

canopus

ProCoder

ProCoder Comparative Analysis
Version 1.0
July 25, 2002

Objective

This document is a straightforward head-to-head comparison of three readily available software packages used for encoding video to various formats (MPEG-2, QuickTime, RealSystem and Windows Media). Two benchmarking machines were used, and their specifications are noted in the next section. When looking at the graphs, it is important to note that the smaller result is a better one. The information displayed is the total encoding time to encode the source file to the destination format.

NOTE: The Tmpg software package only encodes to the MPEG-2 video format; it will not be included on graphs which refer to other video formats.

The three clips used are all DV AVIs. The "Horse.avi" clip is a total of 15 seconds in length and was chosen because it's a more "difficult" file to encode due to the amount of motion and scenery changes in the clip, as well as the subtle differences in color and tone. The "Jackpot Trailer" is 2 minute, 12 second source video with a 16:9 aspect ratio that is a good "real-world" test for conversion because its widescreen aspect ratio is more cinematic in nature. "Animals.avi" is a 20-minute clip with various textures and scene changes, making it a difficult file to encode.

Test Systems

The system used in the single-processor benchmarking test was an AMD Athlon-based system. Its full specifications are as follows:

CPU: AMD Athlon XP2100+
Memory: 512MB DDR Memory
Motherboard: Abit AT7 Max
Hard Drive: IBM Deskstar ATA100
Video Card: Canopus Spectra X21 (GeForce3 Ti500 based)

The system used for the dual-processor benchmarks was a dual Intel Xeon-based machine. Its full specification are listed below:

CPU: Intel Xeon 2.2GHz (dual configuration)
Memory: 512MB Rambus Memory
Motherboard: Compaq Proprietary
Hard Drive: Western Digital ATA 100
Video Card: Matrox G550

Results

ProCoder won every benchmark outright when it came to pure speed. Tmpg came close to beating ProCoder in the MPEG-2 conversion benchmarks, but the quality of the output files was not as accurate as the ProCoder-encoded files. Every other benchmark was won by ProCoder, with the multi-processor machines showing encoding times that were faster or very close to realtime conversion. On a pure software level, ProCoder offers a huge quality and time advantage over the competing software.

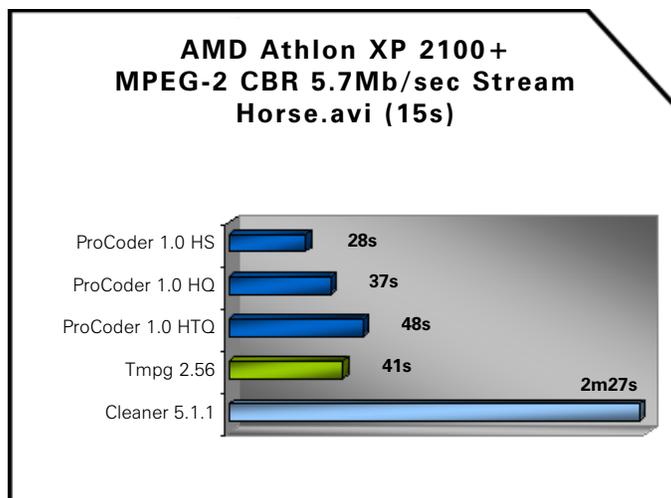
ProCoder's biggest strength is with long conversions because it has a very long high-speed processing pipeline. That way, it can fully utilize system RAM and multiple CPU's (It could utilize 16 or more CPU's if the job is complex enough and the system had that many processors available). However, the amount of overhead involved in starting and stopping this pipeline also explains why there is a narrower performance gap between Cleaner and ProCoder when encoding the shorter clips for certain formats. With longer clips or multiple simultaneous conversions that are longer than one minute, this overhead is fully compensated by the enormous speed gain of the long pipeline. Benchmarking the conversion of shorter clips will mostly measure the administrative overhead and not the real conversion speed. We chose this architecture because clips of a few seconds are rarely used in a professional environment, and we chose not to optimize for benchmarks but rather for the real world.

