



WIPRO
Applying Thought

The Benefits of Intel® Centrino® with vPro™ Technology in the Enterprise

Global Product Strategy & Architecture Practice,
Wipro Technologies

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INTRODUCTION

PCs are essential in today's enterprises, yet managing a PC fleet can consume a significant portion of IT's time and budget. Finding ways to keep employees productive with powerful notebook PCs while keeping IT management costs low requires a combination of sound IT management practices and technology that maximizes benefits to users and minimizes effort for IT.

Intel® Centrino® with vPro™ technology is the culmination of a large-scale initiative to support efforts to keep business users as productive as possible on notebooks and help IT keep cost and efforts low to manage the entire PC fleet. For more information see www.intel.com/business/centrinopro. Intel® Centrino® with vPro technology is built on the same technology as Intel® Core™2 processor with vPro™ technology. For more information see www.intel.com/business/vpro. Released in 2007, business notebooks with Intel® Centrino® with vPro technology deliver a promising mix of built-in manageability, proactive security, and energy-efficient performance capabilities. Key technical components include the Intel® Core™2 Duo processor, the Mobile Intel® GM/PM965 Express chipset, the Intel® Wireless WiFi Link 4965ABG, Intel® Active Management Technology 2.5 (Intel® AMT),¹ and Intel® Virtualization Technology (Intel® VT).² Moreover, compliance with the Intel® Stable Image Platform Program (Intel® SIPP) is a key advantage of most Intel Centrino with vPro technology-based systems.³ Intel SIPP enables a more predictable annual transition from one generation of technology to the next by ensuring no required changes to key platform components or drivers for at least 15 months from introduction. This allows for a 3-month qualification period and a 12-month deployment cycle.

This paper presents the results of research sponsored by Intel and conducted by Wipro Product Strategy & Architecture (PSA) practice, designed to examine the potential impact of Intel Centrino Pro processor technology on the total cost of ownership (TCO) for business notebook PCs. This analysis examines how Intel Centrino Pro processor technology can help reduce infrastructure complexity, and how the technology affects manageability and IT costs. This research extends concepts originally described in Wipro's New Insights on PC Management study,⁴ which detailed the relationship between infrastructure complexity and overall notebook support costs.

EXECUTIVE SUMMARY

Intel® Centrino® with vPro™ technology can have a significant positive impact on IT efficiency. When the technology is deployed in notebooks as part of a comprehensive PC refresh program, companies can achieve a reduction in hardware complexity and realize additional, corresponding cost savings. In order to measure potential benefits, Wipro surveyed senior IT managers from 41 companies in a variety of industries (See Table 1) about current notebook management activities and costs that could potentially be reduced by notebooks with Intel Centrino with vPro technology.

The number of mobile workers ranged from 1,000 to 80,000 in the 41 companies whose IT managers Wipro surveyed. Just over half of the companies were based in North America, and the rest were based in Europe. Using the mean number of notebooks for those mobile workers (12,300 notebooks) and additional information gleaned from survey responses concerning the IT tasks that are typically performed today, Wipro created an enterprise model as a basis for comparison (See Appendix B). Then Wipro estimated the cost of notebook hardware management inefficiencies for the enterprise model and the savings that Intel Centrino with vPro technology could bring about by reducing those inefficiencies.

With this framework, Wipro found:

1. A company with 12,300 notebooks and a 3-year refresh cycle is projected to achieve notebook management cost reduction of approximately \$90,915 in year one of the refresh to over \$617,820 in year four when the entire installed base uses notebooks with Intel Centrino with vPro technology (See Figure 1). To show the full cost benefits of a technology refresh cycle, all figures include the savings for the year following the completed refresh.

Industries Surveyed for This Study	
Aerospace Manufacturing	Government
Automotive	Healthcare
Banking	Insurance
Biotech	Legal
Education	Manufacturing
Energy	Pharmaceuticals
Engineering	Retail
Financial Services	Transportation

TABLE 1. Wipro surveyed senior IT managers representing these industries

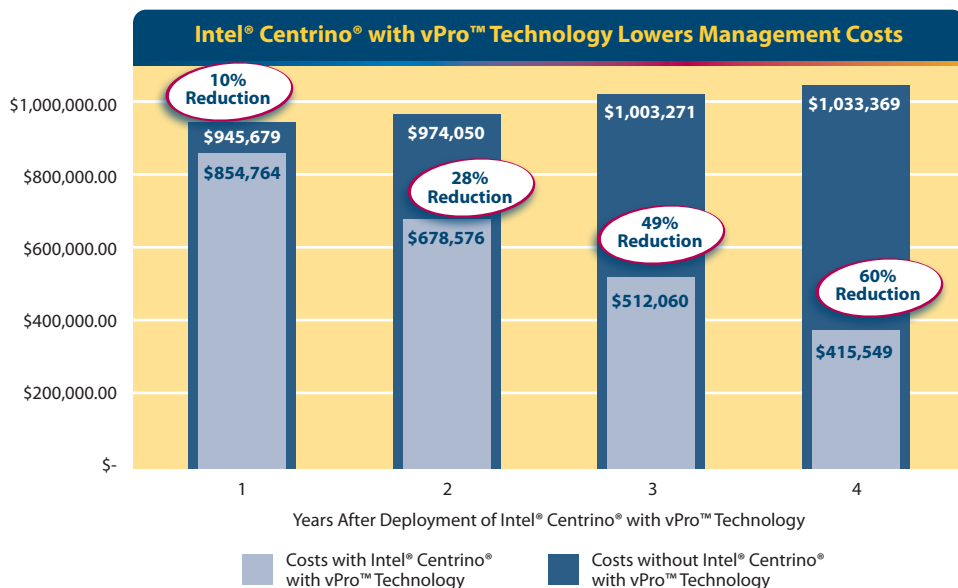


FIGURE 1. Comparison of costs for managing notebooks without and with Intel® Centrino® with vPro™ technology in a company with 12,300 notebooks using a 3-year refresh cycle.

