

Intel® VTune™ Amplifier XE 2011 Release Notes for Linux* OS

Installation Guide and Release Notes

Document number: 323591-002US

6 July 2012

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1 Introduction

Intel® VTune™ Amplifier XE 2011 provides an integrated performance analysis and tuning environment with graphical user interface that helps you analyze code performance on systems with IA-32 or Intel® 64 architectures.

This document provides system requirements, installation instructions, issues and limitations, and legal information.

VTune Amplifier XE has a standalone graphical user interface (GUI) as well as a command-line interface (CLI).

2 What's New

VTune Amplifier XE 2011 Update 10:

- Support for SUSE* Linux Enterprise Server 11 Service Pack 2, Ubuntu* 12.04 and Fedora* 17
- Bug fixes

VTune Amplifier XE 2011 Update 9:

- 3rd Generation Intel® Core™ processors (formerly code named Ivy Bridge) support, including General Exploration and Bandwidth analysis types that are available under “Advanced Intel(R) Microarchitecture Code Name Sandy Bridge Analysis” leaf

VTune Amplifier XE 2011 Update 8:

- Intel® Xeon® processor E5-XXXX (formerly code named Sandy Bridge-EP) support
- DWARF 4 debug format support
- Pre-built drivers for Red Hat* Enterprise Linux 6.2

VTune Amplifier XE 2011 Update 7 adds:

- Newer Linux* OS support: Ubuntu* 11.10 and Fedora* 16
- Bug fixes

VTune Amplifier XE 2011 Update 6:

- Intel® Atom™ processors (code name Saltwell and Cedarview) support, including hardware event-based sampling analysis types and metrics for advanced tuning
- Bandwidth analysis for the 32nm Intel® processors code name Eagleton
- Inline functions support (controlled by a filter bar mode)
- “Tiny” threads timeline mode
- Red Hat* Enterprise Linux 5.7 support
- Bug fixes

VTune Amplifier XE 2011 Update 5:

- Project Navigator
- Bandwidth Analysis for processors based on the Intel® microarchitecture code name Sandy Bridge
- Advanced options for analyzing child processes
- Command line reports with stacks
- Support for analysis of MPI programs that use the Intel® MPI library

- Usability improvements
- Newer Linux OS support: Fedora 15, Ubuntu 11.04, Debian 5

VTune Amplifier XE 2011 Update 4:

- Update 3 sometimes incorrectly presented CPU Time in the thread timeline for Hotspots and Concurrency analysis types. Different scales were used for different threads and, thereby, could confuse a user by presenting low CPU Time in one thread as the same height in the chart as high CPU Time in another thread. The values presented in the tool tip when hovering over the chart were still correct. Update 4 resolves this problem completely.
- Debian* 6.0 support
- Ubuntu* 11.04 support

VTune Amplifier XE 2011 Update 3:

- 32nm Westmere family of processors (code name Westmere-EX) support
- Pre-defined analysis for Intel® Atom™ processor
- Attach/detach to process for the Hotspots, Concurrency, and Locks and Waits analysis types
- Comparison mode in the Summary pane

VTune Amplifier XE 2011 Update 2:

- Support for processors based on the Intel® microarchitecture code name Sandy Bridge, including EBS based analysis types and metrics for advanced tuning
- Fedora* 14 support
- Automatic highlighting and expansion in Bottom-Up and Top-Down Tree panes
- Tooltips for metrics description in grid panes
- Ability to import tb5/6 files from GUI
- JIT API support for Hotspots, Concurrency, and Locks and Waits analysis types
- Overhead time metric calculation for native threading synchronization

VTune Amplifier XE 2011 Update 1:

- Red Hat* Enterprise Linux 6 support

- CentOS* 5.5 support
- Ubuntu* 10.04 support
- Data export to CSV file format
- Source / assembly toggling button
- Bug fixes

3 System Requirements

For an explanation of architecture names, see <http://software.intel.com/en-us/articles/intel-architecture-platform-terminology/>