Continue to the next section for benchmark results...

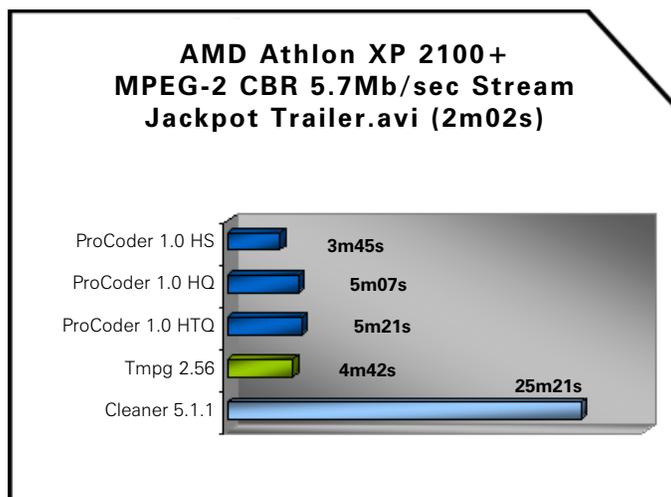
MPEG Benchmarks

Single-processor Conversion

Because Cleaner is limited to non-modifiable MPEG-2 settings, we've used the ProCoder setting that best matched Cleaner's DVD MPEG-2 preset. The parameters are set for a CBR (constant bitrate) stream at 5.7Mb/sec. The results of the benchmark are as follows:



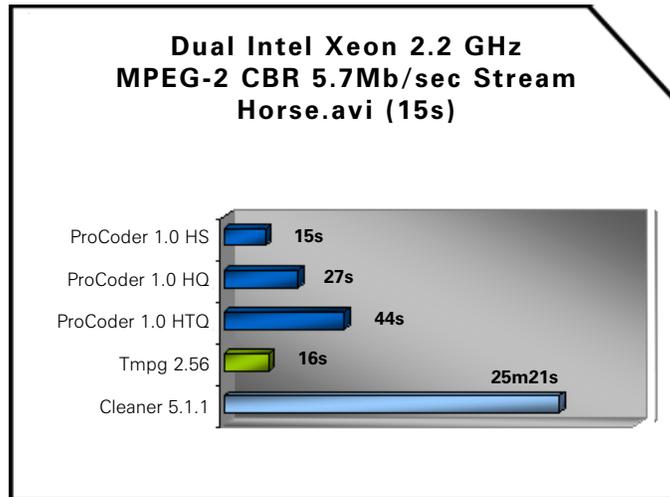
ProCoder performed very well in this benchmark with the high-speed (HS) and high-quality (HQ) MPEG settings outperforming the other two software packages. Tmpg came in with the second fastest time at 41 seconds, followed once again by ProCoder at the highest-quality setting (HTQ). As the Cleaner bar shows, it took much longer to encode than the other two software packages. As with the previous benchmark, the settings used for this conversion were for a 5.7Mb/sec CBR stream. The results of the benchmark are listed below:



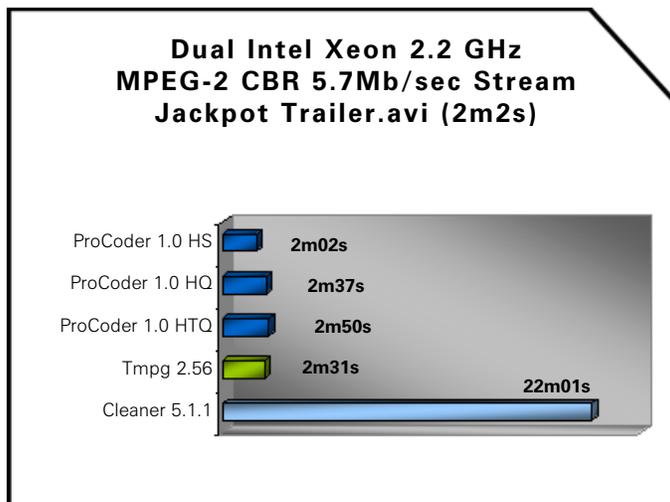
As with the previous benchmark, the ProCoder high-speed setting came in with the fastest conversion time. Tmpg edged out ProCoder's high-quality and highest-quality settings by a few seconds. Cleaner once again is substantially slower than the other two software packages.