2. Large savings are obtained from reducing annual costs of resolving the following automated notebook management failures:

Problem Area	Cost to Resolve without Intel® Centrino® with vPro™ Technology	Cost to Resolve with Intel® Centrino® with vPro™ Technology	Percentage Savings
Hardware and Software Malfunctions	\$712,416	\$302,686	58%
Audit Failure	\$105,270	\$44,767	57%
New Application Deployment Failure	\$49,055	\$18,086	63%
Patch Deployment Failure	\$35,872	\$17,255	52%

TABLE 2. Savings created by Intel® Centrino® with vPro™ technology in key problem areas.

3. A company with 12,300 notebooks and a 3-year refresh cycle is projected to achieve notebook management net savings of approximately \$588,404 in year four, when the entire installed base uses notebooks with Intel Centrino with vPro technology (See Figure 2).

Widespread deployment of notebooks with Intel Centrino with vPro technology can drive down hardware complexity, resulting in reduction in hardware-related IT support costs. This is primarily due to the efficiencies gained when a PC installed base is Intel SIPP-compliant. For example, in a U.S. company with 12,300 non- Intel SIPP-compliant notebooks, the hardware-related IT support costs would fall from \$2,256,915 to \$1,681,668 if the model company's installed base was transformed to 100 percent Intel SIPP-compliant. The result would be an estimated annual savings of slightly more than \$191,749, which is cumulative year over year. The net cost reduction is approximately 25 percent.

Even though notebooks with Intel Centrino with vPro technology are initially expected to be slightly more expensive than typical mid-range business desktop PCs, the business benefits realized from the notebooks more than cost-justify the wide adoption of notebooks based on this new technology.

Finally, this paper includes three different scenarios of companies that have adopted Intel Centrino with vPro technology and have received compelling benefits from the adoption. The scenarios demonstrate that whether large or small, companies that move to Intel Centrino with vPro technology-based notebooks to support the mobile environment will be rewarded with substantial financial benefits, lower IT management costs, and productive employees.

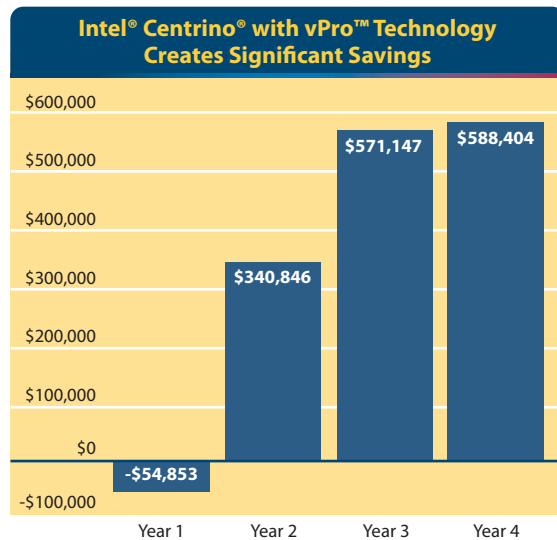


FIGURE 2. Estimated annual notebook management net savings due to notebooks with Intel® Centrino® with vPro™ technology in a company with 12,300 notebooks and a 3-year refresh cycle.

PROJECTED BENEFITS OF NOTEBOOKS WITH INTEL® CENTRINO® WITH vPRO™ TECHNOLOGY

The main objective of this study is to closely examine the effect that the adoption of Intel Centrino with vPro technology can have on notebook management and related costs. To that end, Wipro analysts focused on the benefits of Intel® Active Management Technology 2.5 (Intel® AMT) and Intel® Virtualization Technology (Intel® VT). They are two key components of Intel Centrino with vPro technology that Wipro believes are most likely to have a clear, quantifiable impact on Total Cost of Ownership (TCO) of the notebook installed base. In fact, these two technologies alone have the potential to reduce or eliminate entire categories of IT support costs for notebooks. Their benefits are as follows:

- **Dramatically improved management of major hardware and software malfunctions.** Since Intel Centrino with vPro technology agents are available and operational even when the notebook itself will not boot, IT will benefit from the ability to query the deployed hardware and software configuration, remotely boot and test the system from a management console, and then take remedial action (including ordering a new notebook in the event the system is unrepairable) without time-consuming deskside visits or user intervention.
- **Improved remote asset inventories.** Whether or not they are powered on, it is easier to correctly identify notebooks with Intel Centrino with vPro technology. This can result in a net reduction of inventory failures, audit failures, re-counts, and misidentification of assets. Based on Wipro research, up to 72% of this remedial work can be eliminated with an installed base of Intel Centrino with vPro technology-based notebooks.
- **Easier and faster software deployment.** Intel Centrino with vPro technology can enable application and patch deployments—including security updates—to occur more rapidly, with dramatically reduced times for recovery from failed deployments. Likely reductions are attributable to simplification of problem diagnosis, elimination of most deskside visits, and fewer failed deployments due to misidentification of target systems. In addition, by deploying security updates more promptly, IT managers can minimize the time it takes to close any windows of vulnerability.
- **More effective hardware deployment.** Intel Centrino with vPro technology enables IT departments to minimize diagnosis, troubleshooting, and physical deskside visits associated with failed deployments of new notebooks.
- **More efficient and faster response to security incidents.** Often the best response to security incidents such as worms or virus attacks is the swift reconfiguration of ports and network connectivity by management software. Intel Centrino with vPro technology can make IT personnel more responsive by virtually eliminating the cases where manual effort is required to achieve reconfiguration.

In translating these benefits to cost reduction, Wipro asked the survey respondents to provide time and effort estimates for problem resolution techniques. We collected data on four techniques for solving problems: user assisted via phone, down the wire, shipped notebook to IT, and deskside visit by IT. Each technique for resolution requires some degree of IT planning and labor, but with Intel Centrino with vPro technology, time and effort is reduced for two of these techniques – shipped notebook to IT and desk side visit. The effort reductions are significant for both of these techniques, but there remains some percentage of problems that are not resolvable even with Intel Centrino with vPro technology. Figure 3 shows the reducible effort areas for problem resolution techniques that Intel Centrino with vPro technology offers adopting organizations.

