

New PC Delivery Process Cuts Employee Downtime

Instead of borrowing a loaner PC for half a day, many employees can now get a new ready-to-go, personalized system in under an hour.

Executive Overview

As part of our focus on a user-centered model of delivering IT services, in 2012 Intel IT optimized its PC delivery process, resulting in improved Intel employee productivity, a better employee experience, and improved operational efficiency. We formalized our innovative approach over several months to determine the most efficient ways to reduce employee downtime, technician handling time, and overall process time.

The new, streamlined steps to the PC delivery process include preparing the data, settings, and core applications for employees in advance. These process improvements allow employees to return to work more quickly, reducing their downtime—the time spent without a fully personalized computer, including data migration and final configurations—from an average of 4.5 hours to 1 hour, a 77-percent reduction.

The new PC refresh process handles the requirements of our employees' highly customizable and personalized systems as well as meets the needs of our complex environment, which comprises different hardware requirements and thousands of applications. The process—which also applies to rebuilds—produces the following benefits:

- The reduction of employee downtime enables an average of 3.5 more hours of work for each employee during a refresh or rebuild experience. This translates to 160,000 hours per year in productivity savings.

- The easy-to-maintain delivery process addresses all types of client delivery with fewer steps, less documentation, and a reduced need for loaner PCs.
- We reduced technician touch time—the time Intel IT handles the PC—by 10 minutes per system.
- Instead of borrowing a loaner PC for half a day, many employees can get a new ready-to-go, personalized system in under an hour.

A pilot delivery program conducted in two service centers with over 150 participants demonstrated a continuous reduction in employee downtime and led to implementing this approach for all refreshes and rebuilds.

We plan to continue to streamline the PC delivery process, further optimizing the experience for our employees and increasing productivity for both the employees and technicians.

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BUSINESS CHALLENGE

Intel IT is constantly seeking ways to improve the experience of our employees—our internal customers—while increasing their productivity. As we have shifted to a user-centered model of delivering IT services, we focus on optimizing workflows to deliver services faster and with less interruption to Intel employees. Today, as we deploy desktop PCs, laptops, and business Ultrabook™ devices with Windows* 8 to employees in our enterprise, we are addressing this challenge by streamlining and automating our PC delivery processes, allowing employees to return to work quickly while improving operational efficiency.

With more than 100,000 employees using over 2,000 applications on one or more PCs to perform their jobs, Intel's PC fleet is large and complex. We provide support to highly mobile users, 80 percent of whom are on laptops, for which the user has full administrative rights to modify the standard image. From the outset, an office worker's system will vary considerably from a chip designer's and both will vary from a clean room technician's. Within those roles, each person can further customize the OS and services, install additional applications, and store data in different locations. As a result, no two systems are alike.

This heterogeneous computing environment includes multiple form factors, devices, and OSs. For example, Intel employees currently can choose between using a business Ultrabook device with Windows 8,¹ a variety of laptops, or a desktop PC, in addition to companion devices such as tablets. While many organizations have less than a dozen standard hardware configurations, Intel has over 30 desktop and laptop configurations with multiple drivers, and BIOS and other settings. We further customize the core OS with individual restrictions and updates

and provide enterprise solutions for encryption, remote connectivity, data backup, manageability, and other enterprise controls.

Our standard PC refresh cycle provides employees with a new PC every 2 to 4 years.² Some groups are on a faster track than others within that range based on their work needs. Over the past decade, Intel IT has performed an average of 30,000 PC refreshes per year. With different hardware requirements and thousands of applications and configurations, the PC refresh process had grown increasingly complex.

Improving the employee experience led us to reexamine the provisioning of PCs from their perspective. By 2012, this process typically required 45 minutes of IT handling per PC along with an average employee downtime of 4.5 hours. This downtime period includes the moment the PC leaves the employee's hands to the completion of final data migration and configuration with his or her personal profile and applications, and not just to the point when IT returns the new PC to the employee.

PCs may be delivered to new or remote employees, to employees getting a replacement PC (a refresh), or to those whose current PC needs rebuilding because of problems. During both the refresh and rebuild processes, Intel IT fully provisions the new or rebuilt PC to minimize impact on employee productivity.