Multi-Processor Conversion

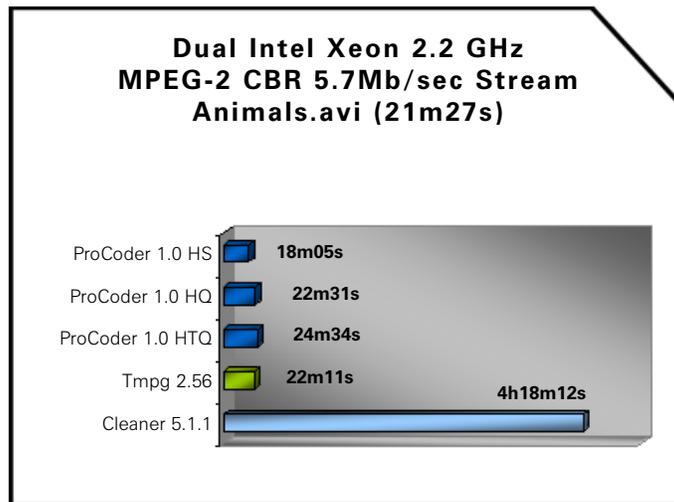
The files used in the multi-processor benchmarks for MPEG-2 are the same files that were used in the single-processor test. You can see the benefits of multi-processing very clearly when looking at the encoding times for ProCoder, and even Tmpg.



ProCoder and Tmpg make short work of this clip. ProCoder's CPU usage peaked at an average of 95% for both processors while Tmpg was less evenly distributed. Cleaner did not have a significant time change despite having more processing power available. Quality results are significant, as well, with ProCoder beating the other two encoders in visible quality at all speeds.



This benchmark really shows ProCoder's ability to harness the power of a multi-processor system. Times were nearly halved down the line for the various quality settings. Tmpg still brings in the second fastest time overall with all of its multi-threading abilities enabled, with ProCoder's higher-quality settings following closely behind. Cleaner is once again considerably slower than the other software solutions, taking close to 10 times longer to encode the file.

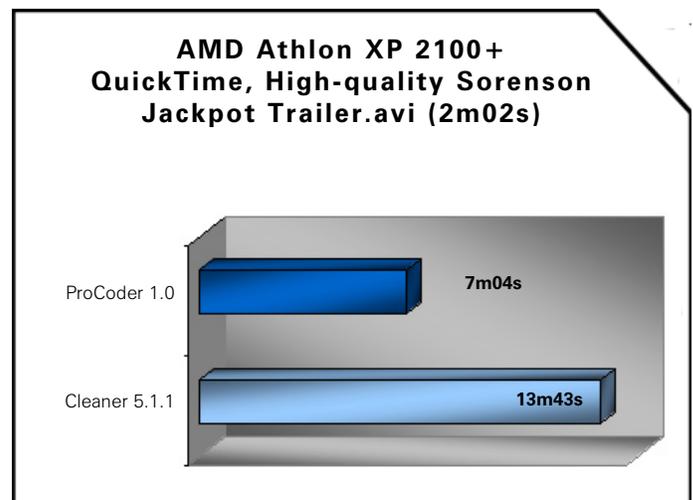
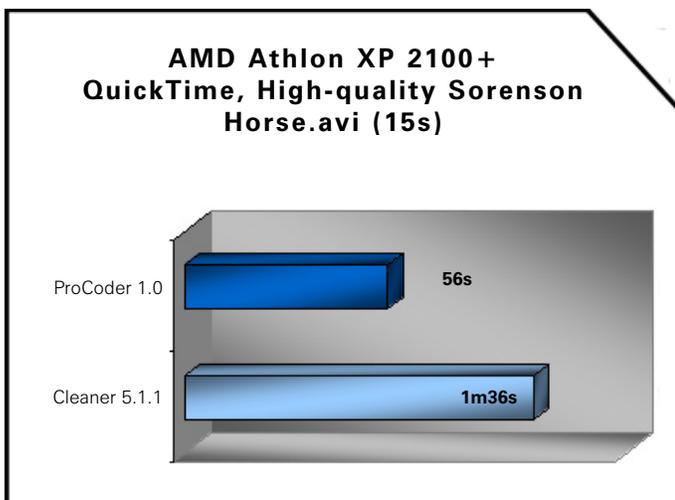