Using the survey data, we also calculated the percentage of reducible effort for each of the problem areas we measured. Table 3 shows the percentage of reducible effort due to Intel Centrino with vPro technology for each of the problem areas that we measured as is visualized in Figure 3.

Category	Percent Reducible
New Application Deployment	96%
Service Pack, Patch and Updates	79%
Mobile PC Audits	88%
Mobile PC Inventory	95%
Help Desk and Major Hardware Malfunctions	89%
Help Desk and Major Software Malfunctions	87%
Security Incident Management	20%

TABLE 3. Percentage of problem area effort reduced by Intel® Centrino® with vPro™ technology.

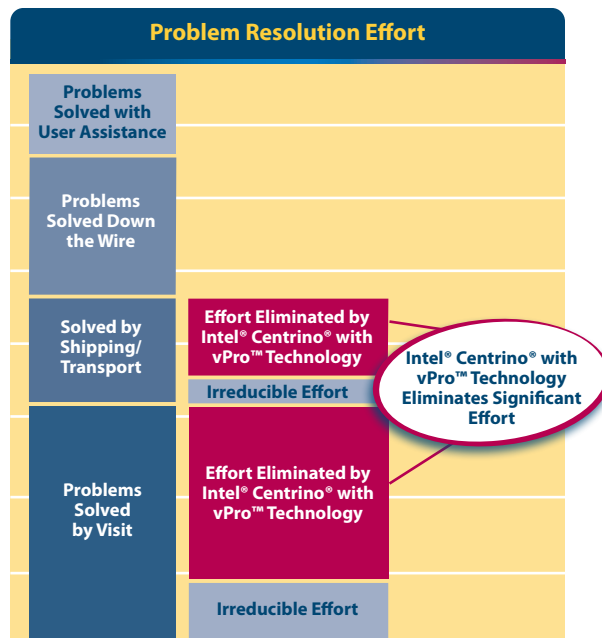


FIGURE 3. Effort reduced by Intel® Centrino® with vPro™ technology. Size of boxes not proportional to reduction. See Table 3 for actual reduction.

Determining Notebook Manageability State

Because this study was focused on mobile computing and the use of notebooks, we created what we call a notebook manageability state model to calculate when the notebooks were able to leverage the Intel Centrino with vPro technology (meaning that they were manageable by IT systems). The Intel Centrino with vPro technology adds various benefits depending on the network and power states of the notebook. See Appendix D for more information about the applicability of the Intel Centrino with vPro technology benefits at various states. Because of the mobility of notebooks, workers can either be in the office or using their notebooks out of the office. During a given 24 hour period during the five day work week, the notebooks are in one of four states: AC powered, on battery, asleep, or off. Our model assigned percentages for these four states during the work day. Additionally, during the same 24 hour period, the notebooks are either connected through wired or wireless technology. Using the data collected from the interviewed companies, we created a model (See Figure 4) that factored in average times for all of these variables.

Intel® SIPP Benefits

Previous Wipro research into the relationship between desktop hardware complexity and IT support costs shows a direct correlation between the numbers of deployed hardware configurations and hardware-related IT support costs. (See Wipro white paper, *New Insights on PC Management*) For each distinct hardware configuration

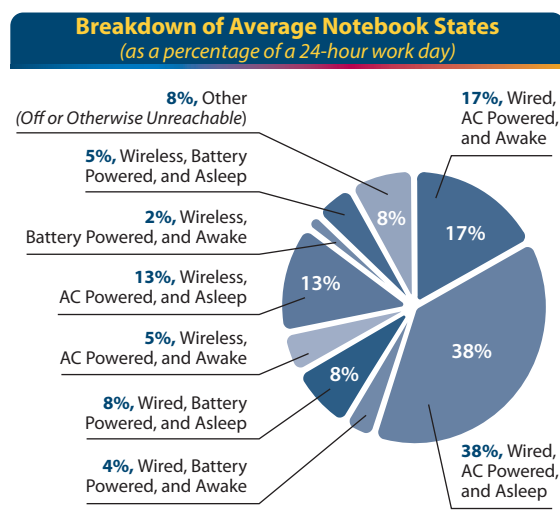


FIGURE 4. Model used to determine manageability states.

in an enterprise's installed base, firms incur an additional average cost of \$12 per PC per year, made up of additional testing, deployment and help desk labor. For a firm with 12,300 notebooks, this means an average of \$147,600 in additional spending for every configuration. Because Intel SIPP specifies timing and alignment of an OEM's hardware configuration introductions, it effectively eliminates those types of surprises. By bringing Intel SIPP-regulated notebooks into a structured refresh cycle, companies can reduce the number of deployed configurations by up to 35 percent. Thus, there is the potential for substantial savings for companies that migrate to Intel Centrino with vPro technology.

Relationship to Intel® Core™2 Processor with vPro™ Technology Benefits

Previous Wipro research into the benefits of Intel® Core™2 processor with vPro™ technology in 2006 showed a similar pattern to the Intel Centrino with vPro technology. The savings in managing notebooks with Intel Centrino with vPro technology mimics the savings created by Intel Core 2 processor with vPro technology in desktop PCs. The overall savings follow the same yearly return pattern and the savings in specific problem resolution areas generally follow the same pattern.

Adopters can begin seeing returns in their very first year of deployment. The cost savings trends are strikingly similar. For those companies already experiencing the benefits of Intel Core 2 processor with vPro technology, they should expect the same type of benefits from Intel Centrino with vPro technology. See *Measuring the Value of Intel® Core™2 Processor with vPro™ Technology in the Enterprise* (2006) for more details on the value of Intel Core 2 processor with vPro technology.

Cumulative Savings from Intel® SIPP and Intel® Centrino® with vPro™ Technology

When the saving generated by adoption of Intel SIPP is coupled with the reduction in IT support costs enabled by Intel Centrino with vPro technology, the return on investment becomes even more compelling. The estimated payback period for a firm with 12,300 notebooks is 15 months, assuming that implementation and the additional cost of the new technology amounts to \$360,000.