In an Intel PC refresh, employees turn in their current PC—whether a laptop, desktop, or business Ultrabook device—and receive a completely new device. When employees receive their new PC, all the data, enterprise applications, and settings have already been migrated.

A system rebuild is where employees who are not yet due for a new computer but are experiencing problems with their PC turn it in for the same model with a new shell or OS, or both. We perform about 10,000 rebuilds each year.

² Studies demonstrate that keeping PCs longer than an average of three years significantly increases support costs and security exposure, suggesting that a two-to-four-year refresh cycle is optimal. See "PC Lifecycle Management: Boosting Productivity and IT Efficiency," July 2012.

¹ See "Deploying Business Ultrabook™ Devices in the Enterprise," January 2013.

Until mid-2012, the delivery process for both refreshes and rebuilds required employees to turn over their PCs to IT and wait about 4.5 hours (or more in some cases) for the new one to be fully provisioned. In the meantime, they received a loaner PC with email and other basic capabilities. However, without access to their data or to any custom applications, this less-than-optimum experience adversely affected productivity. Intel IT's productivity was also hindered because technicians had to spend time provisioning and checking in and out loaner PCs.

As part of Intel IT's shift to user-centered computing,³ we reexamined all processes related to PC services to improve the user experience and IT efficiency. In 2012, we streamlined the PC delivery process for new employees. Those employees now receive a pre-configured PC in a 90-second handover⁴ rather than attending a 90-minute introductory class where they configure it themselves.

A foundation of previous efficiencies, such as streamlining our PC lifecycle management processes⁵, now enables us to take advantage of new technology and trends as they emerge. We developed a single image build process that allows us to update all platforms at once if a configuration changes. We created a set of platform packs specific for each make and model of PC running on a supported platform that is combined with a base image and core applications that apply to the majority of the user population.⁶ The consolidated build process had fewer manual touch points and more automation options, as the process now fully combined the base image, post configurations, data, settings, and applications. This revised image build process enabled us to deliver solutions more frequently, which means that employees can benefit from the new enhancements earlier.

³ See "Best Practices in User-Centered Computing," March 2013.

⁴ This excludes computer training time if they are unfamiliar with the PC they receive.

⁵ See "PC Lifecycle Management: Boosting Productivity and IT Efficiency," July 2012.

⁶ See "Creating a Dynamic Client Build Using Driver Management," April 2012.

Other previous efforts included simplifying the client landscape. For example, our standard laptop configuration for knowledge workers—which includes Intel® Core™ vPro™ processors, increased memory, and higher-resolution displays—also scales to engineering users. This scalability eliminates one of the platform configurations we must support.

Next, we explored ways to optimize workflows when refreshing and rebuilding employee PCs. These processes had evolved but not in a way that efficiently supports employees or IT. Over time, redundancies had accrued, including multiple logons and reboots, along with other inefficient steps, layered onto a base image. This discontinuity resulted from "patching" the script to accommodate each process update. Steps were added one after the other, not in the logical order we would have followed if we had designed the process from scratch.

By optimizing the PC delivery process, we saw an opportunity to improve employee productivity and experience while also reducing technician handling time.

SOLUTION

To improve the employee experience during the PC delivery process, early in 2012 Intel IT formed a team with a goal to reduce employee downtime by streamlining IT process steps. Our ideal target was to have no employee downtime or IT handling throughout the entire process. Our team explored options for achieving that ambitious goal and designed a holistic and economical process that reduced the employee downtime from an average of 4.5 hours to 1 hour and reduced technician handling time by 10 minutes.

Formalizing the new approach took several months. We analyzed the dependencies—such as which steps needed to occur in what order and where data needed to come from—and

then decided on the most efficient process. The analysis focused on reducing the following:

- Employee downtime
- Technician handling time
- Overall process time

Our main goal was to reduce the 4.5 hours of the average employee downtime. Depending on how many applications and how much data the employee had on the PC, the entire process would run at least 3.5 hours, or considerably more in some cases. Secondary goals included reducing technician touch time, which was about 45 minutes—and reducing the overall process time from beginning to end. Touching a PC only once enables technicians to increase efficiency.

