

White Paper  
**Intel Information Technology**  
Client Management  
Intel® vPro™ Technology

# Implementing Intel® vPro™ Technology to Drive Down Client Management Costs

Intel IT offers guidelines for achieving quick returns and long-term value with Intel® vPro™ technology, based on our experience in the first year of a multi-year deployment program.

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IT@Intel

# Executive Summary

Intel IT is in the first year of a multi-year program to deploy and use Intel vPro technology to maintain, manage, and protect our client systems more efficiently and effectively. We have achieved solid returns in the first year of deployment, yet we believe the long-term benefits will be far greater as we build our competency, increase our installed base of compliant systems, and integrate the new capabilities into a broader array of management functions.

Intel vPro technology provides integrated, hardware-based functionality that helps to address many client maintenance, asset management, and security challenges. We believe the potential is great, and we expect it will ultimately deliver value across most of our client management processes. Yet a comprehensive implementation is a long-term commitment that requires new skills and processes for support staff. To help ensure a smooth implementation and garner long-term support from all stakeholders, we targeted 2008 as a tactical year for deployment. We kept it short and simple by focusing on three key use cases, all related to improving our success rate for down-the-wire configuration, diagnostics, and repair.

This white paper describes the methodology we used in planning, developing, and deploying Intel vPro technology and quantifies our cost savings for this initial deployment. It provides an overview of the architectural and engineering phases, and takes a particularly close look at our operational activities, including our methodology for selecting best-fit use cases. If you are interested in implementing Intel vPro technology in your own client management environment, this white paper can help you move forward with greater confidence.

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## Heal, Manage, and Protect

### *Understanding the potential of Intel® vPro™ Technology*

Intel vPro technology is designed to address many of the most costly challenges IT organizations currently face in deploying, maintaining, managing, and securing their client. It enables support teams to securely access and manage PCs over networks, even when an operating system is unresponsive, a software agent is missing or a hard drive has failed.

It also includes a number of other features that can enhance a wide range of client management functions. A partial list would include persistent and protected storage for event logs and asset information, configurable hardware-based traffic filters, and programmable triggers and responses for protecting Internet-connected PCs. For more information, see the resources listed at the end of this paper.

# The Decision to Deploy

For most organizations, the cost of purchasing and managing employee PCs represents a significant percentage of the IT budget. This is true for Intel, and we are continually looking for ways to maximize the value of our PC infrastructure, while reducing associated costs and risks.<sup>1</sup> A key component of our client management roadmap is the implementation of Intel vPro technology to help address some of the key challenges we face in maintaining, managing, and securing our notebooks and desktops.

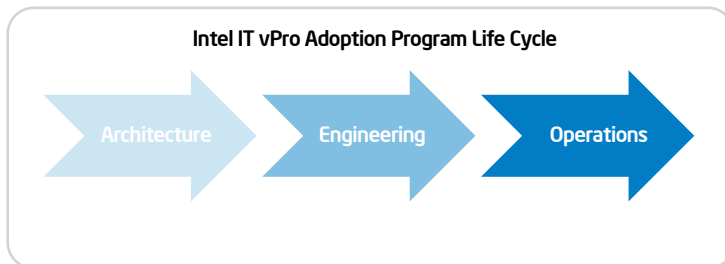
From an IT perspective, Intel vPro technology is best viewed not as a technology, but as a capability to improve client manageability, reduce costs and increase end user productivity. It can enhance a broad range of client management functions (see the sidebar: Heal, Manage, and Protect). However, new organizational competencies and skill sets are required. Compliant PCs are also necessary, and the value to the IT organization and the business will ultimately depend on the total number of Intel vPro technology-provisioned<sup>2</sup> clients in the installed base.

This does not mean organizations need to wait until their installed base is fully provisioned. Intel IT began deploying Intel vPro technology-

enabled client systems during 2007 as part of our standard PC refresh cycle (which ranges between three and five years, based on business needs). We initially considered waiting to upgrade our management tools and processes until we had a larger pool of provisioned systems. However, after closer analysis, we realized we could achieve significant return on investment (ROI) by deploying earlier rather than later. Based on our experience, this has been a good decision. Our support teams are gaining experience with the new tools, and we expect to see our returns increase dramatically as we grow our competency, rapidly adopt additional use cases, and continue to refresh our fleet with the latest Intel vPro technology-enabled platforms.