Table 4 shows the calculated savings per system per year after year three. The manual hardware and software malfunction cost reduction combines IT labor savings from fixing issues down the wire using Intel Centrino with vPro technology with helpdesk cost reductions due to the adoption of Intel SIPP. As the firm standardizes on notebooks with Intel Centrino with vPro technology, the reduction in complexity generates almost \$100 per system per year in SIPP savings across the categories outlined below. These savings are compounded across all categories by the benefits from Intel Centrino with vPro technology, generating savings of \$142 per system per year after year three.

Category	Savings
Manual HW and SW malfunction cost reduction	\$67.76
Minor app / SW update reduction in deployment failure rate	\$50.71
Major app deployment cost reduction	\$12.36
Mobile PC audit failure reduction	\$7.00
Other	\$4.92
Total	\$142.75

TABLE 4. Savings / PC / Yr After Year Three generated by adoption of Intel® SIPP and Intel® Centrino® with vPro™ technology for a company with 12,300 notebooks with a 3 year refresh cycle.

PROJECTED NET BENEFITS OF DEPLOYING INTEL® CENTRINO® WITH vPRO™ TECHNOLOGY

Wipro's survey of IT representatives from 41 North American and European companies brought to light many IT support processes and associated costs that Intel Centrino with vPro technology could positively affect. Survey responses indicate that there are four major cost savings opportunities:

1. Reduction in Hardware and Software Malfunctions (See Figure 5)
2. Audit Failure Resolution (See Figure 5)
3. Patch Deployment Failure Resolution (See Figure 6)
4. New Application Deployment Failure Resolution (See Figure 6)

Reduction in Hardware and Software Malfunctions

Notebook failures due to hardware and software frequently require significant manual labor to resolve. In the case of mobile notebook computing, these failures can cost the organization a substantial amount of money with desk side visits potentially being delayed while workers are out of the office or costly because of notebook shipping requirements for road warriors. But with Intel Centrino with vPro technology, our model company experienced a 58% reduction on desk side visits for hardware malfunctions and a 57% reduction in desk side visits for software malfunctions.

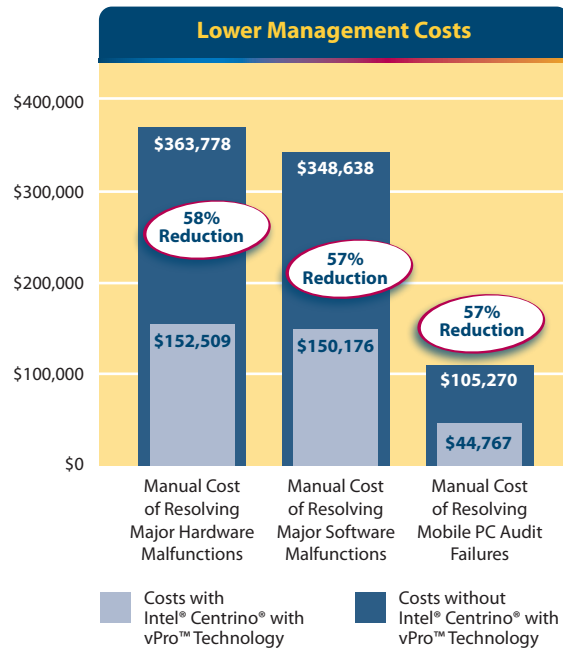


FIGURE 5. Summarizes the annual costs for specific problem resolution areas for 12,300 notebooks with Intel® Centrino® with vPro™ technology and a 3-year refresh cycle.

Audit Failure Resolution

Audit failure is a common problem with mobile notebook computing, and the majority of these failures require manual effort (desk side visit and shipping of notebook) to resolve the audit failure. Our data shows that nearly 25% of audits are inaccurate when first conducted, and this is typically impossible to solve “down the wire.” But with Intel Centrino with vPro technology, 82% of these audit failures can now be resolved “down the wire,” which dramatically reduces the overall effort and cost attributed to the manual efforts previously required.

Patch Deployment Failure Resolution

Ensuring that all patches get deployed to all machines can be extremely challenging in a highly mobile environment. With workers either on the road or away from their primary office location and off of the network, reaching every notebook is not always possible. But with Intel Centrino with vPro technology, IT has a way to be more effective in deploying patches to the entire install base. It not only reduces the failures, but it also helps IT reach hard to manage notebooks. From the model company data (whose patching strategy is to deploy as soon as practical), the net time to deploy patches is cut by 51%. For the model company, up to 22% of notebooks are unreachable when a patch is rolled out, requiring extra effort by IT to deploy the patch on those notebooks. But with Intel Centrino with vPro technology, that 22% is reduced to 4%, which in turn reduces the additional effort required by IT to deploy the patch.

New Application Deployment

New application deployment failures can be particularly costly to organizations with mobile workers because resolution of the problem includes not just having IT fix the problem but also having a mobile worker without a notebook for what could be a significant period of time. Also, problems do not always manifest themselves immediately with workers on the road or away from their primary office location, which extends the resolution process. Of the companies we surveyed, we found that on average, notebook users are without their notebooks for 1.5 days while IT works to resolve a new application deployment problem. The maximum outage reported by the surveyed companies was two weeks, and the minimum was 30 minutes.

