Evolving Centralized IT Client Management

Intel IT's current IT management philosophy is characterized by improved automation, proactivity, consistency, agility, and cost efficiency. Over the last 20 years, Intel's business and our IT environment have undergone many changes, and Intel IT's support and procurement strategy has matured to meet new challenges and opportunities. We refined our approach to IT client management in overlapping phases focused on centralizing IT services, controlling software proliferation, managing hardware, enhancing mobility, and reducing costs.

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July 2009

IT@Intel

Executive Summary

Intel IT has improved security, productivity, and cost savings across the enterprise through an IT management philosophy characterized by improved automation, proactivity, consistency, agility, and cost efficiency. Over the last 20 years, our IT environment has undergone many changes, and our support and procurement strategy has matured to meet new challenges and opportunities.

By developing centralized IT policies, relying on industry standards, identifying the optimal PC refresh cycle, and using well-defined metrics to measure progress and guide decisions, we provide a mobile, cost-effective, and productive environment for our users.

We refined our approach to IT client management in overlapping phases:

- **Consolidating IT services and support.** Instead of having IT services embedded in each Intel group, we moved toward a consolidated IT organization offering centralized services.

- **Managing hardware standards and software proliferation.** Centralized standards and procurement, along with active software license management, have had a profound effect on total cost of ownership (TCO).

- **Managing our hardware upgrades.** We achieve the highest return on investment (ROI) by replacing hardware at an optimal refresh rate.

- **Enabling a mobile workforce.** Mobility supports employees—who can stay connected anywhere, anytime, maintaining business continuity in time of disaster—as well as current trends toward globalization and collaboration.

- **Automating and managing our PC fleet.** We have enhanced IT and end user efficiency through improved automation and enforcement of IT policies.

Some of the tangible benefits resulting from our centralized IT management approach include:

- Support 94,000 PCs with a single base software image.

- Reduced TCO by 53 percent in just three years.

- Inverted the ratio of desktop PCs to laptop PCs from 80:20 to 20:80.

- Cut labor costs for system builds by 75 percent.

- Increased our asset database accuracy from 80 to 90 percent.

- Reduced client PC power consumption by 95 percent.

IT management is not static—technologies and users' needs change constantly. We continue to monitor IT management issues, such as workforce changes, performance demands, environmental concerns, cost reduction, and an increasing emphasis on collaboration. In addition, as we look forward, we identify and take advantage of opportunities in technology and computing trends to accelerate and deliver additional business value to Intel.

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Business Challenge

Twenty years ago, like many enterprises, Intel struggled with decentralized support and procurement processes that escalated costs and made assets difficult to manage. We were inconsistent in selecting which PC assets to buy and didn't have a clear strategy for how long we should keep them before replacing them. We were concerned about security, but didn't want to restrict employee privileges unnecessarily. Employees wanted access to information and applications—not only from their desks, but also in the field, on the airplane, and in the hotel.

Intel IT has proactively identified opportunities with technology and computing trends, such as our move to mobile computing, that have refined and improved our services, delivering increased business value.

Today, we manage the IT assets for 94,000 PCs with a single software image. We continue to find innovative ways to meet the business imperatives to simultaneously reduce costs, add value, enhance security, and increase productivity.

Solution

In response to a corporate directive for IT to reduce total cost of ownership (TCO) for the company and an increasing reluctance on the part of individual Intel business groups to manage their own IT departments, Intel IT has defined and refined our PC management strategy.

Through cost savings and improved services, we have managed this transition over time through corporate directives, negotiations, and a compelling value proposition. We applied our strategy through multiple phases, as we learned, adapted, and continuously improved our methodologies, and responded to the changing PC ecosystem. Figure 1 summarizes these stages.

Each stage had a different focus, such as managing software proliferation or supporting a more mobile workforce. These stages were not discreet; most overlapped. For example, reducing costs was a factor in every stage.