# Planning the Deployment

As with every new technology and capability deployment, the Intel IT planning process for Intel vPro technology covered three high-level phases: Architecture, Engineering, and Operations (Figure 1).



**Figure 1. Our program life cycle for implementing Intel® vPro™ technology covered three high-level phases: Architecture, Engineering, and Operations.**

1. For a broader description of Intel IT's approach to PC management, see the IT@Intel white paper, Client PCs as Strategic Assets. <http://www.intel.com/it/pdf/client-pcs-as-strategic-assets.pdf>

2 We consider a system to be in a "provisioned state" when it is able to communicate with the Intel Set up & Configuration Service (Intel SCS); is successfully integrated into our management system; and can be remotely managed by the management application.

## Architecture - Defining a Framework for Growth

Every IT organization faces the challenge of expanding its capacity and capability in a changing business and technical environment. The Intel IT architecture team takes a broad view of all major new deployments and provides technical guidance to ensure that current investments are well aligned with both our existing environment and our long-term strategy.

For this program, the goal was to ensure that our client manageability solution was fully integrated into our business strategy, capabilities roadmap, and governance framework. Some of the key issues we considered in defining the solution architecture were:

- Future client hardware and software solutions
- Emerging technologies and computing models, such as virtualization and streaming applications
- Data center trends that could impact our client management infrastructure

## Engineering - Optimizing Infrastructure and Applications

### Challenges of a Global Environment

Intel IT engineering teams took the next step in the program lifecycle, taking the architectural definitions and assessing technical requirements in terms of infrastructure, applications, platforms, and provisioning processes. Intel's PC fleet includes over 100,000 client systems in more than 120 countries. It is essential that IT shops at various locations have a solution that can be deployed reliably and will work effectively to deliver a return on investment.

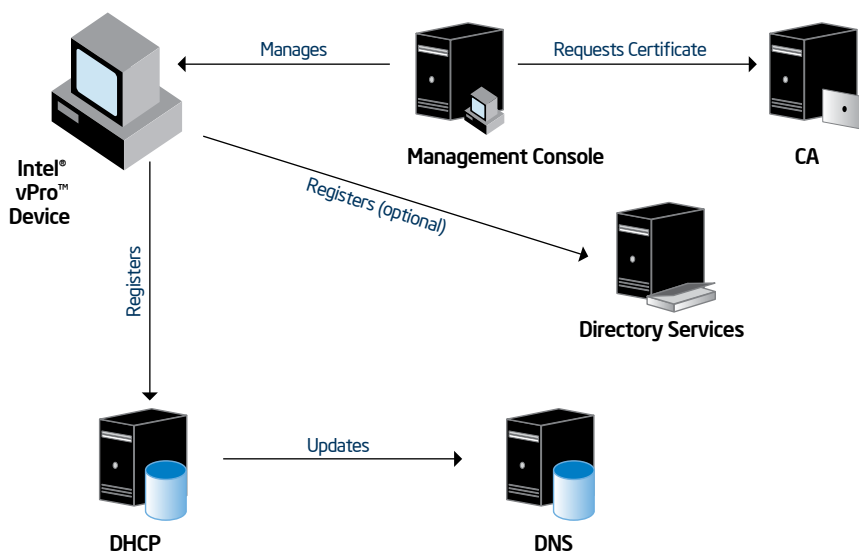
### Implementing Strong Security

One of the most important issues was integrating the new solution with existing security infrastructure and policies to ensure secure client management across the enterprise. This required organizations to perform qualitative security risk assessments to identify, assess, and mitigate risks. Potential threats

were identified and prioritized with the help of Intel's Information Risk and Security group.