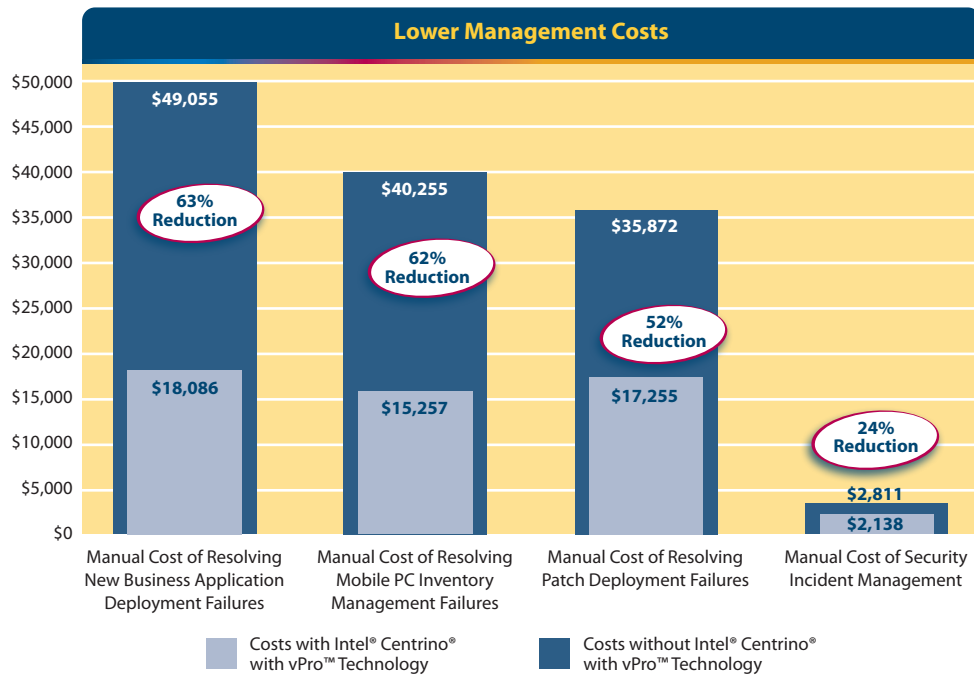


FIGURE 6. Summarizes the annual costs for specific problem resolution areas for 12,300 notebooks with Intel® Centrino® with vPro™ technology with a 3-year refresh cycle.

EXAMPLES OF THE VALUE OF INTEL® CENTRINO® WITH vPRO™ TECHNOLOGY

To illustrate the benefits of Intel Centrino with vPro technology in action, Wipro chose three companies from the research base that demonstrate common usage scenarios for mobile computing. Since these examples are for specific companies, some of the model company assumptions have been customized to suit individual scenarios.

Scenario One

In the first scenario (see Figure 7), the North American company has a total of 50,000 employees, of which 40,000 are using desktop PCs and 10,000 are using notebooks. The workforce has a white collar make up that includes 10,000 knowledge workers and 37,000 structured task workers. Of the knowledge workers, 40% are mobile, and of the structured task workers, 16% are mobile. Collectively, these mobile workers use the wired network 80% of the time while in the office and 90% of the time while out of the office. The company's IT department has established good baseline management practices within the last 4 years, bringing the PC environment under control.

The company has a goal to move more of its knowledge workers to notebooks and thus increase the overall percentage of its total workforce using notebooks. IT plans to adopt mid to high-end notebooks that include the Intel Centrino with vPro technology and use a 2-year refresh cycle to better support the knowledge workers.

Scenario One

50,000 Employees with 10,000 mobile workers

High percentage of knowledge workers

Company goal = become more mobile

By adopting Intel Centrino with vPro technology, the company can acquire 1,680 'free' notebooks per year

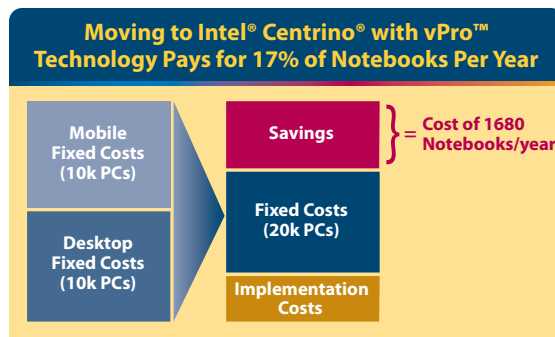


FIGURE 7. Benefits of becoming more mobile in a large enterprise through Intel® Centrino® with vPro™ technology-based notebooks

Impact of Moving to Intel® Centrino® with vPro™ Technology-Based Notebooks

- Switching the current 10,000 mobile installed base to Intel Centrino with vPro technology will lead to \$742,000 in savings.
- Replacing 10,000 of the desktops with 10,000 Intel Centrino with vPro technology-based notebooks on a two-year refresh cycle will save further \$1.02M in fixed costs.
- The net result is that the company can acquire 1,680 'free' Intel Centrino with vPro technology-based notebooks per year, which constitutes over a third of the 5,000 PCs that replace the desktops. This includes the money not spent on desktops that year.

Scenario Two

In the second scenario (see Figure 8), the company has 40,000 employees with 11,000 using notebooks. 80% of these notebooks are basic, and the remaining 20% are mid-range notebooks. IT has acquired these notebooks from four different vendors and has deployed 14 different models. The guiding principle for IT was to choose the lowest priced notebook to support the employees. IT uses a 4-year refresh cycle and only buys new notebooks when it is absolutely essential.

Moving forward, IT plans to gain better control over its notebook procurement and management practices as it invests in 11,000 new notebooks with Intel Centrino with vPro technology. IT will also move to a 3-year refresh cycle, source its new notebooks more strategically and reduce the number of vendors and models in the environment. These steps are designed to reduce the overall cost of managing the notebook fleet and improving the mobile computing experience for the workforce.

Scenario Two
40,000 Employees with 11,000 mobile workers
Company goal = lower PC management cost and improve mobile worker computing experience
By adopting Intel Centrino with vPro technology, the company realizes \$691,207 in savings

Impact of Moving to Intel® Centrino® with vPro™ Technology-Based Notebooks

- The company will realize a savings of \$691,207 once all of the new 11,000 notebooks are fully rolled out.
- The first year investment is only 4% of annual hardware budget.
- The full ROI is realized at 2 1/3 years.

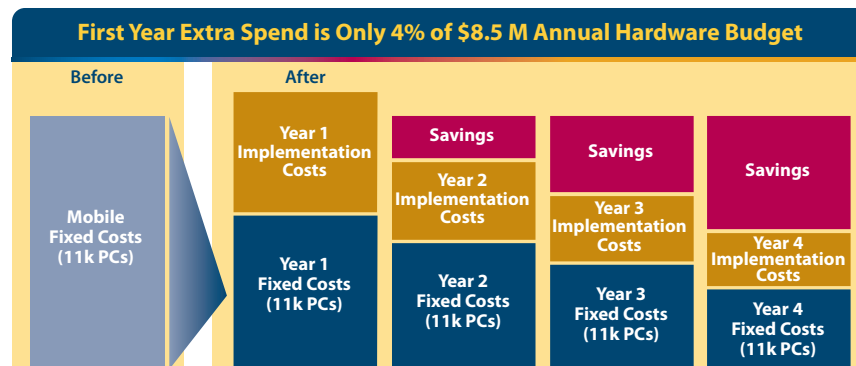


FIGURE 8. Benefits of improving management practices and adopting Intel® Centrino® with vPro™ technology-based notebooks.