We found that as our organization became more mature, our policies became increasingly centralized, we relied more on industry standards, and used more metrics to measure our success.
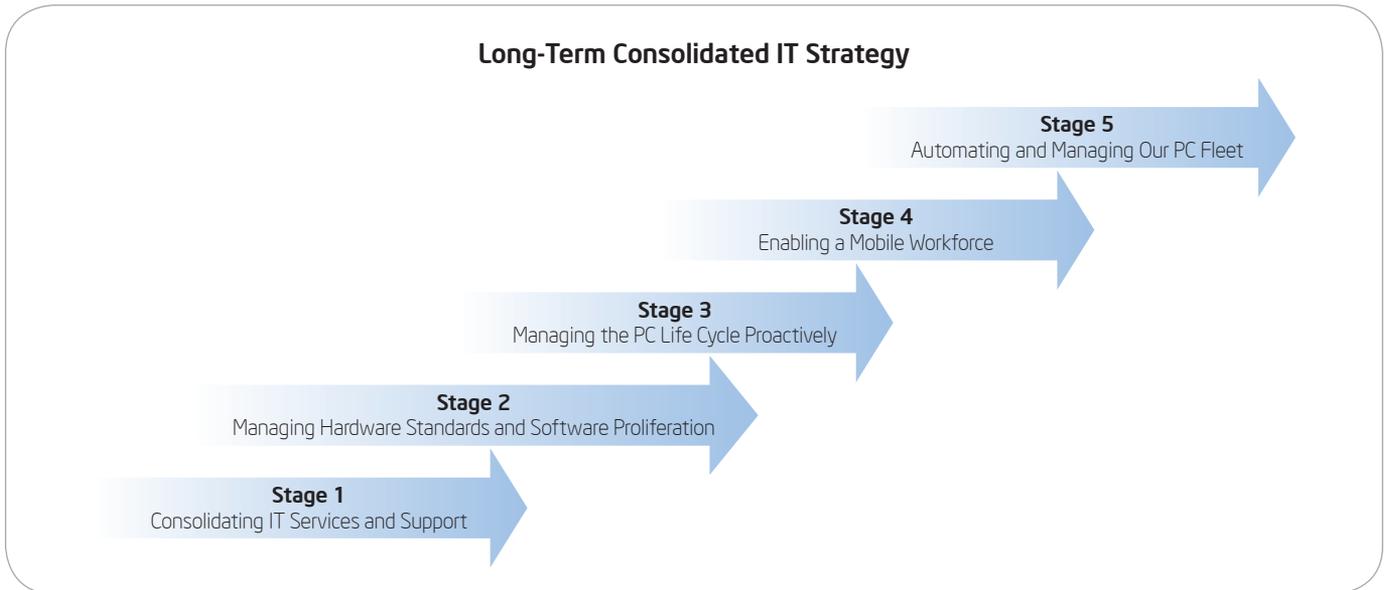
Long-Term Consolidated IT Strategy

Stage 5
Automating and Managing Our PC Fleet

Stage 4
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Stage 3
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Stage 2
Managing Hardware Standards and Software Proliferation

Stage 1
Consolidating IT Services and Support

Figure 1. We moved through five stages in developing our long-term consolidated IT strategy.

Stage 1: Consolidating IT Services and Support

From the late 1980s to 1997, IT services were embedded in each Intel group, creating isolated silos of IT activity. This redundant approach did not allow one group to take advantage of improvements and discoveries made by another group, it distracted each group from their core business and planning functions, and it was also very expensive.

We decided to move toward a consolidated approach to IT services so that business groups no longer deployed or supported their own PCs. Consolidation offered a clear financial advantage to these business groups by transferring the support and planning burden to a central PC management organization.

Stage 2: Managing Hardware Standards and Software Proliferation

During this same time period, each Intel group made its own PC and software purchasing decisions, with little or no input from other groups. As office workers gained confidence with desktop PCs, they began to install software on their machines independently, which raised security concerns. At this stage, our IT environment was characterized by:

- PCs purchased by individual groups and supported by the employees of that group

- Installation of unsupported software by office workers

- Unmanaged software costs

This fragmented approach to infrastructure and assets made it difficult to leverage purchasing power, and software costs spiraled upward.

