterprises move beyond server consolidation towards dynamic, agile data centers, IT infrastructure can better align with corporate business goals by dynamically allocating and balancing computing resources across the breadth of applications. When VM resources are constrained, additional capacity is made available by migrating live VMs to a different physical server. Live migration allows users to move active VMs across a pool of physical resources. It reduces the extra work traditionally involved with moving VMs, including notifying users, shutting down the applications, moving the VM to a new server, and then restarting the VM and each of the applications. Eliminating these steps improves flexibility and efficiency in the management of data center resources.

In the past, successful live VM migration was dependent on compatibility between the source and destination CPUs of the physical servers to guarantee VM stability after the migration. For some data center end users, this dependency created isolated islands of resources (physical servers) resulting in data center fragmentation.

In 2007, Intel solved the challenge by introducing Intel® Virtualization Technology (Intel® VT) FlexMigration, a capability that allows virtualization software vendors to deliver live migration solutions across different generations of Intel® Xeon® processor-based servers. By dramatically enlarging the generation of servers that can be deployed in a VM migration compatibility resource pool, Intel VT FlexMigration enables IT managers to accelerate the adoption of emerging usage models such as load balancing and business continuity during unforeseen spikes in data center resource demand. It also provides investment protection by enabling the utilization of older generation servers with new generation servers in a common resource pool.

Intel VT FlexMigration is one of the many built-in hardware-assist virtualization features found in Intel VT for Intel Xeon processors.

## Early Barriers to Live Migration

Prior to Intel VT FlexMigration, live migrations could only be accomplished between compatible systems. Users of VMware, for example, could use VMotion\* technology to move running virtual machines from one physical server to another server with the identical CPU microarchitecture. To understand why, we need to look deeper at differences between successive generations of microprocessors and what happens during a live migration.

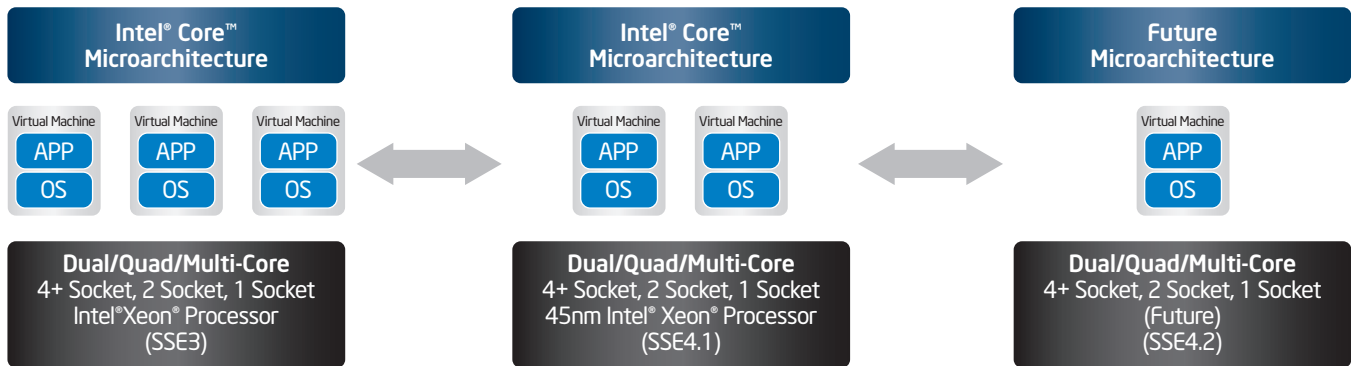
Each new generation of microprocessors can feature a new instruction set that takes advantage of the latest technologies embedded in the microprocessor design. For instance, recently, Intel released a family of microprocessors manufactured on a new 45nm manufacturing process. These microprocessors feature a new instruction set (known as Intel® Streaming SIMD Extensions 4 or “SSE4.1”) to enable more efficient processing of video encoding, graphics, and 3-D imaging.

When a guest application starts within the VM, it queries the CPU-ID of the microprocessor to determine which advanced features are present so the application will use the most efficient software routines. For example, if the server on which the guest application is launched supports the SSE4.1 instruction set and the guest application is compiled to use those instructions, then the application runs using the SSE4.1 instruction set.

When live migration is initiated for a VM, the VM’s current live state is captured and transferred to a destination system without any disruptions (downtime) to the running virtual machine.

Once on the new system, the VM continues nearly instantaneously from its last known position. The VM is not aware that it has been so migrated. If the destination system is of an older generation and lacks SSE4.1, then the guest application using SSE4.1 routines will behave unexpectedly. This is why servers with the same generation of microprocessors were required in early versions of live migration compatibility resource pools.

## Expanding Migration Options with Intel® Virtualization Technology (Intel® VT) FlexMigration



**Figure 1.** Intel® Virtualization Technology (Intel® VT) FlexMigration enables hypervisor software to broaden the live migration capabilities of a resource pool to include multiple generations of Intel® Xeon® processors.

### Intel Virtualization Technology (Intel VT) FlexMigration

Obviously, as IT adds new systems, it would be much more convenient and efficient if an IT manager could simply add new resources to existing pools without having to worry about differences in processor generation. For this reason, Intel has developed Intel VT FlexMigration. When combined with support from virtualization software, it ensures that the hypervisor can expose a consistent set of instructions across all servers in the pool. Intel VT FlexMigration support starts with Intel® Core™ microarchitecture and will be available in future generations of the Intel Xeon processor family.

### Future Proof Resource Pools

With Intel VT FlexMigration, IT managers can easily add current and future Intel Xeon processor-based systems to the same resource pool when using supporting hypervisor software. This gives IT the power to choose the right server platform when it is needed to optimize performance, cost, power, and reliability, without having to worry about forward and backward compatibility across generations of Intel Xeon processor-based servers starting with Intel Core microarchitecture and extending into future generations of Intel Xeon processors. IT managers can pool server resources using multiple generations of Intel Xeon processors (Intel Core microarchitecture and beyond) whether they are

single, dual- or multi-processor based. This creates a dynamic virtual server infrastructure that enables the use of live VM migration to improve usage models such as failover, load balancing, disaster recovery, and server maintenance.

Current Intel® Xeon® 5400 and 5200 processor series, 3300 and 3100 processor series, as well as future Intel Xeon processors, support Intel VT FlexMigration. Using virtualization software that is enabled to take advantage of this feature, Intel servers based on these processors can be pooled with earlier generation of Intel Core microarchitecture processors. These include Intel® Xeon® 7300, 5300, 5100, 3200, 3000 series processors.

### Summary

Flexibility in virtualization deployments is an increasingly important and desirable capability for IT managers to support business goals beyond server consolidation. Previous barriers to live VM migration across generations of servers have been solved with Intel VT FlexMigration. IT managers can get benefits of investment protection with larger virtualization compatibility resource pools across multiple generations of Intel Xeon processor-based servers, today and tomorrow.

## Learn more

To find out more about Intel VT and its features, see:

[www.intel.com/technology/virtualization/](http://www.intel.com/technology/virtualization/)

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