Scenario Three

The third scenario demonstrates that the benefits of Intel Centrino with vPro technology are just as applicable to small companies as they are to large enterprises (see Figure 9).

In this scenario, the company has 3,000 mobile workers using a variety of notebooks. A high percentage of these workers are traveling sales and marketing staff. IT has considered supporting these road warriors with more robust notebooks, but it has been cautious to move forward, sensing that the move would be costly and add more complexity to the environment. But with Intel Centrino with vPro technology-based notebooks, the company will see a compelling financial picture to move the user base to more robust notebooks.

Scenario Three

3,000 mobile workers

Company goal = support mobile workers with more powerful notebook PCs

By adopting Intel Centrino with vPro technology, the company realizes full payback on initial investment in one year

Impact of Moving to Intel® Centrino® with vPro™ Technology-Based Notebooks

- Migrating all 3,000 road warriors to Intel Centrino with vPro technology achieves full payback in the first year.
- The company is able to leverage benefits of turning on Intel Centrino with vPro technology while avoiding process re-engineering and consulting charges.

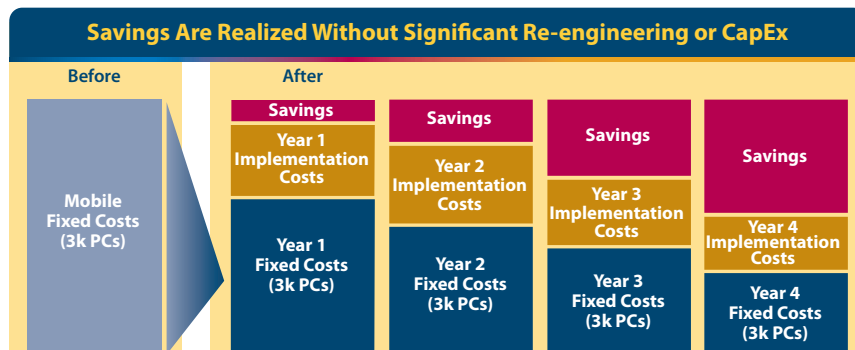


FIGURE 9. Benefits of migrating to Intel® Centrino® with vPro™ technology-based notebooks for a small company.

CONCLUSION

Year after year, IT executives have the unenviable responsibility of assessing the value of the PC installed base and making purchasing decisions that can have a profound impact on end-user productivity and job satisfaction, not to mention an enterprise's bottom line. For many CIOs and network managers, the difficulty of this task is compounded by the sheer quantity of variables involved—multitudes of hardware and software configurations in various lifecycle stages, plus new technologies that, upon implementation, may or may not live up to vendors' claims.

But as this research shows, Intel Centrino with vPro technology enhances IT efficiency and as part of a comprehensive PC refresh program, reduces hardware complexity. The benefits apply to large enterprise and small businesses and are achievable whether the company strategy is to increase notebook deployment or upgrade an existing install base of notebooks. Based on Wipro's survey of 41 companies and the resulting enterprise model, Wipro was able to estimate how much notebook hardware management inefficiencies were costing the enterprise and model the extent to which Intel Centrino with vPro technology can reduce or eliminate those inefficiencies and their associated costs. The key areas in which the Intel Centrino with vPro technology makes a significant difference are:

- Reduction in Hardware and Software Malfunctions
- Patch Deployment Failure Resolution
- Audit Failure Resolution
- New Application Deployment Failure Resolution

Wipro concludes that the benefits of adopting Intel Centrino with vPro technology-based notebooks as part of a structured refresh cycle can be substantial and that those benefits clearly outweigh the additional upfront cost of purchasing notebooks based on the Intel Centrino with vPro technology.

APPENDICES

Appendix A. Research Methodology

In 2007, Wipro PSA consultants and technical architects interviewed CIOs, IT directors, and senior IT managers at 41 companies with headquarters in North America and Europe. We selected a representative sample of firms which had:

- An average of 12,300 notebooks covering 7 locations
- 75 percent of all desktops supported with automated desktop management software

Wipro PSA selected companies to represent a diversity of industries, management practices, and user distributions, ranging from 1,000 to 80,000 mobile workers. All interview participants are actively involved in the planning and execution of the management processes discussed in the survey. The specific assumptions used to model the representative organization and desktop support environment, based on the survey participant profile, are noted in Appendix B.

All the companies surveyed rely on in-house personnel to conduct the IT business processes analyzed in this study. Some use contract staff for certain roles but retain final control and accountability within the organization. This ensured that all reporting reflected direct, hands-on experience with actual management practice.

For this study, Wipro analysts compared the standard set of support capabilities and related IT activities against the capabilities and activities associated with Intel Centrino with vPro technology in order to identify the areas in which Intel Centrino with vPro technology would have a significant impact. Based on this comparison, researchers concluded that Intel Centrino with vPro technology can mitigate the cost and labor requirements required to investigate and resolve:

- PC deployment failures
- Application deployment failures
- Patch management failures
- Audit failures
- Inventory failures
- Major hardware malfunctions
- Major software malfunctions
- Security incidents

Effort and costs are reduced by:

- Eliminating and minimizing manual tasks, such as desktide visits, shipping or transporting of PCs, or inefficient remote problem diagnosis.
- Reducing indirect IT support costs due to the lowering of overall desktop complexity, realized by migrating to Intel SIPP-compliant, Intel Centrino with vPro technology-enabled notebooks. Prior research by Wipro has shown a direct correlation between hardware complexity and overall support costs.
- Increasing the capabilities provided by automated desktop management and security software.