This chart is the most staggering because the 21-minute Animals.avi file takes 4 hours to encode using Cleaner. That's right...four hours. ProCoder's high-speed setting is faster than realtime at a little over 18 minutes with the highest-quality setting clocking in at around 24 minutes and 30 seconds. Even Tmpeg stays close to ProCoder, but Cleaner's MPEG encoding speed is moving at a snail's pace in comparison.

QuickTime Benchmarks

Single-processor Conversion

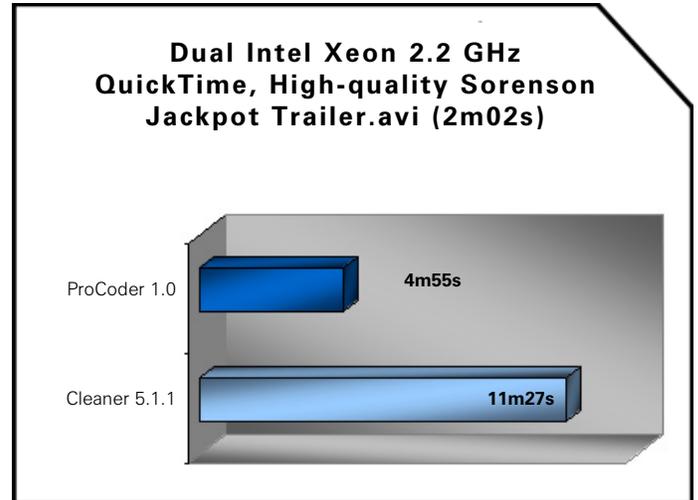
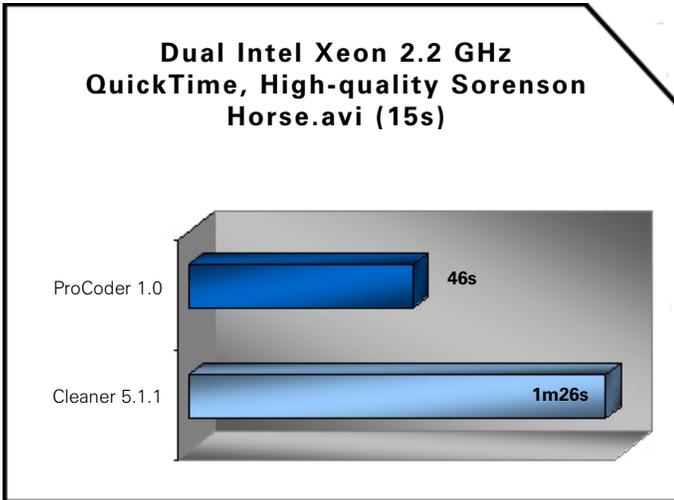
The same machine was used for the QuickTime benchmarking run. Tmpeg was not included in the tests, as it cannot perform QuickTime conversions. A high-quality Sorenson setting was used for this benchmark.



