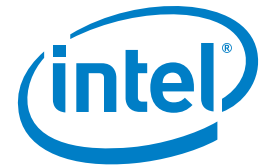


## SOLUTION BRIEF

Federal Government

2nd Generation Intel® Core™ i5 vPro™  
and Core™ i7 vPro™ Processors



# Federal Agencies: Benefits of Client-Side Virtualization

A Flexible, New Solution for Improving Manageability, Security, TCO, and User Experience



## New client-side virtualization solutions offer:

- Centralized management capability
- Lower costs because workspace images are managed centrally on a server
- Protection of data and virtual images through centralized management of security policies
- Improved user experience due to local execution of applications

## A Great Value for IT and Improved Productivity for Employees

As new enabling technologies emerge for client compute delivery, IT departments in the federal government are being challenged to determine the optimal enterprise client computing strategy—deciding which combination of client platforms and service delivery models will best meet the needs of employees and the IT organization, now and into the future.

Adoption of virtualization for client computing is increasing because it has many compelling benefits. New client-side virtualization solutions running on 2nd generation Intel® Core™ i5 vPro™ and Core™ i7 vPro™ processors promise to meet the needs of both IT administrators and users. These solutions give IT an efficient, cost effective, and secure way to centrally manage client devices; they also deliver local performance and compute capabilities that enable employees to work with complex and graphics-intensive applications—whether they are online or offline.

## Client Computing Virtualization Models

For all client computing virtualization models, the elements of computing (applications and OS) are abstracted and separated from each other and from the underlying hardware; this helps make the agency workspace and data more acces-

sible and portable. The main difference between these approaches lies in where the virtualization occurs, either centralized in the data center or distributed to the endpoints. While virtualization promises a higher degree of control over application management and data, and potentially can lower IT costs, which model is the best option for both users and IT departments?

## Server-Hosted Virtual Desktop Infrastructure and Thin Clients

Significant interest in client virtualization has centered on server-hosted virtual desktop infrastructure (VDI) and thin-client computing (Figure 1). This model is used to host multiple, unique client images on a single server or group of servers within virtual machines (VMs) managed by a server-side hypervisor. Because the computing occurs in the data center, employees can access their applications and data through a variety of devices, including inexpensive bare-bones thin-client machines.

IT departments find thin-client solutions attractive because of misconceptions around cost savings, improved protection of intellectual property, and simplified manageability as compared to traditional management of an intelligent PC fleet. However, thin clients can place a heavy burden on an IT infrastructure, overloading the network and servers in already density-constrained data centers.



The end-user experience on thin clients is far from optimal. It is bereft of standard multimedia experiences, and because thin clients rely on the network, performance can be inconsistent. Thin-client computing does not support offline computing, which impacts productivity for mobile professionals and can impact an entire agency if major network or data center failure occurs. In addition, many employees require unique applications that run best locally and typically wouldn't be included in a standard software image build; this level of flexibility is not possible on a thin client.

### Client-Side Virtualization Solutions Benefit Both IT and Users

Client-side virtualization technologies enable compute models that don't compromise the performance and mobility that users expect; in addition, they offer many of the same benefits that IT departments find attractive in VDI. These solutions use the local processor and compute capabilities in the client PC to run CPU-intensive and rich multimedia applications for a great user experience. For example, with local processing capability, client-side virtualization can support voice

and video applications such as Microsoft Lync\* Server. VDI on thin clients cannot support these types of applications.