Implementation Costs of Deploying Intel® Centrino® with vPro™ Technology

The projected net benefits of deploying notebooks with Intel Centrino with vPro technology were obtained by balancing the one-time and per-PC implementation costs against yearly savings. Since we assume that notebooks with Intel Centrino with vPro technology are phased in via a company's normal refresh process, yearly savings increase as the refresh cycle proceeds.

Implementation Costs

Both one-time and per-PC implementation costs have been included in our analysis:

One-time implementation costs. These costs are incurred in the first year of Intel Centrino with vPro technology implementation:

- Training of IT installation and support staff
- Staff / consulting costs associated with re-engineering the IT installation and supporting processes to include Intel Centrino with vPro technology-specific activities
- Engineering costs to integrate Intel Centrino with vPro technology features and capabilities with an existing inventory, trouble ticketing system, alert/event database(s), etc.

Per-PC implementation costs. These costs are incurred as the PCs are installed:

- OEM Intel Centrino with vPro technology charge – additional premium charged by OEMs for Intel Centrino with vPro technology-based notebooks
- Configuration cost – additional cost of configuring notebooks with Intel Centrino with vPro technology
- Inventory cost – additional cost to install notebooks with Intel Centrino with vPro technology during an inventory update

It is assumed that there is no additional license charge by Independent Software Vendors for notebook management / security software to support notebooks with Intel Centrino with vPro technology, as this support will be included in their normal release updates.

Costs and savings were calculated using the average burden rate of the surveyed companies, shown in Appendix B

Appendix B. Assumptions Used to Model a Representative Environment

Company Average	Value
Number of Notebooks	12,300
Number of Notebook Vendors Supported	3
Refresh Cycle	3 year
Percentage of Notebooks Supported by Automation Management Software	75%
Number of Notebook Models Deployed Per Year	5
Average Annual Burden Rate - Level 1	\$76,905
Average Annual Burden Rate - Level 2	\$113,541
Average Annual Burden Rate - Level 3	\$170,267

Appendix C. Glossary of Terms Used in the Study

Term	Definition
Company	See enterprise.
Enterprise	The entire firm. For example, if the question asks the number of clients in your enterprise, it refers to the number of clients across all worldwide locations.
Hardware Configuration	A collection of PCs that use the same hardware driver stack.
Intel® Active Management Technology 2.5 (Intel® AMT)	A solution for improving PC management, Intel Active Management Technology 2.5 along with third-party applications allows IT to better discover, heal, and protect networked PCs. Intel AMT stores hardware and software information in non-volatile memory. With built-in manageability, Intel AMT allows IT to discover assets even while PCs are powered off. In addition, Intel AMT provides out-of-band management capabilities to allow IT to remotely heal systems after OS failures. Lastly, Intel AMT is able to contain infected clients as well as block incoming threats.
Intel® Virtualization Technology (Intel® VT)	Intel® Virtualization Technology (Intel® VT) is comprised of a set of processor enhancements that improve traditional software-based virtualization solutions. These integrated features give virtualization software the ability to take advantage of offloading workload to the system hardware, enabling more streamlined virtualization software stacks and “near native” performance characteristics.
Notebook PC	Any PC that is built to be mobile, such as a notebook or laptop, and is not a smart phone or personal digital assistant (pda).
Refresh Cycle	The planned length of time from when PCs are deployed to when they are decommissioned and replaced by new PCs.
Security Incidents	Events where the network is attacked by malware (i.e., viruses, trojan horses, worms, etc.) or is otherwise misconfigured, and IT staff is unable to reach desktop PCs to protect them or get them back online.
Total Cost of Ownership (TCO)	TCO accounts for all the costs associated with procuring, deploying, and owning IT systems. TCO includes purchase, lease, and maintenance costs for hardware and software. It also includes labor costs associated with planning, purchasing, testing, configuration, deployment, software updates, training, and technical support. Some TCO models, such as Gartner's, also include end-user costs such as downtime and peer support. TCO models do not take into account the end-user benefits that flow from a technology, such as increased productivity.

Appendix D. Manageability States for Intel® Centrino® with vPro™ Technology

Use Cases	Usages	Wired Capabilities					
		Plugged Into Power			Battery Power		
		Awake/Healthy	Awake/Sick	Asleep	Awake/Healthy	Awake/Sick	Asleep
Remote platform/hardware/software asset tracking	Discover platform hardware and software inventory regardless of OS or power state	Yes	Yes	Yes	Yes	Yes	NA
Remote diagnosis and repair	IT diagnoses remotely, out-of-band via event log stored in non-volatile memory and serial-over-LAN/IDE-redirect remote boot	Yes	Yes	Yes	Yes	Yes	
Encrypted, remote software update	ISV application discovers/updates down-rev anti-virus engines and signatures	Yes	Yes	Yes	Yes	Yes	
System isolation and recovery	Virus outbreak protection	Yes	Yes	NA	Yes	Yes	
Agent presence checking and alerting	Ensure critical applications are running	Yes	Yes		Yes	Yes	

Awake = System is on **Asleep** = System is standby, hibernate, or off **Healthy** = User OS up and running **Sick** = User OS is down

Use Cases	Usages	Wireless Capabilities*					
		Plugged Into Power			Battery Power		
		Awake/Healthy	Awake/Sick	Asleep	Awake/Healthy	Awake/Sick	Asleep
Remote platform/hardware/software asset tracking	Discover platform hardware and software inventory regardless of OS or power state	Yes Also supported in presence of L3 VPN	Yes	NA	Yes	Yes	NA
Remote diagnosis and repair	IT diagnoses remotely, out-of-band via event log stored in non-volatile memory and serial-over-LAN/IDE-redirect remote boot	Yes	Yes		Yes	Yes	
Encrypted, remote software update	ISV application discovers/updates down-rev anti-virus engines and signatures	Yes	Yes		Yes	Yes	
System isolation and recovery	Virus outbreak protection	Yes	Yes		Yes	Yes	
Agent presence checking and alerting	Ensure critical applications are running	Yes Also supported in presence of L3 VPN	Yes		Yes	Yes Also Supported in presence of L3 VPN	