The primary risk identified was that of a rogue administrator tampering with clients and potentially compromising the network. To address this issue, we designed a certificate-based authentication solution to control access to the client management console (Figure 2). This solution takes advantage of the vendor certificate hash supplied on all Intel vPro technology-enabled client systems. To safeguard against unauthorized client access, each new client system is provisioned with a digital certificate prior to deployment. Provisioning and registration are then completed down-the-wire, after which the device is available for out-of-band management from the console.

As a publicly owned company, Intel has an obligation to employ very strong security measures. Not all companies will require this level of authentication. To meet diverse needs, Intel vPro technology supports three configuration models: advanced, standard, and basic. The advanced model supports certificate-based security. The other models support less stringent security approaches, and may provide a better fit for many businesses.<sup>3</sup>



**Figure 2. During the engineering phase, infrastructure changes were defined that would enable enterprise-class administration and security for the new client management solution.**

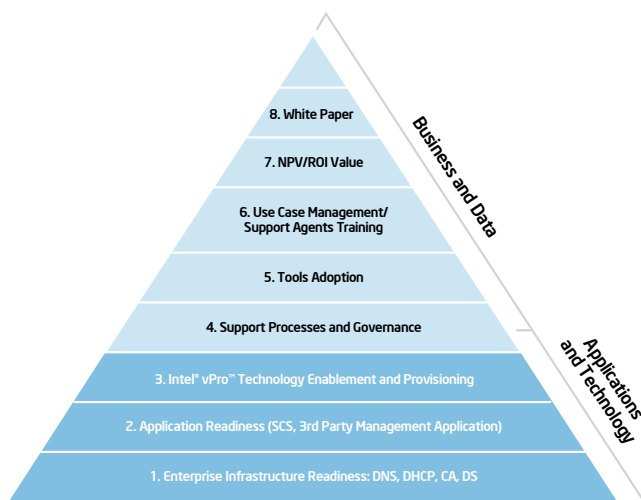
<sup>3</sup> All three configurations models support core Intel® vPro™ technology-based capabilities, such as IDE-Redirect, Serial-over-LAN, power controls, etc. For more information about configuration models and security capabilities, see the Intel white paper, Intel® Centrino® 2 with vPro™ Technology and Intel® Core™2 Processor with vPro™ Technology. [ftp://download.intel.com/products/vpro/whitepaper/crossclient.pdf](http://download.intel.com/products/vpro/whitepaper/crossclient.pdf)

# Planning the Operational Environment

Once the architecture and engineering phases were complete, the Intel operational team was able to begin. Our task was to determine how the new infrastructure and applications would actually be used in the production environment and then design the tools and processes that would be used at the touch points between end users and IT support agents. With the completion of this phase, we would be ready to begin deploying and using the new capabilities in the production environment.

## Adoption Strategy – Starting Slow to Ensure Long-Term Value

A key first step in our operational planning phase was to define our strategy for use case adoption. Under most circumstances, Intel IT selects use cases based primarily on ROI considerations. However, given the significant long-term potential of Intel vPro technology for transforming our client management environment, we wanted to make sure the initial implementation was as smooth and successful as possible. Once the business side of the company is engaged in any new deployment, there is always pressure to deliver as much value as possible in the least amount of time. We wanted all stakeholders happy, so we could count on their support over the long haul.



**Figure 3. To coordinate our planning efforts, we identified the major components of the Intel® vPro™ technology implementation as a layered diagram in which the design and implementation of each layer depends on the design and implementation of the underlying layer.**

We therefore defined 2008 as a tactical year in which we would keep it short and simple to help ensure success. Rather than trying to maximize our short-term returns, we would identify and implement use cases that would deliver meaningful value with minimal effort. These use cases would need to address real IT pain points, but would also have to be easy to implement. By restricting our implementation to just a handful of use cases, we would also give our support agents and end-users time to digest the new capabilities and processes, rather than overwhelming them with too much change all at once.