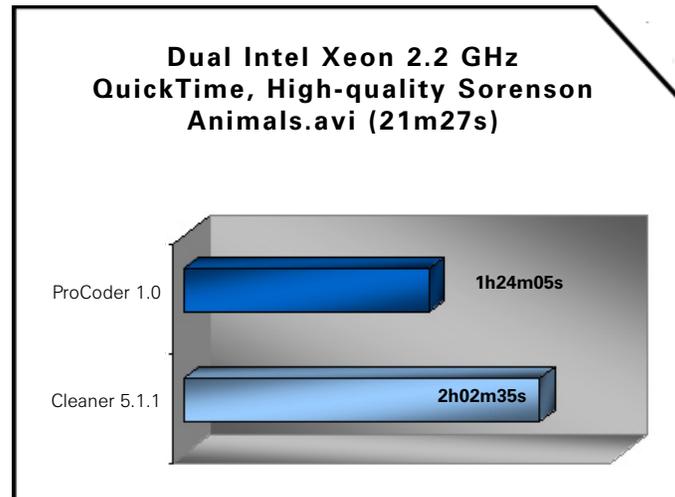
ProCoder once again consistently outperforms Cleaner, taking nearly half as long to encode the files to QuickTime on both the shorter and longer clips.

Multi-Processor Conversion

ProCoder outperforms Cleaner once again on both the single and multiple processor configurations. Of particular note is the large time difference between the ProCoder conversion time on the single processor setup and the dual processor setup. Even though the MHz ranges are close for the two machines, the dual-processor system cuts the conversion time nearly in half while Cleaner gains just a marginal time benefit.



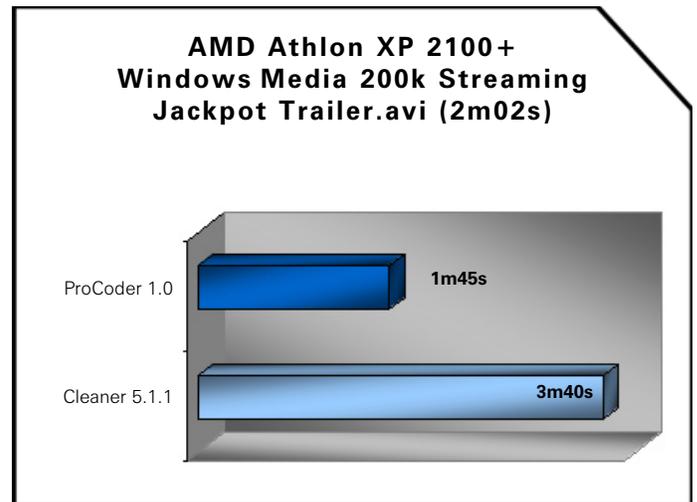
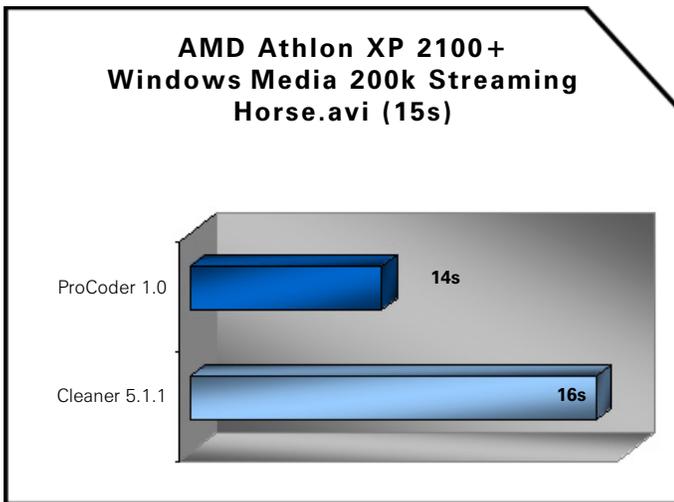
When encoding the "Animals.avi" clip, ProCoder beats Cleaner by almost 40 minutes using a dual-processor system when encoding to a high-quality Sorenson QuickTime file. As you can see, when the files are of a significant length, the gap between Cleaner and ProCoder widens.



