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Speeding Up Anti-Virus Scanning Software

“ After using VTune Performance Analyzer and refactoring the code, we saw a 66 percent overall performance boost in our on-access anti-virus scanner. ”

Vladimir Masliukov
Quality Assurance Director
Kaspersky Lab

The need for anti-virus software

Virus threats on the Internet are steadily increasing. Though users recognize the importance of anti-virus software, they want it to work quickly without PC performance degradation. The speed with which anti-virus applications unzip attachments, read and scan files for viruses, and perform report logging functions are all crucial factors in the usability and effectiveness of any information security system. Meeting this challenge,

engineers at Kaspersky Lab used Intel® VTune™ Performance Analyzer to optimize and enhance the performance of their award-winning Kaspersky Anti-Virus® scanning software.¹

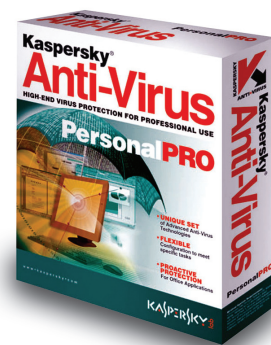
Intel® VTune™ Performance Analyzer boosts application performance

The Intel VTune Performance Analyzer helps locate and remove software performance bottlenecks by collecting, analyzing, and displaying system-wide data down to specific functions, modules, or instructions. The VTune Performance Analyzer provides profiling technologies that enable optimization across multiple operating system platforms and development environments and support the latest Intel® processors.

THE APPLICATION

Leading anti-virus software offers timely virus scanning and analysis

Users worldwide choose Kaspersky Lab products for exceptional virus detection rates, timely virus analysis, and quality services. Their products offer protection against viruses, Internet worms, e-mail worms, Trojans, and other malicious programs. Their anti-virus solutions reliably protect home PCs and personal handheld devices, as well as workstations, servers, and Internet gateways for business networks of all sizes and complexity.



THE CHALLENGE

Rapid virus detection is key in staying competitive

The Kaspersky Lab development team must constantly keep the scanning performance of their Kaspersky Anti-Virus software competitive. Their customers demand thorough protection with minimal system impact.

To meet this demand, Kaspersky Anti-Virus software offers two anti-virus software scanners. The “on-demand scanner” scans all files on an entire system and generates a report that identifies corrupt files. The “on-access scanner” scans individual files for viruses each time a file is accessed and prevents the system from opening corrupt files. The on-access scanner is active in the background and can affect a user’s system performance each time a file is accessed.

The challenge faced by the Kaspersky Lab development team: speed up their scanning software. They decided to focus their optimization efforts on the on-access scanner. They gave particular attention to speeding up the performance of two modules contained within the on-access scanner application — the report logging function and the archive (.zip file) checking function.

THE ANSWER

Finding bottlenecks improves performance

The development team tested the performance of the on-access scanner software using a performance benchmarking tool called SYSmark*, a tool that measures office productivity. They first ran SYSmark to determine baseline performance with no anti-virus software installed. Next, they ran SYSmark again after installing Kaspersky Anti-Virus. They measured a system performance degradation of 24 percent.

“We managed to make great performance improvements by using VTune and refactoring. We plan to use VTune to boost performance of our on-demand scanner in the future.”

Vladimir Masliukov
Quality Assurance Director
Kaspersky Lab

They used the VTune Performance Analyzer to locate and alleviate performance bottlenecks and hotspots in their on-access scanner module within the Kaspersky Anti-Virus application. Kaspersky Lab developers built the list of modules and functions located on the slackless path (hotspots) with the help of the VTune analyzer's Call Graph. Next, they used the ClockTicks parameter in the VTune analyzer's Sampling to determine which functions needed to be optimized and then made the required optimizations.

After making these improvements, running SYSmark showed a significant performance gain for the on-access scanner, with a reduction in system overhead from 24 to 8 percent. “After using VTune Performance Analyzer and refactoring the code,

Kaspersky Lab Anti-Virus* Application Product Modules	Before Performance Tuning	After Performance Tuning	Percent Improvement
Report Logging Module	4.3 seconds	1.3 seconds	70%
Archive Checking Module	8.8 seconds	5.9 seconds	30%
Anti-Virus* Engine	1 min 26 sec	1 min 19 sec	8%
System Performance Degradation	24% degradation	8% degradation	66% performance improvement

Performance Improvements Before and After Using Intel® VTune™ Performance Analyzer²

¹ See <http://www.kaspersky.com/awards.html> for a list of awards received by Kaspersky Lab products.

² The performance data was provided by Kaspersky Lab. Runtime tests for overall performance of the on-access scanner were performed on SYSmark* to test office productivity before and after the code was tested using the Intel® VTune™ Performance Analyzer 6.0 and then refactored. The operating system for the server based on the Intel® Pentium® 4 processor with Hyper-Threading Technology was Windows® XP, and hardware specifications were Pentium 4 processor with HT Technology, 2.4 MHz, 512 MB, 512 KB cache.

Compatible with leading Windows® and Linux® development environments, Intel® Software Development Products are excellent for maximizing application support of the latest features of Intel® processors. Designed for use in the full performance cycle, Intel Software Products include Intel® Compilers (C++ and Fortran), Intel® Performance Libraries, Intel® VTune™ Analyzers, Intel® Threading Tools, and Intel® Cluster Tools.

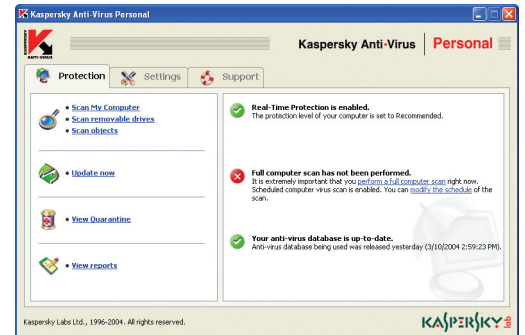
Performance and benchmark information were provided by Kaspersky Lab. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing.

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we saw a 66 percent performance boost of our on-access anti-virus scanner,” said Vladimir Masliukov, Quality Assurance Director at Kaspersky Lab.

The team focused performance analysis on three sub-modules of their on-access scanner: the report logging module, the archive checking module that unpacks and scans archived files for viruses, and the anti-virus engine. Using the VTune Performance Analyzer's Call Graph Profiling and Counter Monitor features, the team located report handling slowdowns. As a result,



Kaspersky Anti-Virus main window*

they completely redesigned their report logging module and decreased the time it took to log the report from 4.3 seconds down to 1.3 seconds — a 70 percent performance improvement. They also boosted performance of their archive checking module by 30 percent using the Call Graph method to create a hotspot graph. The development team also improved their Anti-Virus engine by 8 percent by using the Call Graph Profiling and Sampling features to locate and optimize hotspots. As Vladimir Masliukov, Quality Assurance Director at Kaspersky Lab, stated, “Since we used VTune [Performance Analyzer] to boost the performance of our on-access anti-virus scanner, our customers say that our products’ performance is much better.”

VTune Performance Analyzer Provides Competitive Edge

Using the VTune Performance Analyzer, Kaspersky Lab developers pinpointed performance bottlenecks and hotspots in their code to significantly boost performance of their anti-virus application software. System performance degradation caused by activation of their on-access scanner dropped by 300 percent, and the various application modules and Anti-Virus Engine are faster and more efficient than ever. “We managed to make great performance improvements by using the VTune [analyzer] and refactoring,” said Masliukov. “We plan to use VTune [analyzer] to boost performance of our on-demand scanner in the future.”



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