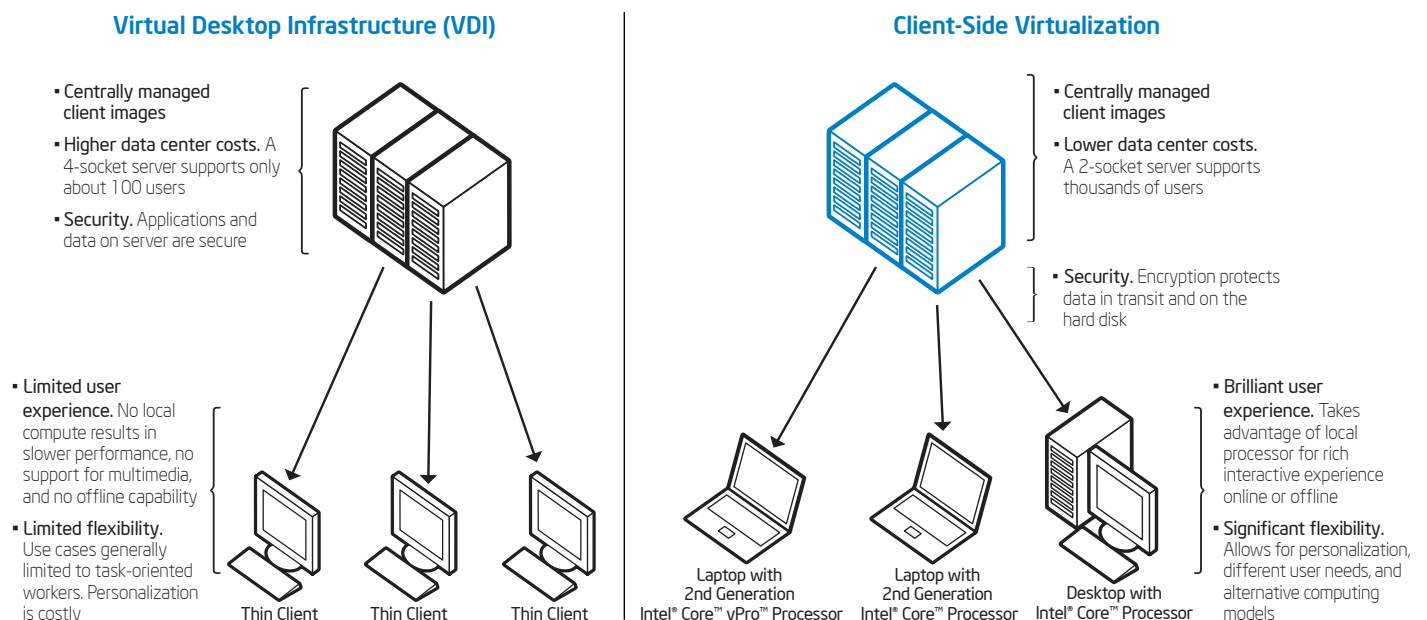
Client-side virtualization offers IT organizations significant benefits, including centralized manageability, security, and reduced operating costs.

### CENTRALIZED MANAGEMENT

Like VDI, client-side virtualization solutions offer efficient management and control of data and applications, because workspace images are managed centrally on a server. Client systems running a hypervisor download these images and run them locally. Products such as Citrix XenClient\*, Microsoft Med-V\*, Microsoft Virtual PC\*, MokaFive Suite\*, RingCube vDesk\*, Virtual Computer\*, and Wanova Mirage\*, offer fully managed virtualized client solutions with a variety of features to simplify and automate image management.

Although the features differ, these solutions help an IT administrator manage the VMs deployed throughout the agency through a central management server and console. IT can update the centrally stored image and push it out to users to improve

Figure 1. Comparison of server-hosted virtual desktop infrastructure (VDI) and client-side virtualization.



**Table 1. Recommended Intel® Core™ vPro™ Processor to Meet Your Organization's Needs**

	Intel® Core™ i7 vPro™ Processor	Intel® Core™ i5 vPro™ Processor
2nd generation Intel® Core™ processor technology for top-of-the-line performance	2 and 4 cores	2 cores
Improved virtualization performance with built-in Intel® Virtualization Technology <sup>1</sup> (Intel® VT)	▪	▪
Hardware-assisted security with Intel® vPro™ technology <sup>2</sup>	▪	▪
Remote manageability even when the PC is unresponsive with Intel vPro technology <sup>2</sup>	▪	▪
Hardware-based acceleration of encryption and decryption with Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) <sup>3</sup>	▪	▪
Increased processor speeds when performance is needed with Intel® Turbo Boost Technology 2.0 <sup>4</sup>	▪	▪
Intelligent energy efficiency	▪	▪
Four-way or greater multi-tasking processing <sup>5</sup>	▪	▪
Disable PCs at the hardware level with optional Intel® Anti-Theft Technology (Intel® AT) <sup>6</sup>	▪	▪
Stunning visual media experience with built-in visuals <sup>7</sup>	▪	▪

the process for software updates, OS migrations, and troubleshooting issues. Any changes to the virtual image are kept separate from the user's personal environment, which means that users can customize their own environment without affecting agency applications or data.

IT managers can control the entire life cycle of the VMs remotely, including setting up images on the server for endpoints to download and enforcing usage policies to secure VMs and data. IT administrators can also control VM sessions, including starting, stopping, and locking the VMs, and remotely monitoring clients and troubleshooting issues.