Processor Requirements

- For general operations with user interface and all data collection except Hardware event-based sampling analysis
 - A PC based on an IA-32 or Intel® 64 architecture processor supporting the Intel® Streaming SIMD Extensions 2 (Intel® SSE2) instructions (Intel® Pentium® 4 processor or later, or compatible non-Intel processor).
 - For the best experience, a multi-core or multi-processor system is recommended.
 - Because the VTune Amplifier XE requires specific knowledge of assembly-level instructions, its analysis may not operate correctly if a program contains non-Intel instructions. In this case, run the analysis with a target executable that contains only Intel® instructions. After you finish using the VTune Amplifier XE, you can use the assembler code or optimizing compiler options that provide the non-Intel instructions.
- For Hardware event-based sampling analysis (EBS)
 - EBS analysis makes use of the on-chip Performance Monitoring Unit (PMU) and requires a genuine Intel processor for collection. EBS analysis is supported on Intel® Pentium® M, Intel® Core™ microarchitecture and newer processors (for more precise details, see the list below).
 - EBS analysis is not supported on the Intel® Pentium® 4 processor family (Intel® NetBurst® MicroArchitecture) and non-Intel processors.
 - However, the results collected with EBS can be analyzed using any system meeting the less restrictive general operation requirements.
 - EBS analysis requires a non-virtual machine to ensure access to the on-chip PMU. EBS is not supported within a virtual machine environment.

- The list of supported processors is constantly being extended. Here is a partial list of processors where the EBS analysis is enabled:

Mobile processors

Intel® Atom™ Processor
Intel® Core™ i7 Mobile Processor Extreme Edition
Intel® Core™ i7, i5, i3 Mobile Processors
Intel® Core™2 Extreme Mobile Processor
Intel® Core™2 Quad Mobile Processor
Intel® Core™2 Duo Mobile Processor
Intel® Core™ Duo Processor
Intel® Core™ Solo Processor
Intel® Pentium® Mobile Processor

Desktop processors

Intel® Atom™ Processor
Intel® Core™ i7 Desktop Processor Extreme Edition
Intel® Core™ i7, i5, i3 Desktop Processors
Intel® Core™2 Quad Desktop Processor
Intel® Core™2 Extreme Desktop Processor
Intel® Core™2 Duo Desktop Processor

Server and workstation processors

Intel® Xeon® processors E7-8800/4800/2800 family
Intel® Xeon® processors E3-1200 family
Intel® Xeon® processors 65xx/75xx series
Intel® Xeon® processors 36xx/56xx series
Intel® Xeon® processors 35xx/55xx series
Intel® Xeon® processors 34xx series
Quad-Core Intel® Xeon® processors 7xxx, 5xxx, and 3xxx series
Dual-Core Intel® Xeon® processors 7xxx, 5xxx, and 3xxx series

System Memory Requirements

- At least 2 GB of RAM

Disk Space Requirements

- 280 MB free disk space required for all product features and all architectures

Software Requirements

- Supported Linux* distributions:
 - Red Hat* Enterprise Linux 4 (starting from Update 8)

- Red Hat* Enterprise Linux 5 and 6
 - CentOS* versions equivalent to Red Hat* Enterprise Linux* versions listed above
 - SUSE* Linux* Enterprise Server (SLES) 10 and 11
 - Fedora* 15, 16 and 17
 - Ubuntu* 10.04, 10.10[†], 11.04[†], 11.10 and 12.04
 - Debian* 5.0 and 6.0
- We support all OS distributions above. For your information, the VTune Amplifier XE was qualified on the builds listed below:
 - Red Hat* Enterprise Linux 4 Update 8
 - Red Hat* Enterprise Linux 5 Update 6 and 7
 - SUSE* Linux Enterprise Server 10 Service Pack 4
 - SUSE* Linux Enterprise Server 11 Service Pack 1
 - Fedora* 15 and 16
 - Ubuntu* 11.04 and 11.10
 - Debian* 5.0 and 6.0
 - Supported compilers:
 - Intel® C/C++ Compiler 11 and higher
 - Intel® Fortran Compiler 11 and higher
 - GNU C/C++ Compiler 3.4.6 and higher
 - Application coding requirements
 - Supported programming languages:
 - Fortran
 - C
 - C++
 - Concurrency and Locks and Waits analysis types interpret the use of constructs from the following threading methodologies:
 - Intel® Threading Building Blocks
 - Posix* Threads on Linux*
 - OpenMP*[1]
 - Intel's C/C++ Parallel Language Extensions
 - To view PDF documents, use a PDF reader, such as Adobe Reader*.