Windows Media Benchmarks

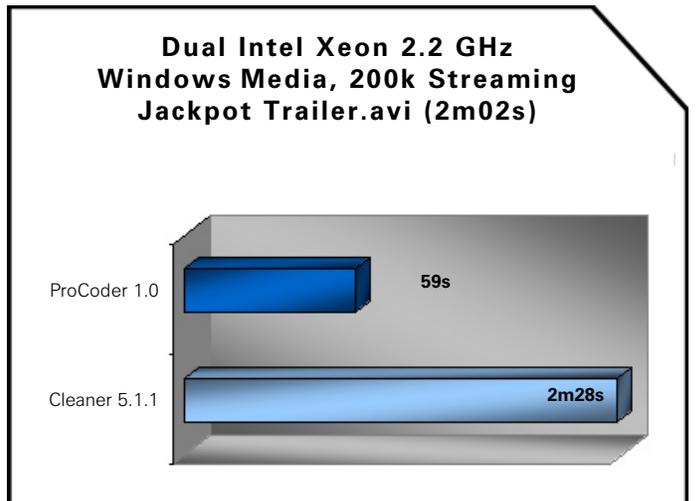
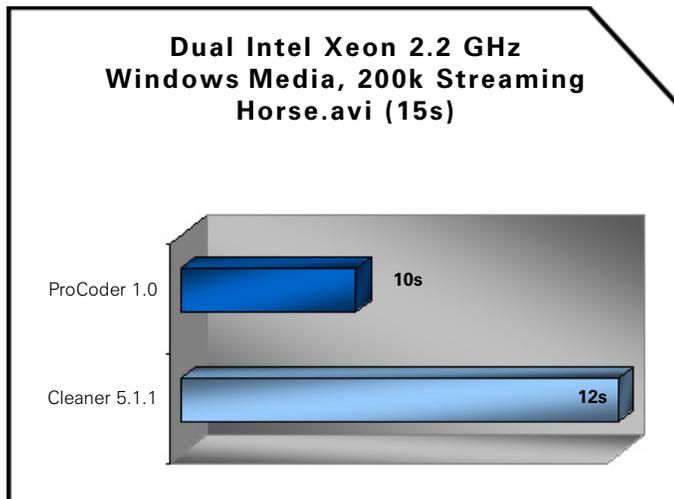
Single-processor Conversion

Once again the Athlon XP 2100+ based system was used to run the Windows Media benchmarks. A Windows Media target for Broadband Streaming at 200k was selected as the output for both system configurations. The benchmarks are listed below:

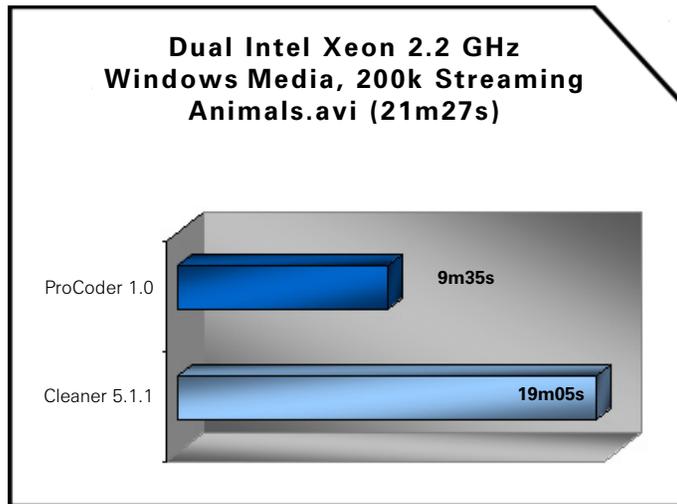


Multi-processor Conversion

These encoding times show an overall increase in performance for ProCoder due to its enhanced multi-threading and slightly faster CPU.