## Defining Solution Components

To coordinate our planning efforts, we began by identifying the major components of the solution and representing them in a layered diagram (Figure 3). In this representation, design, and implementation at each layer depends on the design and implementation of the underlying layer. To provide a complete picture, we included components related to the infrastructure, applications, and processes that would be owned and managed by Intel IT engineering teams. The layers we identified were:

### Application and Technology Layers (owned by engineering)

- 1. Enterprise Infrastructure Readiness** – Key infrastructure elements must be ready to support the new client management applications, tools, and processes. Four components required change to enable enterprise-class administration and security for the new client management capabilities: DNS (Domain Name Server), DHCP (Dynamic Host Configuration Protocol), CA (Certificate Authority), and DS (Directory Services).

**2. Application Readiness** - Two applications would be used to manage the client systems: Intel Set up & Configuration Service (Intel SCS) to provision Intel vPro technology, and a third-party enterprise management console for other management functions. Both had to be deployed and stabilized.

**3. Intel vPro technology Enablement and Provisioning** - Specific tools and processes had to be defined for provisioning new clients down-the-wire. In addition, we had already deployed a number of Intel vPro technology-enabled clients prior to this project, but had not provisioned them. Tools and processes had to be defined for provisioning these systems manually and with minimal disruption to end users (e.g., whenever an unprovisioned notebook is brought to an IT depot for repair).

**Business and Data Layers (owned by operations)**

**4. Support Processes and Governance** - With appropriate infrastructure in place, the next step was to define processes for our support agents and create detailed scripts for handling specific incidents and service requests. All new processes had to be aligned with the ITSM (Information Technology Service Management) processes we were already using.

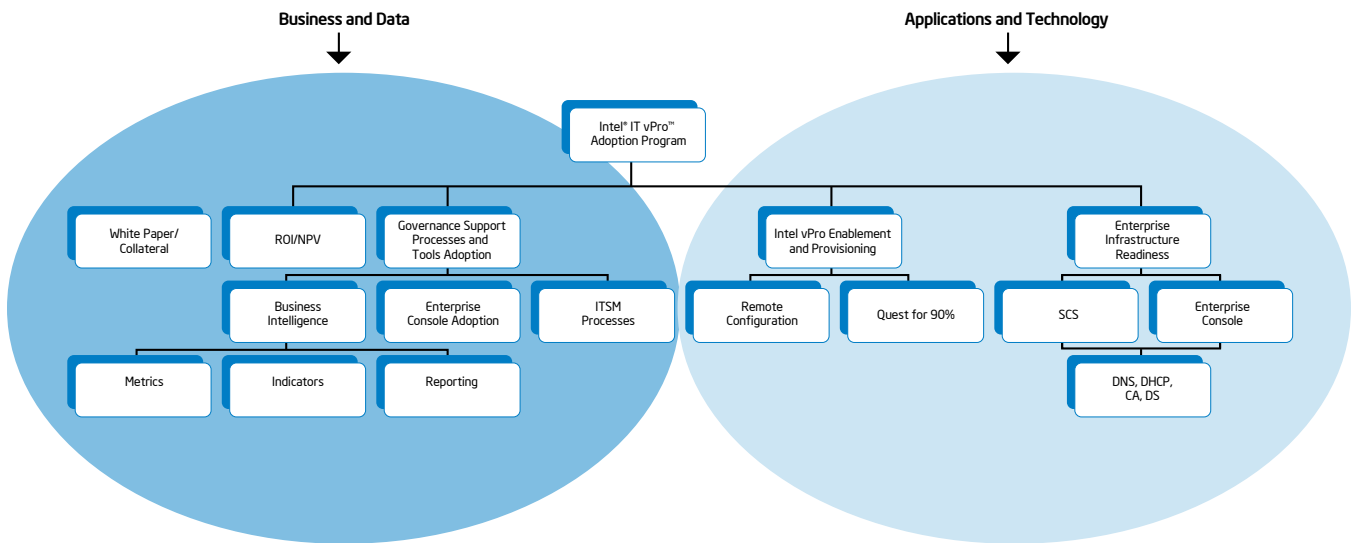
**5. Tools Adoption** - Tools had to be in place to support all our defined processes. Some new tools had to be developed and some had to be modified (e.g., our incident management tools had to be able to capture data for Intel vPro technology-related use cases).

**6. Use Case Management/Support Agents Training** - Our support agents had to be prepared for all new activities. Both training and communications were required.