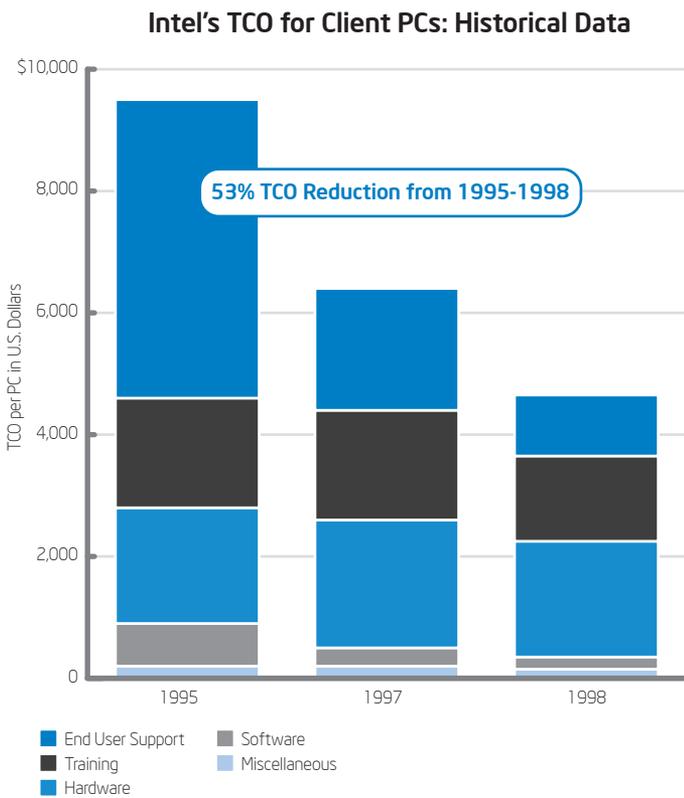## Intel's TCO for Client PCs: Historical Data

Figure 2. Intel IT achieved a 53 percent reduction in total cost of ownership (TCO) from implementing centralized PC support and software procurement.

Single Build Image Supported by Centralized Procurement

Recognizing these problems, we implemented a centralized procurement strategy that allowed us to achieve economy of scale through distributed licensing. Figure 2 shows our reduction in TCO from 1995 to 1998.

With a centralized procurement policy in place, between 2000 and 2001, we were able to move from 14 separate client system builds to a single build image. This had a profound impact on our costs:

- Our technician build time dropped from two hours to one hour.
- Our build development time decreased from eight person weeks to two person weeks.
- Our build testing time decreased from two person weeks to four person days.

Having a single build image has saved Intel about USD 3 million in costs directly related to the build process and slashed our labor costs per build by 75 percent, from USD 20,000 to USD 5,600. Our single-build approach facilitates more rapid updates and OS upgrades.

Centralizing Desktop Management

In the 1990s, we also migrated to a large-scale desktop management system. We used a combination of in-house tools and third-party enterprise management software packages to manage an array of focus areas, summarized in Table 1.

Standardizing and centralizing our asset management enabled us to reduce costs, improve security, and improve productivity—always our goals.

Securing the Environment

Late 1998 to 2001 saw widespread virus attacks, such as NIMDA and Code Red, as well as Y2K fears. These threats caused us to focus on building a structured environment that was more secure.

Our first attempt to tighten security severely restricted user privileges; for example, office workers could not install applications that might pose a threat. However, instead of lowering costs, our approach actually increased costs, because call center usage increased greatly. Users, frustrated by not being able to install the software they needed, called technical support to manage the installation process for them.

We quickly learned that we needed a new approach: We trained our employees about secure behavior and gave them privileges to install business-critical software. Our motto during this phase was "trust and verify."

Our single-build approach allows us to quickly and easily integrate new security patches into the build process and then distribute the build globally, which reduces our exposure to intrusion and computer vandalism.

Stage 3: Managing the PC Life Cycle Proactively

To simplify Intel's PC environment, we have reduced the variety of platforms we support. Purchasing higher-performing PCs allows us to offer a smaller number of standard desktop PC and laptop configurations that apply across usage segments and consequently reduce TCO. For example, our standard laptop configuration for knowledge workers—which includes Intel® dual-core technology, increased memory, and higher-resolution displays—also scales to engineering users. This eliminates one of the platform configurations we must support.

In planning our refresh cycles, we take into account strategic line-of-business and fleet management requirements, which include:

- **Buying manageability built in.** We buy PCs that we can integrate into our standard management consoles and manage from day one, eliminating the need to buy additional software or create customized solutions.