Some client-side virtualization solutions offer users an automated option to roll back to a previous workspace image if a corruption occurs—reducing calls to the help desk, saving IT money, and reducing employee frustration and downtime.

**PROTECTION FOR DATA AND THE AGENCY ENVIRONMENT**

Client-side virtualization solutions offer numerous ways to protect both data and the VMs. The central management

consoles for these solutions provide the ability to lock down and make the environment secure.

IT administrators can set up authentication and security policies that control access to the VMs and prevent data from being compromised. For example, a policy could be set up to deny a user access to the VM if an incorrect password is entered more than three times, or a policy could be established to lock a VM after a predefined idle period or set an expiration date for the VM, which could be helpful in managing VMs for contract workers or disconnecting a device that has been stolen.

Through policies and group settings, IT managers can control which users are allowed access to the VMs while disconnected from the server, and offline work permissions could be limited to a predefined period of time, after which the VM is disabled until the user reconnects to the management server and re-authenticates.

To further protect the data and environment, most of these client virtualization solutions offer a variety of encryption features, such as an encrypted connection



back to the server to protect data in transit and encryption of the whole hard drive or the segment that contains the VM.

In addition, every time a client system connects to the server, the management server can push out the most recent policies, settings, and patches to ensure that the endpoint is using the most updated, secure workspace.

### **IMPROVING TOTAL COST OF OWNERSHIP AND FLEXIBILITY**

Client-side virtualization offers a compelling value compared to server-hosted VDI. While the cost of thin-client devices is marginally lower than the cost of intelligent PCs, the infrastructural costs of deploying thin-client computing models and VDI can be complex and expensive, involving the purchase of servers, network upgrades, and SAN storage.

The server-side approach comes with capacity limits and requires building up data centers and infrastructure to address peak capacity. Because client-side virtualization takes advantage of the PC's CPU to power the VM, new users can be added with little impact to data center and infrastructure; it's an inherently flexible and cost-effective solution.

In addition, PCs based on Intel® Core™ vPro™ processors are becoming more and more energy efficient with every new generation, and client-side virtualization allows employees to use a single PC for multiple purposes, potentially reducing hardware and energy costs. For example, instead of a single government employee requiring four PCs to access information from different classified networks, this technology enables secure separation of these four environments using VMs on a single PC, thus improving worker productivity and reducing capital equipment and energy costs. Also, with centralized management, IT can easily support remote workers' computing requirements, which increases workplace flexibility for employees and reduces energy, cooling, and office space requirements as fewer workers need to drive to the office.

A TCO study sponsored by Microsoft, involving research on more than 100 organizations with 500 or more VDI desktops, found that for office workers in a VDI environment, the TCO was higher than that of a well-managed PC environment by up to 11 percent per user.<sup>8</sup> While VDI reduced hardware and service desk costs, new software and engineering costs offset those savings, actually increasing overall costs. VDI redistributes IT labor costs, but total labor costs are almost identical in the PC environment.

In addition, in its TCO model, MokaFive claims its client-side virtualization solution can reduce IT costs by at least 45 percent compared to traditional management of a PC fleet. According to its model, the savings are delivered in three areas: reduction of operational costs, help desk costs, and capital costs.<sup>9</sup>

### **IMPROVING USER EXPERIENCE AND PRODUCTIVITY**

The end-user experience on thin clients is far from optimal. Not only do users experience slower performance due to network latency, but also thin clients don't support standard multimedia experiences, applications that require local execution, or offline operation. While thin clients may be acceptable for some task-oriented workers, their limited flexibility doesn't work well for many user groups.

With client-side virtualization, agencies can realize all the performance benefits offered by using rich-client PCs, including the new multi-core processing power available on PCs based on the 2nd generation Intel Core vPro processors (Table 1). IT can give users the client-side performance they need for multi-threaded applications such as Microsoft Office 2007\*, real-time collaboration tools, and other compute intensive software, while still achieving robust security. The end-user experience is intelligently upgraded as compared to a thin-client experience, especially when the solution makes use of the new Intel® HD Graphics capabilities available on these processors.

Several client-side virtualization solution providers are taking advantage of Intel® Virtualization Technology<sup>1</sup> (Intel® VT), hardware enhancements built into the 2nd gen Intel Core vPro processors. Intel VT shifts much of the burden of software-based virtualization into the hardware, and thus it simplifies and reduces the overhead of virtualization, making it easier for third-party vendors to build lightweight hypervisors. It also helps make virtualization more efficient and secure in general, and significantly improves performance— to near native levels or better, depending on the virtualization solution used.