**7. NPV/ROI Framework** - We had created detailed projections of expected returns prior to kicking off the project. However, we also needed a framework for capturing actual value in real time. This would be important not only for measuring the returns on our investment, but also for understanding potential costs and value for extending the solution to new use cases.

**8. White Paper Development** - Although this activity is not part of the actual implementation, we felt it was important to share our experience with other organizations to help them evaluate and implement Intel vPro technology (we encourage other companies to share their stories, as well).

Once these requirements were defined, we created a Work Breakdown Structure (WBS) diagram for assigning ownership and responsibilities (Figure 4).



**Figure 4.** Once requirements were defined, we created a Work Breakdown Structure (WBS) framework for assigning ownership and responsibilities.

## The Management Connection

### Secure Out of Band (OOB) Client Management

The communication channel used by Intel vPro technology is based on the TCP/IP firmware stack. It is completely independent of the OS and supports secure communications via HTTP authentication, Transport Layer Security (TLS) and/or security certificates. This enables secure, out-of-band communications virtually any time for powering up, tracking, and managing client systems. Other important capabilities provided for down-the-wire management include:

- Serial-Over-LAN (SOL): IT support staff can remotely control a PC's keyboard and video console for remote diagnostics and repair.
- Integrated drive electronics redirect (IDE-R): System boot can be remotely redirected to a clean image available over the network, so a failed system can be booted up, regardless of the state of the OS or hard drive.
- Dedicated, persistent and protected storage for event logs and asset information, so technicians can access needed information more reliably.

## Selecting Specific Use Cases

As described earlier, our strategy for 2008 was to focus on a small number of use cases that were relatively easy to implement. We took a systematic approach to identifying our best-fit use cases.

### 1. Map client management pain points -

At this stage, we did not limit our options, but documented all client management issues that had been driving up our costs, increasing business risk, or disrupting end users.

### 2. Create a matrix of pain points versus Intel vPro technology capabilities -

This allowed us to determine which capabilities could help resolve specific pain points. Every match in the matrix represented a potential use case.

### 3. Prioritize potential use cases -

For this initial deployment, prioritization was based on minimizing implementation complexity and resource demand. Potential ROI was not a primary driver.

Using this process, we identified three use cases that fit our criteria. We then examined our 2008 support data for incidents related to each case. Initially, we used this information to validate our use case selections. Later we used it to determine process flow and develop support scripts and training materials.

### Our selected use cases included:

- **Remote Diagnosis and Remote Repair (RDRR)** - A notebook that is inoperable due to a software issue, such as a missing or corrupt system file, has to be transported to a physical IT depot for diagnosis and repair. With Intel vPro technology, the problem can be diagnosed and repaired down-the-wire, with no need for a technician to physically touch the machine. This approach is much faster, less costly, and less

disruptive to the end user. The time savings are especially significant for employees working at remote sites or home offices. These workers would normally have to mail their system to an IT depot and could be without a notebook for two days or even longer.

- **Remote Diagnosis and Local Repair (RDLR)** - A notebook with a failed hardware component, such as a hard drive, has to be diagnosed and repaired at an IT depot. With Intel vPro technology the problem can be diagnosed remotely, and the depot can be notified in advance of specific parts requirements. This can significantly reduce the mean time to repair (MTTR). For employees at remote sites, it may be possible to simply mail the part to the user, talk them through the installation, and finish the repair over the network (reducing the repair time by roughly 50 percent).
- **Remote Configuration (RC)** - A notebook requiring a BIOS update (such as a hard drive password update) or other pre-OS state configuration changes has to be transported or mailed to an IT depot. With Intel vPro technology, such issues can be diagnosed and resolved remotely. Again, this approach is much faster, less costly, and less disruptive to end users.

Since ease of implementation was a primary concern, it was important that all three of our chosen use cases relied on the same core Intel vPro technology capabilities. In this case, all three rely on the ability to manage systems down-the-wire, even if they are powered down or inoperable due to a corrupt OS or a failed hard drive (see the sidebar: The Management Connection).