Awake = System is on **Asleep** = System is standby, hibernate, or off **Healthy** = User OS up and running **Sick** = User OS is down

Appendix E.
Details of Three Examples

Scenario One	
Total manual failure resolution cost before Intel® Core™2 Processor with vPro™ Technology (~30k Desktops)	\$4,749,585.04
Cost for 10k notebooks	\$1,558,262.81
Total manual failure resolution cost with Intel® Centrino® with vPro™ Technology	\$201,406.37
Total Implementation cost of Intel® Centrino® with vPro™ Technology	\$361,282.76
Net savings moving from 10k Desktop to 10k Mobile	\$1,020,505.88
Difference in cost between Desktop and Mobile PCs	\$850.00
Savings moving from Desktop to Mobile	\$1,020,505.88
Fixed costs saved moving 10k mid-to-high end notebooks to Intel® Centrino® with vPro™ Technology	\$742,457.38
Number of Notebooks moving 10k Desktops to 10k Intel® Centrino® with vPro™ Technology Mobile buys outright, per year	658
Number of Notebooks moving 10k Notebooks to Intel® Centrino® with vPro™ Technology-based Notebooks buys outright, per year	479
Total number of Intel® Centrino® with vPro™ Technology-based PCs paid for outright per year	1,138
Number of Intel® Centrino® with vPro™ Technology-based PCs purchased, including sunk cost for Notebooks aka “free”	1,680

Scenario Two					
	Prior to Migration	Year 1	Year 2	Year 3	Year 4
Total Manual Failure Resolution Cost	\$1,595,428.56	\$764,423.06	\$624,743.09	\$457,940.03	\$371,629.61
Failure Resolution Cost Savings		\$831,005.50	\$1,018,548.32	\$1,234,650.12	\$1,371,738.25
SIPP Savings		\$171,482.85	\$342,965.70	\$514,448.55	\$529,882.01
Total Savings		\$1,002,488.35	\$1,361,514.02	\$1,749,098.67	\$1,901,620.26
Implementation cost, including added cost of higher-end PCs		\$1,312,892.31	\$1,140,931.00	\$1,175,158.98	\$1,210,413.70
Net Expense / Savings		(\$ 310,403.96)	\$220,583.02	\$573,939.74	\$691,206.56

Appendix E.
Details of Three Examples (continued)

	Scenario Three			
	Year 1	Year 2	Year 3	Year 4
Total projected Manual Failure Resolution Cost Before Intel® Centrino® with vPro™ Technology	\$230,653	\$237,573	\$244,700	\$252,041
Total Manual Failure Resolution Cost With Intel® Centrino® with vPro™ Technology	\$208,479	\$170,384	\$124,893	\$101,354
Net Intel® Centrino® with vPro™ Technology Manual Failure Resolution Cost Savings	\$22,174	\$67,189	\$119,808	\$150,688
Additional Intel® SIPP Savings	\$46,768	\$93,536	\$140,304	\$144,513

Appendix F.
About Wipro Product Strategy & Architecture Practice

The Wipro Product Strategy & Architecture (PSA) practice is a division of Wipro Technologies, a global technology services division of Wipro Ltd. (NYSE-WIT). Wipro PSA practice has more than 12 years experience in researching, analyzing, and documenting the business value of technology solutions. Wipro PSA practice helps enterprises and technology vendors develop innovative and effective product and IT strategies that enable them to expand market opportunities, extend competitive advantage and economize business operations.

In addition to providing consulting services to technology vendors, PSA consultants and technologists work with global enterprises and service providers in architecting and implementing large-scale systems. This practical, hands-on experience gives Wipro PSA practice consultants and technical architects first-hand knowledge that informs their business analysis work.

For further information, contact theodore.forbath@wipro.com or visit www.wipro.com/psa

Related Analyses by Wipro Product Strategy & Architecture Practice

- Measuring the Value of Intel® Core™2 Processor with vPro™ Technology in the Enterprise (2006)
- Measuring the Value of Intel® Core™2 Processor with vPro™ Technology in the People's Republic of China (2006)
- Measuring the Value of Intel® Core™2 Processor with vPro™ Technology in Europe (2006)
- Measuring the Benefits of Mobile PCs in the Enterprise (2005)
- Insights in PC Management in China: The Importance of Controlled Hardware Diversity (2005)
- Insights in PC Management in India: The Importance of Controlled Hardware Diversity (2005)
- Recommended Practices: Strategic Management of the PC Installed Base (2004)
- New Insights on PC Management: Benefits of Controlled Hardware Diversity (2004)



NOTES

1. Intel® Active Management Technology requires the computer system to have an Intel® AMT-enabled chipset, network hardware and software, as well as connection with a power source and a corporate network connection. Setup of Intel AMT requires configuration by the purchaser and may require scripting with the management console or further integration into existing security frameworks to enable certain functionality. It may also require modifications or implementation of new business processes. With regard to notebooks, Intel AMT may not be available or certain capabilities may be limited over a host OS-based VPN or when connecting wirelessly, on battery power, sleeping, hibernating or powered off. For more information, see www.intel.com/technology/platform-technology/intel-amt.
2. Intel® Virtualization Technology (Intel® VT) 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.
3. At time of product introduction, all Intel® Centrino® with vPro™ technology-based PCs will be Intel® SIPP-enabled. But PC manufacturers will be rolling out a wide variety of Intel Centrino with vPro technology-based PC configurations at many performance levels and price points. Check with your vendor regarding Intel SIPP compliance. A stable image computer system is a standardized hardware configuration that IT departments can deploy into the enterprise for a set period of time, which is usually 12 months. Intel SIPP is a client program only and does not apply to servers or Intel-based handhelds and/or handsets. See www.intel.com/business/bss/products/client/stableplatform for more information on Intel SIPP (Intel Stable Image Platform Program).
4. Available from Wipro at www.wipro.com/webpages/insights/pc_management.htm
5. Refer to Wipro white papers, *New Insights in PC Management*, *Measuring the Benefits of Mobile PCs in the Enterprise*, *Insights on PC Management in India* and *Insights on PC Management in China*, 2003-2005

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