- **Planning for tomorrow's needs.** We make sure PCs can meet the demands of tomorrow's computing environment by using multi-core processors along with components and applications that can scale for future needs.

- **Selecting standard components.** Using standard components, such as common chipsets, graphics capabilities, and networking hardware across all PCs, simplifies engineering, procurement, and support.

We control our costs by developing a single, gold software image build for our selected stable PC platforms. This consequently improves security because we can update the fleet quickly, without compatibility problems.

Table 1. Desktop Management System

Focus Area	Results
Asset Management - Asset inventory/discovery - Software distribution - Patch management - Endpoint device power consumption management and mobile computing	- Increased PC asset inventory registration by 25 percent to improve inventory accuracy to over 97 percent. - Regular software audits helped ensure purchasing was in compliance with our procurement policies. - Reduced average PC power footprint consumption by 95 percent.
Security - Security vulnerability - Detection and remediation - Security policy enforcement	- Minimized the impact of many major security threats by keeping our PCs current at the latest patch levels of software; reduced overall time to patch systems through improved tools and employee awareness programs. - Reduced data vulnerability by requiring encryption on PCs and through an improved hard drive destruction and disposal process.
Governance - IT compliance reporting - Software license management	- Expanded audits of client systems and automated our processes to help ensure compliance moving forward as part of Intel's overall compliance efforts, - Automated software audits regularly scan for installed software, and poll and verify for appropriate licenses to keep Intel legal. - Defined, deployed, and enhanced e-Discovery processes to preserve and collect PC-located data and to reply to regulatory and legal requests more quickly and efficiently.

We also invest in technologies, such as Intel® vPro™ technology, that simplify our PC fleet management processes and reduce our support costs.

Finally, we streamline our software acquisitions and deployments, aligning them with hardware release dates to create predictable, cyclical transitions from one generation of software and PC technology to the next. We take advantage of programs such as Intel® Stable Image Platform Program (Intel® SIPP), which helps ensure a sufficiently long buying cycle— 12 to 15 months—and lowers engineering effort.

Managing Our Hardware Upgrades

We initially thought that buying lower-cost PCs would save us money. However, our performance requirements soon outpaced these PCs' capabilities, and we had to conduct a widespread refresh— before the PCs had paid for themselves.

In addition to determining the right equipment for our needs, we also experimented with how long to maintain hardware before replacing it. Once we started purchasing high-end machines, we stopped actively retiring systems. This resulted in problems for both our end users and our support staff. We experienced an almost three-fold increase in exception requests, and help desk calls on these older systems began to take more and more of our support time, resulting in loss of productivity and dissatisfaction from our customer base.

To determine the optimal PC refresh rate, we developed a model that translates cost factors into annualized cash flows based on various refresh frequencies. The model optimizes for the most cost-effective refresh cycle by determining the point at which support costs outweigh client acquisition costs. Salvage value and disposal cost also have an impact on the result.

Using this model, we discovered that after year three, costs begin to climb due to hardware failures, driver issues, application conflict errors, and extended warranty costs, as shown in Figure 3.

Fine-tuning Centralized Systems Management

As we fine-tuned our approach to PC management, we developed and implemented risk management strategies that reduced security threats across the enterprise, while still encouraging creativity and productivity. In addition, we standardized our hardware environment and turned to negotiated pricing to further reduce acquisition costs.

We pay close attention to calculating ROI for acquisitions and process, and use tools developed in-house for evaluating processes. We then use the information from these tools to guide decision making. An increasingly centralized systems management strategy, fueled by financial modeling tools, helps us track and manage assets, define a cost-efficient refresh cycle, and purchase assets based on long-term needs, not just today's needs.

Stage 4: Enabling a Mobile Workforce

From 1998 to 2003, overlapping with the task of securing our environment, we dedicated ourselves to improving support for a mobile workforce. Our focus on mobility was due to two factors:

- Changing work requirements demanded new mobile solutions.
- Mobility aids in business continuity.

Increasing Mobility

Many of our employees work on collaborative teams that are globally distributed across campuses and time zones. Further, two-thirds of Intel teams are virtual, and one-fifth of

our employees have remote managers. Mobility has helped to provide a flexible and accommodating work environment for our employees, supporting their day-to-day work and collaboration across global teams.