The shorter "Horse.avi" clip came in with similar results as before. ProCoder outperformed Cleaner, but only by a small margin. The longer "Jackpot Trailer" shows the real difference in conversion speed between ProCoder and Cleaner. ProCoder converted the file in under half the time of Cleaner. While Cleaner took slightly longer than realtime to convert the file, ProCoder converted the file 2x faster than realtime.

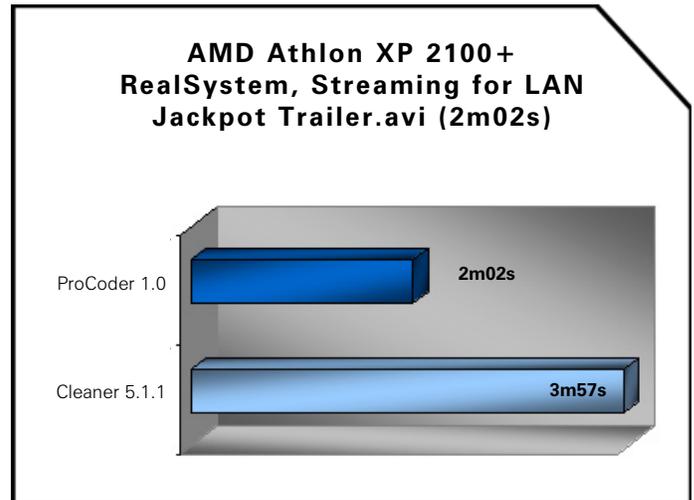
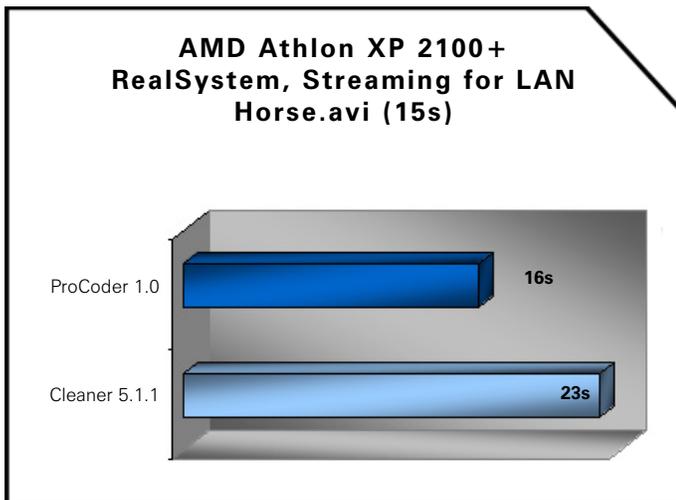


ProCoder encodes the "Animals.avi" to a Windows Media 200k Streaming file on the dual-Xeon machine almost twice as fast as Cleaner. Both times are faster than realtime, but ProCoder finishes 10 minutes before Cleaner.