The Original PC Delivery Process

Our original PC refresh process began with a series of steps that included both physical handling and multiple automated scripts.

1. Run a "core build" to create the **base image**, which consisted of the OS and a few enterprise-specific configurations.
2. Associate the PC with the domain and user it was prepared for ("**personalization**"), along with some post-build tasks.
3. Receive the old PC (employee downtime began at this point).
4. **Migrate** a predetermined set of applications.
5. **Migrate data** and settings from the old PC to a new PC, including such things as encryption, backup settings, and certificates.
6. Complete **final configurations** and settings before delivering the new system back to the customer.

This entire process typically took about 4.5 hours, from pre-base image preparation of BIOS and Intel® Solid-State Drives to delivery of the system to the customer.

The New PC Delivery Process

Our new approach to the PC refresh process involved rethinking and reordering the steps to remove redundancies and shorten the overall time. The main challenge was to unfold the complex dependencies and simplify the process. A large part of this disentanglement involved integrating “patches” to the process where they should logically take place in the script.

A key decision was to shift the original employee downtime to Intel IT technicians who perform complete client builds in an automated fashion. This revised approach used these steps in the following order with Intel IT doing the first four:

1. Create the PC base image build.
2. Perform the personalization tasks.
3. Complete the final configurations (now bundled with the “post-build” automation).
4. Perform the application migration.
5. Receive the old PC (employee downtime begins at this point).
6. Migrate the data.

Delivery of a new or rebuilt PC to the employee now takes place after data

migration. As part of the process, the Intel IT technician verifies with the employee that critical components, such as the VPN, are working properly, and explains how to use them. The delivery is considered complete only after verifying with the employee that the data has migrated successfully.

By reordering our steps, we pushed out the point at which the employees needed to turn over their old PCs to us (see Figure 1).

We now start by running a core build to create the base image. We continue with user association (personalization). Instead of requiring the employees to turn in their PCs for the remainder of the process, we first migrate the applications and then perform the post-build configurations. The former are user-specific configurations that we usually perform after the image is complete, such as site-specific settings, encryption, backup settings, and others.

Near the end of the process, we invite the employee to a short session to migrate data and finalize settings. More than 93 percent of Intel employees, who typically have 40 GB of data or less, can complete data migration

in 1 hour. Those with more than 40 GB of data will complete this phase in 2 hours.

As a result of the reordering of steps, Intel IT now performs more of the process, such as migrating applications, before employees drop off their computers. Shortening the downtime period is a significant improvement because it simplifies other processes, such as checking out loaner PCs, as well as other dependencies that had grown over time. This new process now takes up to 3 hours total, including the technician time, depending on the amount of data to be migrated.

How We Consolidated and Improved the Delivery Process

Determining where each individual step in the delivery process should efficiently happen gave us the opportunity to reorder, consolidate, and change a number of dependent processes and actions.

For example, in the old process, technicians consulted four separate documents as part of the PC delivery process, depending on whether it was for a refresh, rebuild, or for new or remote employees. Many of the