As we identified these trends, beginning in 1998, we began adopting a primarily mobile computing fleet, transitioning over a three-year period to a fleet that consisted of mainly laptop PCs. We then layered on additional value-added wireless capabilities. Over the last decade, Intel employees have become more productive, as well as dependent on wireless and hand-held devices to get their work done. As shown in Figure 4, at the beginning of this stage, we had about an 80:20 percent split between desktop PCs and laptop PCs. At the end of the phase, that ratio had reversed.

Safeguarding Business Continuity

A number of recent events have underscored how important it is to be prepared for unforeseen circumstances. Pandemic infections such as SARS and swine flu, as well as acts of nature such as earthquakes, hurricanes, blizzards, and floods, all pose threats to business continuity. Mobility helps Intel better manage risk and disaster recovery by allowing employees to take the "office" with them. For example:

- When a water main break affected a site in California, employees simply took their wireless laptops to a dry location and continued working.

- After a snowstorm shut down an Oregon campus for three days, we experienced very little loss of productivity. Approximately 5,000 employees simply worked from home using their laptop PCs.

- SARS shut down a Hong Kong office, but fast deployment of laptops enabled employees to work from home, with minimal impact to operations.

Calculating the Business Value of Mobility

Mobile PCs enable a service center-based hardware support and upgrade model. Customers are scheduled into the deployment centers, which offer technician-assisted migrations and training in a classroom setting. A single technician can support upgrading multiple PCs simultaneously. In addition, economies of scale with mobile platforms decrease PC upgrade and support costs.
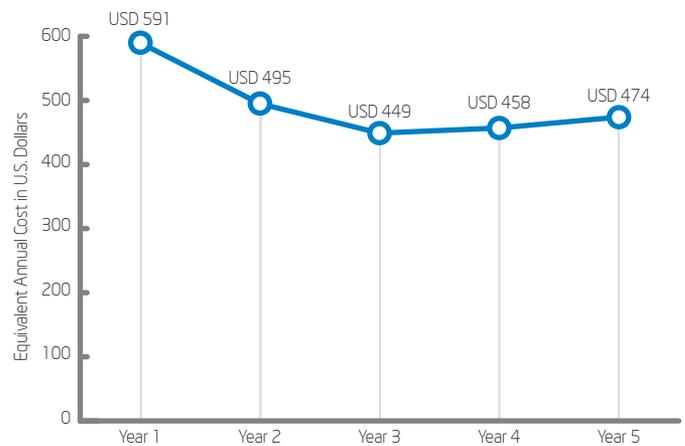

IT PC Annual TCO by Refresh Rate

Figure 3. The sample data shown here helped us determine that a three-year refresh cycle optimized cost efficiencies.

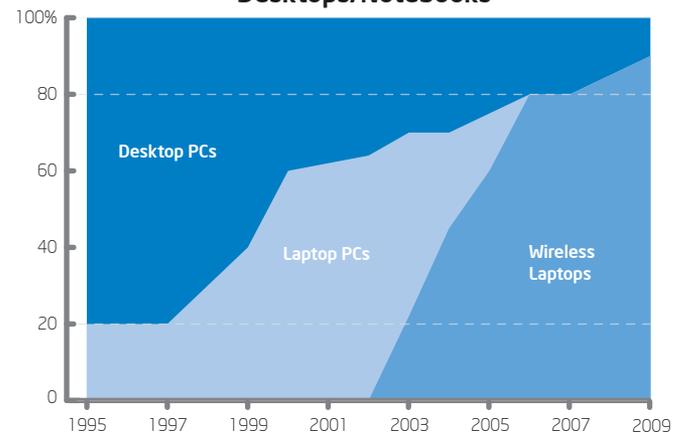**Approximate Mix of Desktops/Notebooks**

Figure 4. By using total cost of ownership data and usage data, we inverted our desktop PC to wireless laptop ratio and achieved significant cost savings.

The role of mobility in disaster preparedness was a surprise for us; we did not include it in our model and calculations to identify business value of mobile PCs. This sort of unexpected benefit is a compelling reason to continue to measure ROI on a post-implementation basis.