RealSystem Benchmarks

Single-processor Conversion

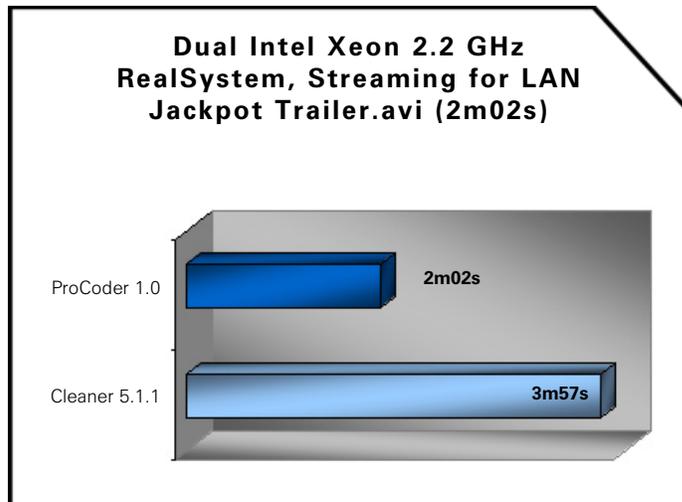
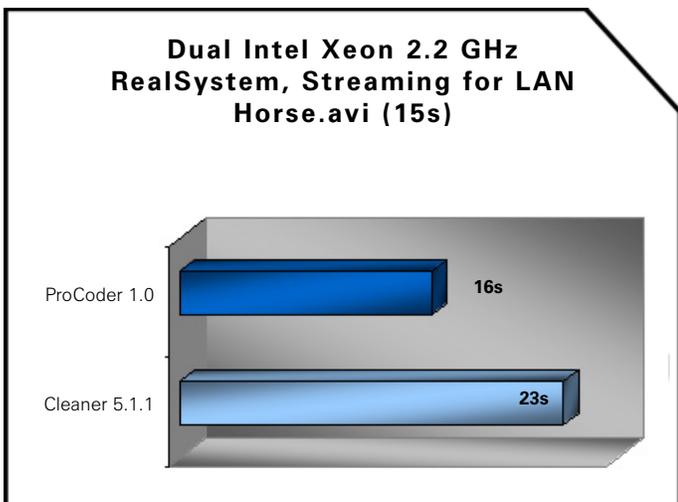
The destination target for the single and multi processor benchmarks was a streaming RealSystem file intended for a LAN environment. The results are listed below.



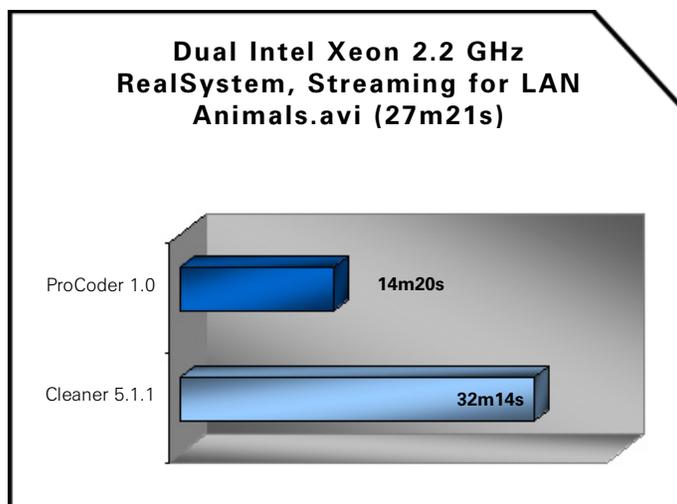
ProCoder maintains a significant time advantage when encoding to the RealSystem format, coming in at just above a realtime speed. Cleaner once again does much better in the shorter clip than in the longer one.

Multi-processor Conversion

The destination target for the single and multi-processor benchmarks was a streaming RealSystem file intended for a LAN environment. The results are listed below.



As with other target file types, ProCoder once again handily outperforms Cleaner. ProCoder encoded both clips faster than realtime. Cleaner performed well in the smaller file conversion, but slowed down considerably when dealing with the larger clip.



While encoding the "Animals.avi," the dual-processor machine allows ProCoder to encode the RealSystem Streaming for LAN file about 7 minutes faster than realtime, while Cleaner languishes far behind at a slower-than-realtime mark of 32 minutes and 14 seconds, 11 minutes longer than the original source clip.

Batch Processing Prowess

The real power of ProCoder is shown when multiple files are encoded at the same time in a "batch" file. With Cleaner, the source file must be read EACH time it encodes a new format, which is inefficient and significantly slows down encoding speeds. With ProCoder, the file is read by the application ONCE and all four files were encoded simultaneously. To understand the overall effectiveness of ProCoder's batch processing, we encoded the 20-minute "Animals.avi" to each of the four file types used in our benchmarks — MPEG-2, QuickTime, Windows Media and RealSystem — simultaneously. ProCoder's extremely smart mechanism for batch processing of files saves a tremendous amount of time in the long run, as the graph demonstrates.