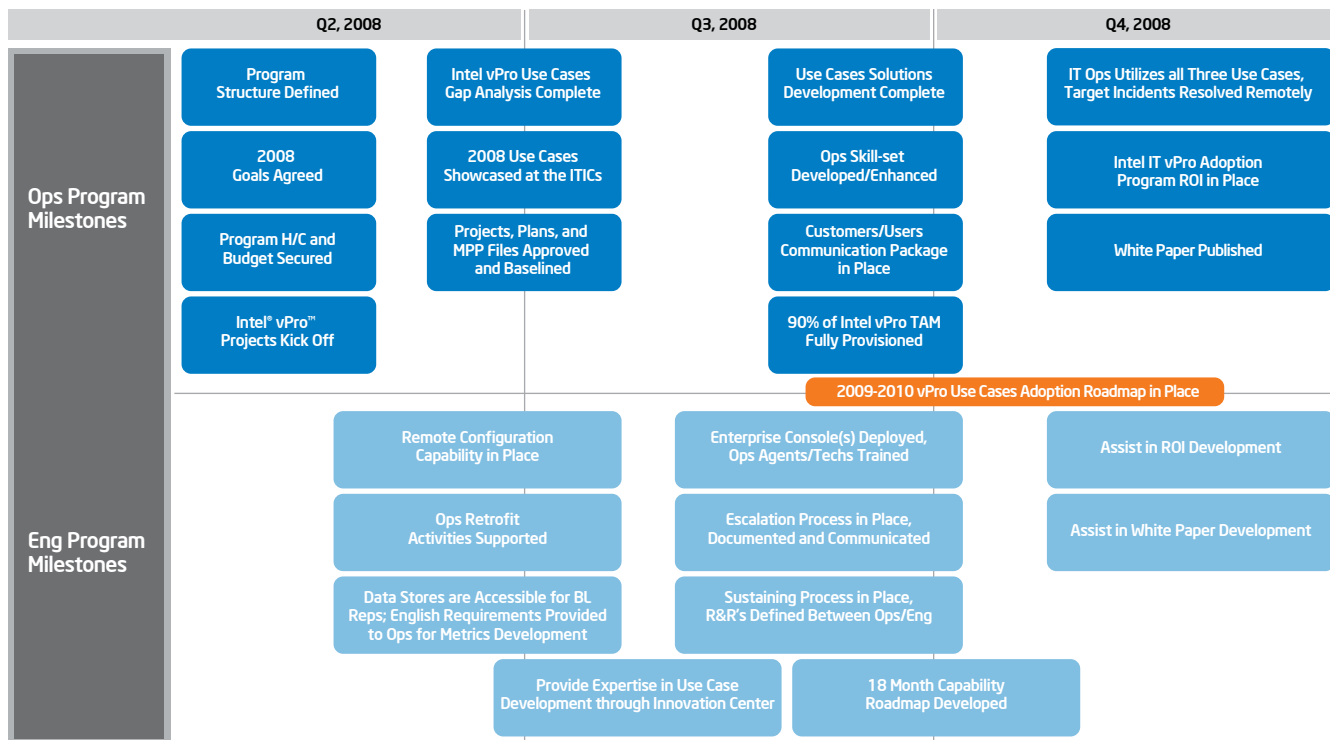


Figure 5. The final step in our high-level operational planning was to create a 2008 adoption roadmap for Intel® vPro™ technology. With our roadmap defined, individual organizations could begin planning and coordinating their detailed activities.

## Creating a Use Case Adoption Roadmap

Once our use cases were defined, we were able to construct a comprehensive 2008 adoption roadmap for our Intel vPro technology implementation (Figure 5). We included both engineering and operational milestones to provide a single, high-level view of all design and implementation requirements. Individual teams were then able to use this roadmap as a foundation for planning and coordinating their detailed activities and timelines.