Notes:

VTune Amplifier XE supports analysis of applications built with Intel® Fortran Compiler Professional Edition version 11.0 or higher, Intel® C++ Compiler Professional Edition version 11.0 or higher, or GNU* C/C++ Compiler 3.4.6. Applications that use OpenMP* technology and are built with the GNU compiler must link to the OpenMP* compatibility library as supplied by an Intel® compiler.

4 Technical Support

If you did not register your product during installation, please do so at the [Intel® Software Development Products Registration Center](#). Registration entitles you to free technical support, product updates and upgrades for the duration of the support term.

For information about how to find Technical Support, Product Updates, User Forums, FAQs, tips and tricks, and other support information, please visit <http://www.intel.com/software/products/support/>

Note: If your distributor provides technical support for this product, please contact them for support rather than Intel.

5 Installation Notes

If you are installing the product for the first time, please be sure to have the product serial number available so you can type it in during installation. A valid license is required for installation and use.

This product package can be used to install the software on both IA-32 systems and Intel® 64 systems. The installer determines the system architecture and installs the appropriate files. Both 32-bit and 64-bit versions of the software are automatically installed on an Intel® 64 system.

To begin installation, do the following:

1. *gunzip* and *untar* to retrieve the installation packages.
2. Execute the `./install.sh` script file (available at the top level in the untarred contents) as a root user. Activation is required.

Note:

1. To install all components to a network-mounted drive or shared file system, execute the following command in place of the one in step 2 above: `./install.sh -- SHARED_INSTALL`
2. The install can be run as a non-root user, but in this case not all collectors will be available to the user.
3. For successful installation you should have read and write permissions for the `/tmp` directory.

Installing Collectors on Remote Systems

You can install the command line data collection features of the product on remote systems to reduce overhead and simply collect data remotely. Data collection on a remote system does not require a license; however, viewing of the data cannot be done on the remote system unless a license is present.

The results of any data collection that is run on the remote system must then be copied to the system where the regular install was done for analysis, viewing, and reporting.

To do this:

1. Copy the `CLI_install` folder (found at the top level in the untarred product install package) to the remote machine.
2. Execute `./install.sh` script file (this file is located inside the `CLI_install` folder). No activation will be required.

Default Installation Directories

The default top-level installation directory for this product is:

- `/opt/intel/vtune_amplifier_xe_2011/`

This product installs into an arrangement of directories shown in the diagram below. Not all directories will be present in a given installation.

- `/opt/intel/vtune_amplifier_xe_2011/`
 - `bin32`
 - `bin64*`
 - `config`
 - `documentation`
 - `include`
 - `lib32`
 - `lib64*`
 - `man`
 - `message`
 - `resources`
 - `sepdk`
 - `samples`

(*) `bin64` and `lib64` are available for Intel® 64 architecture install package

Establishing the VTune Amplifier XE Environment

The `amplxe-vars.sh` script is used to establish the VTune Amplifier XE environment.

The command takes the form:

```
source <install-dir>/amplxe-vars.sh
```

Advanced Installation Options

VTune Amplifier XE uses a kernel driver to enable event-based sampling (EBS) analysis. If you are not using a default kernel on the supported Linux* distributions listed above, use the SEP Driver Kit in the VTune Amplifier XE to compile drivers for your kernel.

If no pre-built drivers are provided for your kernel, the VTune Amplifier XE installer will automatically use the SEP Driver Kit to try and build a driver for your kernel. The driver can also be built manually after the product is installed using the SEP Driver Kit.

Note: Additional software may be needed to build and load the SEP kernel driver on the Linux operating system. For details, see the `README.txt` file in the `sepdk/src` directory.

When the Advanced installation is chosen, the following options are available:

- `Driver install type [use pre-built driver (default) / build driver / driver kit files only]`

If no pre-built driver for this system is found, the option will be set to **build driver**.

You may change the option to **driver kit files only** if you do not want to build/install driver or want to do it manually after installation.

- `Driver access group [vtune (default)]`

Setting the driver access group ownership is a security feature and is used to control access to the kernel module. By default the group for accessing the driver is "vtune". You may set your own group during installation or change it manually after installation by executing `./boot-script --group <your_group>` from the `sepdk/src` directory.

- `Load driver [yes (default)]`

By default, installation loads the driver into kernel.