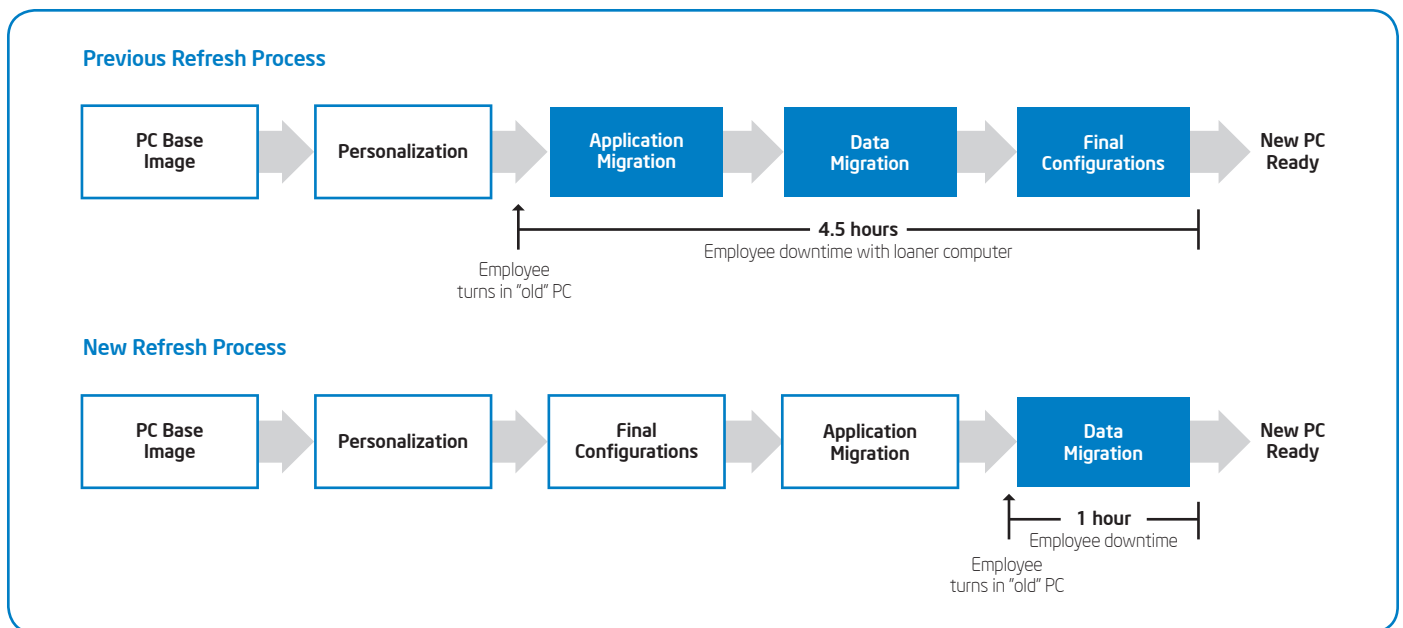


Figure 1. The new PC refresh process shifts the order of steps to significantly reduce average employee downtime.

documented steps were similar but were customized with small details specific to the type of delivery. We consolidated all processes into one document, highlighting the relevant changes. The streamlined process eliminates the need to maintain and follow four separate documents.

Consolidating the documents enabled us to remove dependencies. For example, we now bundle relevant BIOS updates and configurations in the pre-configuration step of the image build. With the previous process, we performed such updates manually before the image build instead of as part of it. This bundling was technically possible before the change, but it wasn't until we focused on efficiency and the customer experience that we integrated them.

In addition, when engaging the employee in the old process, we asked a number of questions: where documents were stored, hard drive size, previous or duplicate hard drive passwords, existence of special certificates, the need for a loaner system, and specific

settings of certain applications, such as the voice-over-IP (VoIP) phone.

Once we transformed the process, some of these questions became irrelevant. For example, the VoIP phone settings were now automatically migrated without manual intervention. The location of documents and hard drive size were handled by the application and settings migration. With the new process, most of these questions were eliminated, which in turn reduced the amount of documentation we kept per delivery and the amount of both technician and customer interaction in the process.

Now that the application migration is included as part of the process, we didn't need to wait for some of the post-build final steps before certain actions took place. We removed some validation and configuration steps such as the manual mapping of printers or email data files, and manual configurations for office productivity software or other applications. In the past, applying these steps later created a lower quality of integration.

For example, in the previous process, we migrated data and settings and then the employee ran a script to migrate applications. Most application configurations would have been missing, because the settings migration happened before the applications were installed. With the new process, the technician—not the customer—triggers the automatic installation script and only then does the migration of settings and data happen. This eliminates waiting for the employee to initiate that step in the process, reduces the overall process time, and ensures all the settings are in place.

Other factors that reduced the overall time included removing the choice of editing and presentation software versions, which had been part of an outdated requirement, and eliminating wait times between multiple process scripts.

Having established the new approach, in 2012 we conducted a pilot program in two service centers with over 150 participants. We examined every aspect of what was needed to adjust the process and improve efficiency.

Visions for the Future of PC Delivery

At many companies, receiving a new computer and getting back up to speed can be a complicated process that requires many steps. With both process improvement and technological advances, the future promises a more efficient, faster, and more seamless process.