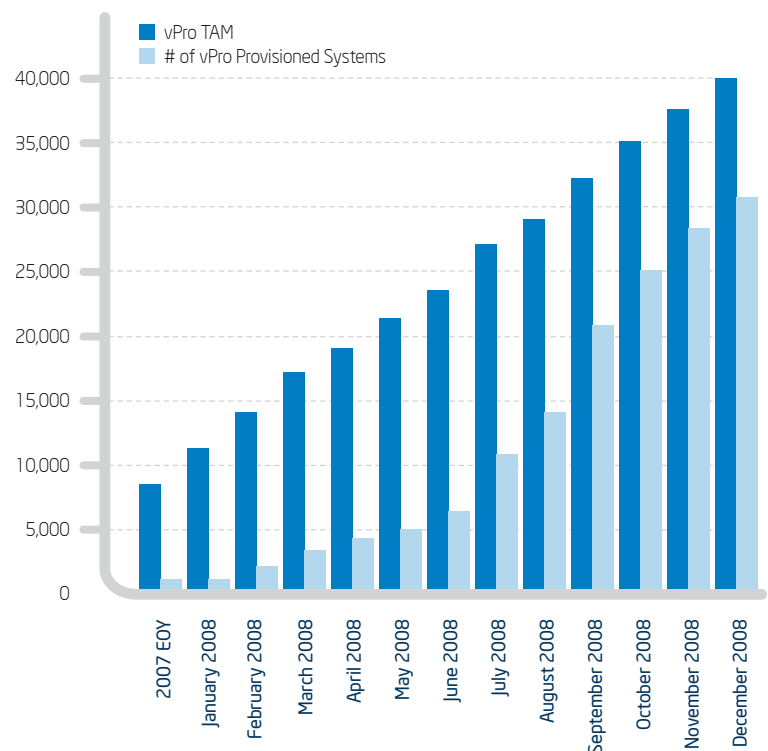
## Cost Savings

Based on the three use cases we have adopted so far, we estimate cost savings of \$0.5M in 2009 and expect this figure to reach \$1M in 2011, due to planned increases in the number of Intel vPro technology-provisioned systems in our fleet. These savings are mainly driven by the improved efficiency of configuration, diagnostics and repair and represent just the tip of the iceberg. In the first half of 2009 we will be conducting another ROI exercise that will take into account the additional use cases we plan to implement over the next two years (described later in this paper). Based on this expansion, we expect to see exponential growth in both cost savings and ROI.

# Key Learnings and Recommendations

The following recommendations are based on our experience to date in integrating Intel vPro technology-based solutions into our existing client management environment. The best approach may vary for each organization, depending on goals, requirements and current solutions.

- **Evaluate the potential for Intel vPro technology in your environment** - If you decide to take advantage of these management capabilities, it makes sense to begin integrating Intel vPro technology-based client systems into your standard PC refresh cycle as soon as possible. This will magnify your returns on the future investments you make to upgrade your client management infrastructure and operations.
- **Provision all new clients for Intel vPro technology-based management** - Before we began planning our implementation, we were deploying systems without provisioning them (Figure 6). Although we now have a goal to provision 90 percent of these systems by the end of 2008, the cost of this after-the-fact provisioning is roughly \$100K, since a technician has to physically touch each machine. We could have eliminated this expense by provisioning all new clients when they were initially deployed. (To ensure maximum coverage, consider having support personnel run a script to validate provisioning whenever they physically touch a machine, e.g., during break-fix support).
- **Check with your preferred client management application vendor to assess support for Intel vPro technology** - Leading ISVs offer support for key functions and continue to add capabilities. However, support does vary and it's important to make sure your plans mesh with the capabilities supported by your preferred vendor.
- **Perform a detailed gap analysis for your selected use cases** - This is essential to ensure key requirements are not overlooked. In our planning process, we divided gap analysis into three steps. First, we mapped our existing process flows and future process flows for each use case. Second, we identified all gaps and bundled them into four categories (solutions, skill-set, processes, tools). Third, we assigned owners to ensure every gap was addressed in our project plans.
- **Consider beginning with a small pilot deployment** - Our proof-of-concept deployment to Intel Training Rooms gave us confidence in the value we could realize and helped us clearly define requirements.