- `Install boot script [yes (default)]`

By default, installation sets up a boot script that loads the driver into the kernel each time the system is rebooted. The boot script can be disabled later by executing `./boot-script --uninstall` from the `sepdk/src` directory.

How to Activate Your Evaluation Software after Purchasing

Users of evaluation versions of Intel Developer Products have a new tool that allows converting evaluation-licensed products to fully licensed products once the product is purchased and a serial number is obtained. The “Activation Tool” is a utility that enables users of evaluation products to enter a valid product Serial Number to convert the product to fully licensed status.

Run the `/opt/intel/ActivationTool/Activate` script, and provide your purchased product serial number, either as an argument to the program, or when prompted. For example:

```
/opt/intel/ActivationTool/Activate ABCD-123AB45C
```

Be sure to login or “su” to root if you want the product license to be available to all system users.

Removing the Product

If you want to remove components from an installation, run `uninstall.sh` script as root user from the product installation folder.

6 Issues and Limitations

Known Issues and Limitations

- **Running time is attributed to a next instruction (200108041)**
 - To collect the data about time-consuming running regions of the target, the VTune™ Amplifier XE interrupts executing target threads and attributes the time to the context IP address.
 - Due to the collection mechanism, the captured IP address points to an instruction AFTER the one that is actually consuming most of the time. This leads to the running time being attributed to the next instruction (or, rarely to one of the subsequent instructions) in the Assembly view. In rare cases, this can also lead to wrong attribution of running time in the source - the time may be erroneously attributed to the source line AFTER the actual hot line.
 - In case the inline mode is ON and the program has small functions inlined at the hotspots, this can cause the running time to be attributed to a wrong function since the next instruction can belong to a different function in tightly inlined code.
- **An application that allocates massive chunks of memory may fail to work under VTune Amplifier XE (200083850)**
 - If a 32-bit application allocates massive chunks of memory (close to 2 GB) in the heap, it may fail to launch under the VTune Amplifier XE while running fine on its

own. This happens because the VTune Amplifier XE requires additional memory when profiling an application. The workaround could be in using larger address space (for example, converting the project to 64-bit).

- **Hardware event-based analysis may crash certain Intel® Core™ i7 processor-based systems when deep sleep states are enabled (200149603)**
 - On some Intel® Core™ i7 processor-based (code named Nehalem) systems with C-states enabled, sampling may cause system hanging due to a known hardware issue (see errata AAJ134 in <http://download.intel.com/design/processor/specupdt/320836.pdf>). To avoid this, disable the “Cn(ACPI Cn) report to OS” BIOS option before sampling with the VTune Amplifier XE analyzer on Intel Core i7 processor-based systems.
- **Link to instruction guide: instruction set reference document is not positioned on description of proper instruction. (200091607)**
 - The reference information for assembly instructions can be opened in any PDF viewer, but only Adobe Acrobat Reader* supports positioning the instruction reference document on the required page. To ensure correct functionality of this feature, you are recommended to install the latest available version of Adobe Acrobat Reader.
- **VTune™ Amplifier XE does not support profiling an application launched under debugger (200092508)**
 - The Hotspot, Concurrency or Lock and Waits analysis types provide incorrect results when analyzing an application launched under a debugger. VTune Amplifier XE does not detect whether a debugger is attached to a profiled application. Make sure that no debugging tools are attached to the application that is profiled with the VTune Amplifier XE.
- **Security-enhanced Linux* is not supported (200155374)**
 - Security-enhanced Linux settings (SELinux) are currently not supported by the VTune Amplifier XE and need to be either disabled or set to permissive for a successful tool suite installation. If your Linux distribution has SELinux enabled the following error message will be issued by the installer: "Your system is protected with Security-enhanced Linux (SELinux). We currently support only

"Permissive" mode, which is not found on the system. To rectify this issue, you may either disable SELinux by - setting the line "SELINUX=disabled" in your /etc/sysconfig/selinux file - adding "selinux=0" kernel argument in lilo.conf or grub.conf files or make SELinux mode adjustment by - setting the line "SELINUX=permissive" in your /etc/sysconfig/selinux file or ask your system administrator to make SELinux mode adjustment. You may need to reboot your system after changing the system parameters. More information about SELinux can be found at <http://www.nsa.gov/selinux/>

- **On Ubuntu* 11.04 and Ubuntu 11.10 systems, Standalone GUI silently disappears when opening the results.** (200197559)
 - You are recommended to switch visual theme to "New wave" or switch to another window manager, for example, KDE*.