The range of possibilities includes ideas that not long ago seemed futuristic, such as delivering PCs through vending machines, PC hospitals for quick fixes, self-migration, and virtual desktop infrastructure (VDI), with clients running applications from a company's data center. Companies are already moving user data and configurations to the cloud to remove the need for having the hardware at hand for those steps.

The technologies used to deliver virtualization can vary. Possibilities range from VDI and application virtualization—whether hosting or streaming—for non-mobile task worker PCs, to streamed desktops and local virtual machine-based desktops for more mobile workers who need the flexibility of local processing power. Cloud services support a variety of client devices and delivery methods to both thin and rich clients.⁴

Whether the person's desktop or applications are executed client-side or server-side, the computing environment would be wholly managed and delivered from the data center. Centralized management afforded by desktop virtualization makes migration itself easier, with images built once and used many times, and with subsequent upgrades managed more efficiently.

Desktop virtualization is a natural, low-risk solution for both bring-your-own-device (BYOD) instances and mobility. Virtualization allows IT departments to take full advantage of employee-owned devices as virtual desktop endpoints for accessing a corporate standard server-based OS and applications. With data and applications residing in a private or public cloud, users would gain true device independence and consistency of experience with zero downtime for hardware refreshes. Employees would connect the old and new PCs to the cloud and—with no IT intervention needed—simply synchronize the data, applications, and settings from the cloud.

⁴ See "Better Together: Rich Client PCs and Cloud Computing," March 2009.

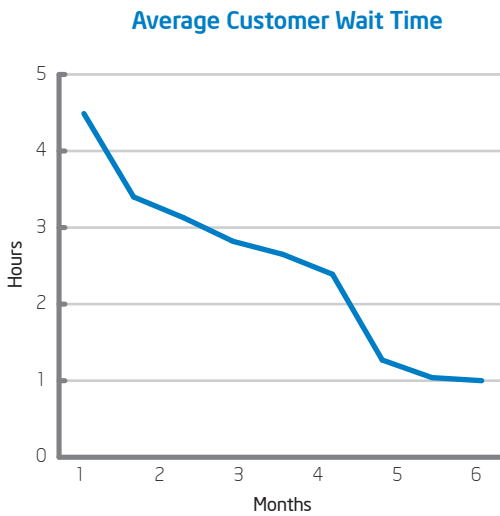


Figure 2. Average customer wait time during the PC delivery pilot decreased continuously as the refresh process improved.

RESULTS

Streamlining the PC refresh process to deliver PCs to Intel employees with the data, settings, and applications prepared for them in advance reduced employee downtime by 77 percent. Additional efficiencies came from shifting most of Intel IT’s PC handling to a centralized “build bench,” where IT technicians perform complete client builds in an automated and larger-scale fashion. After only 6 months, Intel IT transformed the PC delivery experience to include application migration as well as data and settings up front, while reducing customer downtime from 4.5 hours to 1 hour and cutting out 10 minutes of IT handling per system.

During the pilot, we continued to refine the approach and saw a continuous reduction in average customer wait time (see Figure 2). Because the previous process had been in place for years, technicians who formerly handled the PCs during both the refresh and rebuild steps now used a new, smoother process; however, they needed to make certain adjustments.

For example, with the new process, technicians can handle more PCs in parallel than before. This increased volume changed the physical layout—both size and positioning—of the build benches used during rebuilds and refreshes. As a result, a larger numbers of PCs could be delivered in less time.

During the pilot, we saw continuous improvement in the reduction in PC delivery time. Factors that contributed to this improvement included changes to infrastructures, alignment of execution behaviors across sites, technical improvements, and improvement to the automation scripts, such as installing local fonts where needed.

For example, with the previous process, employees received loaner PCs to use during their downtimes, which could last hours, depending on how much data needed migrating. With the new approach, employees could turn in their systems at lunch time and come back to a ready PC in about an hour. Others experienced wait times as short as 15 minutes. In the new approach, checking out a loaner PC is a rare occurrence. Not only does this save time in each PC refresh or rebuild, but it also eliminates having to maintain a large fleet of loaner PCs, and frees the technician from managing loaner PCs to concentrate instead on rebuilds or refreshes.

Feedback from pilot participants was overwhelmingly positive. A sample quote from one employee: “The migration process was painless! Great job!” Because results from the pilot were so encouraging, we quickly moved forward with full production deployment of the process globally.