**Figure 6. Provisioning Intel® vPro™ technology in new clients is essential to realize full value. Though we should have begun sooner, we have ramped up our provisioning processes in 2008, and are rapidly catching up with the backlog. (Quantities for December, 2008 are based on internal projections.)**

## Where We Go from Here

Intel IT will be expanding its implementation of Intel vPro technology in 2009 by integrating more use cases. Our efforts will focus primarily on capabilities that will help us improve efficiency and effectiveness for security and asset management. To date, our planned use cases for 2009 implementation include:

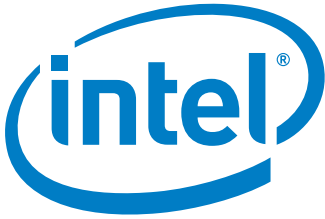
- **Auditing and compliance** – By increasing the accuracy and completeness of down-the-wire auditing, we will largely eliminate the need for physical audits and help to improve our compliance with Sarbanes Oxley.
- **System defense** – Infected or noncompliant client systems will be automatically limited from full access to the network; and reconnected only after they have been healed and returned to full compliance (all this will be accomplished remotely using out-of-band connectivity).
- **Sustainability/Green IT** – Client systems that are not in use will be detected and automatically powered down yet will remain accessible and manageable over the network.
- **Remote builds** – The ability to build systems over the network anytime and anywhere will simplify deployment and maintenance and reduce associated support costs.
- **Agent presence checking** – Antivirus compliance will be verified down-the-wire, even for systems that are powered off.
- **Last day office HDD wipe** – On an employee's last day in the office, his or her system will be powered up remotely and the hard drive will be erased.

Until now, we have been “pushing” Intel vPro technology-based processes into our client management environment. In 2009 and beyond, we expect to see increasing “pull” from our client support teams. As they experience the power of these capabilities, they can begin to integrate them into more processes and use cases to address their specific organizational needs and pain points. We will encourage this process by establishing giveaways and other incentive programs to motivate support personnel to find, implement, and share valuable new solutions.

We believe this decentralized implementation strategy will ultimately drive faster innovation, more comprehensive use and better overall value than we could achieve with our current top-down approach. In tandem with our growing base of Intel vPro technology-provisioned clients, we are confident that the returns on our client management investment will increase dramatically over the next few years and help to substantially increase the value—and reduce the cost and risk—of our client assets.

## Conclusion

In 2008, Intel IT moved beyond pilot programs and began implementing Intel vPro technology across the enterprise. To garner support for what will be a multi-year implementation, we selected three use cases that would be easy to implement. This approach has been successful and has delivered substantial cost savings, while laying a foundation for moving forward. We hope this strategy will provide a good model for other IT organizations as they begin to implement next-generation client management solutions based on Intel vPro technology.



[www.intel.com/IT](http://www.intel.com/IT)

## Additional Resources

- **IT@Intel** – Access additional information and resources from Intel’s IT organization.  
<http://www.intel.com/IT>
- **IT@Intel Open Port** – Engage with Intel’s IT leaders in a community forum that includes presentations, blogs and open discussions with a broad community of IT professionals.  
<http://communities.intel.com/community/it>
- **Intel vPro Expert Center** – Find technical resources and get guidance and support from Intel experts and others who are planning or implementing Intel vPro technology-based client management solutions.  
<http://communities.intel.com/community/vproexpert>
- **Intel vPro Technology Web Site** – Learn more about the technology and the value it delivers, through case studies, white papers and product information.  
<http://www.intel.com/technology/vpro/index.htm>

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## Acronyms

CA	Certificate Authority	RC	Remote Configuration
DHCP	Dynamic Host Configuration Protocol	RDLR	Remote Diagnosis and Local Repair
DNS	Domain Name Server	RDRR	Remote Diagnosis and Remote Repair
DS	Directory Services	ROI	Return on Investment
HTTP	Hypertext Transfer Protocol	SOL	Serial-Over-LAN
IDE-R	Integrated Drive Electronics Redirect	TAM	Total Available Market
ISV	Independent Software Vendor	TCP/IP	Transmission Control Protocol/ Internet Protocol
NPV	Net Present Value	TLS	Transport Layer Security
OOB	Out of Band	WBS	Work Breakdown Structure

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