- **VTune Amplifier XE collectors may fail to run on the Ubuntu 11.04 and Ubuntu 11.10** (200197563)
 - VTune Amplifier XE may fail to collect data for Hotspots, Concurrency, and Locks and Waits analysis types on the Ubuntu 10.10 and Ubuntu 11.04 operating system. Once a collection is started, the message appears in the output: "Failed to start profiling because the scope of ptrace() system call application is limited. To enable profiling, please set /proc/sys/kernel/yama/ptrace_scope to 0. See the Release Notes for instructions on enabling it permanently."
 - To workaround this problem for the current session, set contents of the /proc/sys/kernel/yama/ptrace_scope sysctl file to 0.
 - To make this change permanent, set kernel.yama.ptrace_scope value to 0 at /etc/sysctl.d/10-pttrace.conf file using root permissions and reboot the machine.

- **Concurrency analysis may provide incorrect Wait time data if Linux futexes are used** (200163557)
 - In certain cases, custom synchronization constructions based on Linux futexes are not detected by the VTune Amplifier XE. System libraries may also use such constructions. To ensure Wait time correctness in the Concurrency analysis, use syscall(SYS_futex, ...) API in your code.

- **VTune Amplifier XE collectors may crash or produce corrupted data while profiling stripped binaries.** (200165647)
 - VTune Amplifier XE may fail to collect data for Hotspots, Concurrency, and Locks and Waits analysis types if the main executable of an analysis target statically links some symbols from libc.so or libpthread.so (for example, pthread_create). To avoid this, do not strip the main executable. Use the -E linker switch to export the statically linked symbols to the dynamic symbol table of the main executable. For the list of symbols required for correct profiling, see the Analyzing Statically Linked Libraries topic in the online help.

- **Timeline pane displays incorrect concurrency and thread states for a paused region in the Concurrency and Locks and Waits analyses.** (200204715)
 - Concurrency and thread state data may be incorrect in the Timeline pane for a region corresponding to the time when data collection was paused. Ignore the timeline data in a paused region during result analysis.

- **Hotspots, Concurrency and Locks and Waits analysis types may not work on executables that do not depend on the libpthread.so.0 library.** (200208975)
 - There is currently a limitation in the product regarding profiling application targets where the executable does not depend on the libpthread.so.0 library. The message "Link libpthread.so to the application statically and restart profiling" appears when profiling an application where program image does not depend on libpthread.so.0 but then it dlopen()-s a shared library which does depend on libpthread.so.0. The collector is not able to follow the program execution and module load/unload so the collection results are likely to be misleading. A workaround is to set "LD_PRELOAD=libpthread.so.0" before running the collection.

- **Opening results significantly delayed on Linux systems configured with "large pages"** (200215471)
 - To work around this issue make sure that you have hugectl utility and libhugetlbfs library on the system. VTune Amplifier XE can be started this way:
 - hugectl --heap <amplxe install dir>/bin32/amplxe-gui
 - LD_PRELOAD=libhugetlbfs.so <amplxe install dir>/bin64/amplxe-gui

- **Event-based profiling results may be incorrect if nmi_watchdog interrupt capability is enabled** (200171859)
 - If the nmi_watchdog interrupt capability is enabled on a Linux system, event-based profiling results may be incorrect. For example, when using a pause-resume scenario for event-based analysis on 64-bit Red Hat* Enterprise Linux* 6.1 with this feature enabled, no data will be collected after the collection is resumed. Before running event-based analysis on Linux systems, ensure that the nmi_watchdog interrupt capability, if available, is disabled. Disabling the nmi_watchdog interrupt is accomplished by adding the Linux kernel boot parameter 'nmi_watchdog=0' to your system boot loader and then rebooting the system.

- **Information collected via ITT API is not available when attaching to a process.** (200172007)
 - When collecting statistics data using ITT API injected into a source code, like Frame Analysis or JIT-profiling, attaching to a process will not bring expected results. Use the VTune Amplifier XE analysis to start an application instead of attaching to a process.

- **Only one stack frame is shown in Java code if IBM* J9* JVM is used** (200227950)
 - Currently Java stack unwinding is not supported for IBM* J9* JVM.