This new approach reduces disruption for employees and increases productivity. The reduction of employee downtime enables an average of 3.5 more hours of work for each employee during a refresh or rebuild experience, which translates to employee productivity savings of 160,000 hours per year.

NEXT STEPS

The changes we have made so far are the first in a broader strategy to transform the way we perform client deliveries and reduce total employee downtime to less than 10 minutes.

Our goal is to further streamline the PC delivery process, both for retrofitting an OS on an existing system or refreshing a PC, which will provide an even smoother experience for employees. As a result, we anticipate increased productivity for both employees and technicians. As part of our continuous improvement methods, we will incorporate more automation to streamline the process and reduce IT handling time further.

Intel IT is currently exploring the option of a fully automated and cloud-embedded client delivery process. This approach would enable removal of both data and application migrations from inside the current process, as well as full automation of the entire delivery process. Every step, from hardware configuration, pre-execution triggers, building images, and dynamic post-configuration to actual delivery, would all be automated.

We envision enabling employees to receive their system and start working immediately—with no migration or downtime. At some point, picking up a PC with all your relevant data from a vending machine may no longer seem futuristic.

Mobile Devices and Refresh Cycles

Alternative form factors, such as tablets and smartphones, are used both as companion devices and for some as primary devices. Tablets are growing in popularity and suitability for enterprise needs. Meeting the need for mobility and connecting to keyboards, mice, and monitors when desired, many tablets provide the flexibility that more and more employees are seeking to do their work.

With the advent of touch screens and new laptop categories such as business Ultrabook™ devices, the business case for mobile devices drives refreshes as employers seek to improve productivity with increased versatility on devices fit for purpose to workers' needs.

At Intel, the PC fleet is viewed as a strategic asset. We've chosen to deploy mobile business PCs to 80 percent of our employee base and have seen significant improvements in productivity and employee satisfaction. We regularly and proactively decommission older systems that no longer deliver adequate performance or provide optimal security protection. At the same time, we continually invest in new technologies that can help our employees increase their productivity and reduce IT support costs.

Intel IT recently conducted a successful proof of concept (PoC) using Intel® Atom™ processor-based tablets with Windows* 8 across our enterprise. We found that employees are very pleased with the ability to use a tablet to access enterprise applications.

The PoC survey found the following results:

- 80 percent of employees reported an increase in flexibility
- 57 percent of employees reported an increase in their productivity
- Employees generally used the tablet to consume, not to create, content
- Employees generally used the tablet as a companion device, not a primary device

Based on information from this evaluation, Intel IT will continue to drive a broader roadmap for Intel® processor-based tablets and Windows 8. We see great value in supporting Intel Atom processor-based tablets with Windows 8 in our enterprise.

CONCLUSION

Simplifying PC client delivery, which involved reworking and reordering steps in the process, produced an improved customer experience as well as reduced IT handling time. Intel IT now performs more of the process, such as migrating applications and final configurations, before employees drop off their computers.

Employees no longer migrate their own data; this step is now performed at the end of the process and handled by a script. By removing redundancies and “wait time” between steps, we shortened the overall handling time and almost eliminated the need for loaner PCs.

After only 6 months, Intel IT transformed the PC delivery process to reduce customer downtime from 4.5 hours to 1 hour and cut out 10 minutes of IT handling. With the new approach, employees can turn in their systems at lunch time and come back to a fully personalized PC. Some receive their

new PC and are back to work in as little as 15 minutes. This innovative approach placed customer needs at the center of PC client delivery and made it more efficient, more effective, and more productive for both employees and Intel IT.

ACRONYMS

BYOD	bring your own device
PoC	proof of concept
VDI	virtual desktop infrastructure
VoIP	voice over IP

FOR MORE INFORMATION

Visit www.intel.com/it to find white papers on related topics:

- “PC Lifecycle Management: Boosting Productivity and IT Efficiency”
- “Best Practices in User-Centered Computing”
- “Deploying Business Ultrabook Devices in the Enterprise”
- “Deploying Microsoft Windows* 8 in the Enterprise”
- “Creating a Dynamic Client Build Using Driver Management”

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