Stage 5: Automating and Managing Our PC Fleet

Although we made great progress in many areas during the previous stages, in 2001 it became clear we needed to achieve even more on several fronts:

- **Cost reduction.** Although reducing costs had always been a goal of our long-term strategy development, extracting maximum value from every asset became increasingly important as IT budgets continued to shrink.

- **Governance.** We needed to increase our focus on governance, accountability, standards, and controls.

- **Security.** Personally identifiable information and intellectual property needed to be secure.

Reducing Costs through Automation

Automation of processes and implementation of remote asset management were key factors in further reducing our expenses. Through both off-the-shelf products and custom software tools, we regularly inventory all PCs connected to the network for security vulnerabilities, installed software, configuration, and appropriate patch levels. For example, using a combination of independent software vendor (ISV) and in-house tools, we have the ability to remotely repair or upgrade users' PCs, which cuts down travel time and costs. It is also a critical aspect of supporting a distributed, global workforce.

We reduced the amount of time it takes to build a client PC from two hours to one hour and made the build process more automatic. Technicians spend only five minutes of that hour physically interacting with the PC; otherwise it runs unattended.

Governance

An increasingly complex regulatory environment required us to focus on governance issues. We have made significant efforts in the areas of asset auditing, inventory controls, and remote management to help ensure compliance. As a result of these efforts, we have improved our asset inventory accuracy to over 90 percent.

Security

We needed to take steps to help ensure both intellectual property and personally identifiable information were well protected on client PCs. We used a combination of mandatory employee training, improved PC security and manageability capabilities, and enforcement of minimum security standards to accomplish this goal.

Results

By centralizing our IT management, adapting to changing end user needs, and developing tools to help guide decision making, Intel IT now supports 94,000 clients with a single build image. We have minimized costs, maximized data security, and increased IT staff productivity.

Some of the key things we have learned while developing our long-term IT strategy include:

- Mobility improves productivity and enhances TCO.

- PC fleet management generates real value.

- Mobile technology has a positive "green" impact.

Some of the tangible benefits resulting from our centralized IT management approach include:

- Reduced TCO by 53 percent in just three years.

- Inverted the ratio of desktop PCs to laptop PCs from 80:20 to 20:80.

- Cut system build labor costs by 75 percent.

- Increased our asset database accuracy to over 97 percent.

- Reduced client PC power consumption by 95 percent.

Looking Ahead

Looking ahead, we will identify and take advantage of opportunities in technology and computing trends to accelerate and deliver additional business value to Intel. In particular, we see the following vectors of activity:

- **Cost reduction.** We will continue to find ways to lower energy consumption and administrative costs.

- **Mobility.** Our workforce will become even more globally distributed, and there will be a continued focus on collaboration and cloud computing.

- **Performance.** Employees, business groups, and applications require higher performance computing, and media such as video and podcasts will create more demand for bandwidth.

- **Work force.** The entry of the youngest generation into our workforce brings with it increased expectations for social media, which raises security issues and is an opportunity to further increase overall productivity.

- **Environmental concerns.** We will continue to adopt green IT standards, both as a good corporate practice and for the real value it returns to the environment and to Intel.

- **Remote management.** We see opportunities to improve our methods of managing our PC fleet remotely, such as through the use of Intel vPro technology—which allows us to discover assets even while PCs are powered off, to perform remote diagnosis and repair of PCs even when the OS is not responsive, and more.

Conclusion

Intel IT has evolved into a tightly managed organization with a focus on mobility and security. We have developed centralized IT policies, relying on industry standards, identifying the optimal refresh cycle, and using well-defined metrics to measure progress and guide decisions. We have learned that a highly centralized approach to IT management enables us to meet our three-fold goals of cutting costs, enhancing security, and improving IT staff productivity.

For additional content on Intel IT's best practices on this topic, go to www.intel.com/it
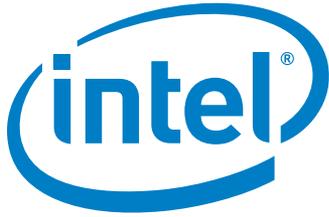
Author

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Acronyms

Intel® SIPP	Intel® Stable Image Platform Program	ROI	return on investment
ISV	independent software vendor	TCO	total cost of ownership