- **Do not use -ipo option since it causes the inline debug information to switch off.** (200260765)
 - [Windows] If using the Intel® compiler to get performance data on inline functions, use the additional option “/debug:inline-debug-info”, but avoid using the /Qipo option. Currently this option disables generating the inline debug information in the compiler. Note that the Intel compiler integrated into the Microsoft Visual Studio* IDE uses the /Qipo by default in the Release configuration.
 - [Linux] If using the Intel® compiler to get performance data on inline functions, use the additional option “-inline-debug-info”, but avoid using the -ipo option. Currently this option disables generating the inline debug information in the compiler.

- **Intel® Compiler currently doesn't support function split ranges in debug info which may lead to wrong performance data attribution in case function ranges are overlapped (e.g. performance data attributed to one function, but should have been split by two).** (200260768)
 - In some cases the Intel® Compiler generates imprecise debug information about ranges of inline functions. This may lead to wrong performance data attribution when the Inline mode is turned on, for example: instead of two functions performance data is attributed just to one of them.
- **Help TOC is truncated in some Linux browsers.** (200272063)
 - When using certain HTML browsers to view the VTune Amplifier XE documentation, if the Contents tab width appears truncated and hides some of the topic titles:
 - - Click the Index (or Search) button
 - - Click the Contents button
- **VTune™ Amplifier XE data collection on Intel® Many Integrated Core (MIC) architecture currently is limited to hardware event-based sampling data collected from target units** (200179057)
 - No information on function call stacks is recorded during collection. However, you may mistake partial call chains appearing in result Groups for real call stack information. These partial chains are the result of inline function information in debug symbol tables and can be ignored.
- **Attaching to managed run-time processes is not supported** (200179386)
 - When attaching to a .NET/Java application the information of managed run-time part of the application will not be provided in results. The resulting profile will contain only native code relevant information.
- **Attaching the VTune Amplifier XE to a process may take some time** (200276420)
 - Your target application may complete before the data collection starts, so the VTune Amplifier XE may report an error. Increase the duration of your test application if necessary.

- **Event-based collection on fixed counters with stacks collection enabled fails on some CPUs (200179695)**
 - On some old CPUs, fixed PMU counter values cannot be reliably read and, as a result, EBS collection with stacks gives all zeros for such counters. For example, see the errata for Intel® Core™ 2 Duo processors in <http://download.intel.com/design/processor/specupdt/318733.pdf>. To workaround this problem, launch a custom analysis with the Clockticks and Instructions Retired specified as precise events.

- **VTune(TM) Amplifier XE doesn't show call stack for some functions from Intel(R) Math Kernel Library (200282798)**
 - If you are using 3rd party libraries which do not have unwinding or debug information please consider creating custom analysis type with "Stack unwinding mode" set to "After collection". This also applies to Intel(R) MKL.

- **Limited event description for Intel® Xeon® processor E5-XXXX and the 2nd Generation Intel® Core™ processor family desktop processors. (200285238)**
 - Developers can find more details on events by checking the Intel® 64 and IA-32 Architectures Software Developer's Manual <http://download.intel.com/products/processor/manual/325462.pdf>, Tables 19-3, 19-4 and 19-5.

- **Hot functions are duplicated in the grid if inline mode is ON. When turning it off, only one entry remains but the stack for it is not resolved. (200287043)**
 - Change stack unwinding mode to "After collection". For doing this create a new custom analysis and select 'After collection' in 'Stack unwinding mode' drop-down list.

7 Attributions

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It appears that the arithmetic coding option of the JPEG spec is covered by patents owned by IBM, AT&T, and Mitsubishi. Hence arithmetic coding cannot legally be used without obtaining one or more licenses. For this reason, support for arithmetic coding has been removed from the free JPEG software. (Since arithmetic coding provides only a marginal gain over the unpatented Huffman mode, it is unlikely that very many implementations will support it.) So far as we are aware, there are no patent restrictions on the remaining code.

The IJG distribution formerly included code to read and write GIF files. To avoid entanglement with the Unisys LZW patent, GIF reading support has been removed altogether, and the GIF writer has been simplified to produce "uncompressed GIFs". This technique does not use the LZW algorithm; the resulting GIF files are larger than usual, but are readable by all standard GIF decoders.

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