## SUPPORT FOR NEW COMPUTING AND USAGE MODELS

Intelligent PCs offer the highest degree of flexibility, enabling support of alternative computing models for different needs and use cases. Thin clients support only server-hosted virtualization models, such as VDI and terminal services.

Only intelligent clients can take advantage of emerging virtualization models that tap into performance wherever it is available, allowing IT to harness the extra processing cycles on all the systems in the workplace. Imagine

software demands rising above a server's capacity. Applications can dynamically move to client PCs that have additional performance headroom. Agencies could potentially "wake up" employee PCs in the middle of the night that have been powered down, and run compute-intensive algorithms on their installed PC base instead of buying more servers for the data center. This powerful form of load balancing, which includes client PCs in the resource pool, is only possible with intelligent PCs with performance and headroom.

## Conclusion

Client-side virtualization running on PCs based on the 2nd gen Intel Core vPro processor family provides a great value for IT—offering flexibility, centralized manageability, improved security, and reduced operating cost—while also providing the benefits of local execution of programs. These solutions can improve employee productivity by delivering uncompromising performance and a stunning visual experience. The 2nd gen Intel Core vPro processor family enables maximum flexibility for addressing client computing needs for the federal government—now and into the future.

## WORKING WITH INTEL

Intel has been working for more than 30 years to help federal agencies effectively manage, process, and share information across vast government networks by delivering technologies, platforms, and solutions to the U.S. government. Intel solutions for federal customers include a comprehensive selection of commercial off-the-shelf (COTS) products and technologies, enabling agencies to apply new technologies more rapidly while reducing their overall costs to achieve greater mission capability and efficiency.

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<sup>1</sup> Intel® Virtualization Technology (Intel® VT Technology) requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain computer system software enabled for it. Functionality, performance, or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.

<sup>2</sup> Intel® vPro™ technology is sophisticated and requires setup and activation. Availability of features and results will depend upon the setup and configuration of your hardware, software, and IT environment. To learn more, visit <http://www.intel.com/technology/vpro>.

<sup>3</sup> Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) requires a computer system with an Intel AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. For availability, consult your reseller or system manufacturer. For more information, see <http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni>.

<sup>4</sup> Requires a system with Intel® Turbo Boost Technology capability. Intel Turbo Boost Technology 2.0 is the next generation of Turbo Boost Technology and is available only on 2nd generation Intel™ Core™ processors; consult your PC manufacturer. Performance varies depending on hardware, software, and system configuration. For more information, visit <http://www.intel.com/technology/turboboost>.

<sup>5</sup> Requires an Intel® Hyper-Threading Technology (Intel® HT Technology) enabled system; consult with your PC manufacturer. Performance will vary depending on the specific hardware and software used. Not available on all Intel® Core™ processors. For more information including details on which processors support Intel HT Technology, visit <http://www.intel.com/info/hyperthreading>.

<sup>6</sup> Intel® Anti-Theft Technology (Intel® AT). No system can provide absolute security under all conditions. Requires an enabled chipset, BIOS, firmware, and software, and a subscription with a capable service provider. Consult your system manufacturer and service provider for availability and functionality. Intel assumes no liability for lost or stolen data and/or systems or any other damages resulting thereof. For more information, visit <http://www.intel.com/go/anti-theft>.

<sup>7</sup> Available on the 2nd generation Intel® Core™ processor family. Includes Intel® HD Graphics, Intel® Quick Sync Video, Intel® Clear Video HD Technology, Intel® InTru™ 3D Technology, and Intel® Advanced Vector Extensions. Also optionally includes the Intel® Wireless Display depending on whether it's enabled on a given system. Whether you will receive the benefits of built-in visuals depends upon the particular design of the PC you choose. Consult your PC manufacturer whether built-in visuals are enabled on your system. Learn more about built-in visuals at <http://www.intel.com/technology/visualtechnology/index.htm>.

<sup>8</sup> "VDI TCO Analysis for Office Worker Environments," Microsoft, November 29, 2010. <http://download.microsoft.com/download/7/9/A/79AA903-25B4-4D76-8580-BC47D5700433/Microsoft%20VDI%20TCO%20whitepaper%20customer%20ready%20v1%202.pdf>.

<sup>9</sup> For more details on the MokaFive TCO model, see <http://blog.mokafive.com/>.

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