

Which phase-3 eSTREAM ciphers provide the best software speeds?

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Abstract. This paper compares the software speeds of 128-bit 10-round AES, 256-bit 14-round AES, 256-bit CryptMT v3, 256-bit Dragon, 128-bit HC-128, 256-bit HC-256, 128-bit LEX v2, 128-bit NLS v2, 128-bit Rabbit, 256-bit RC4, 256-bit Salsa20/8, 256-bit Salsa20/12, 256-bit Salsa20/20, 256-bit SNOW 2.0, 256-bit Sosemanuk, and 80-bit TRIVIUM.

0 Introduction

Suppose a user wants to encrypt data, in software, using one of the “phase 3 software” eSTREAM ciphers: CryptMT, Dragon, HC, LEX, NLS, Rabbit, Salsa20, or Sosemanuk. Which cipher will provide the best performance?

The answer depends—more than one might expect—on the user’s CPU. This paper considers the following representative set of ten CPUs:

| Architecture | Manufacturer | CPU | ID | MHz | Release date |
|--------------|--------------|--------------------|---------|------|--------------|
| amd64 | Intel | Core 2 Quad Q6600 | 6fb | 2394 | 2007.07 |
| ppc64 | IBM | Cell PPE | | 3192 | 2006.11 |
| amd64 | Intel | Pentium D 930 | f64 | 3000 | 2006.01 |
| amd64 | AMD | Athlon 64 X2 3800+ | 15,75,2 | 2000 | 2005.08 |
| x86 | Intel | Pentium M LV 718 | 695 | 1300 | 2004.10 |
| x86 | Intel | Pentium 4 HT 530 | f41 | 3000 | 2004.06 |
| ppc64 | IBM | PowerPC G5 970FX | | 2000 | 2004.01 |
| sparcv9 | Sun | UltraSPARC III Cu | | 1200 | 2003.08 |
| x86 | Intel | Pentium 4 1.9 | f12 | 1900 | 2001.08 |
| ppc32 | Motorola | PowerPC G4 7410 | | 533 | 2001.01 |

The rest of the paper is organized into ten sections, one section for each CPU.

The answer also depends heavily on how many bytes are generated in each keystream, and on how many keystreams are generated from each key. This paper reports cycle counts per encrypted byte for six different situations:

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- “long”: Encrypt one long stream.
- “agility”: Encrypt many parallel streams in 256-byte blocks.
- “1500”: Set up a nonce and encrypt a 1500-byte packet.
- “576”: Set up a nonce and encrypt a 576-byte packet.
- “40”: Set up a nonce and encrypt a 40-byte packet.
- “40k”: Set up a key, set up a nonce, and encrypt a 40-byte packet.

All of these numbers are collected by the eSTREAM benchmarking framework. The raw data and the framework versions that I used are available from my web page <http://cr.yp.to/streamciphers/timings.html>, along with raw data for many more ciphers and many more computers. The official eSTREAM position appears to be that long-stream performance is most important, so I have put it first.

I have included one of the “phase 3 hardware” eSTREAM ciphers, namely TRIVIUM, because it provides good software performance, often matching or exceeding the speeds of the “software phase 3” ciphers. I have also included all of the “benchmark” eSTREAM ciphers: 10-round AES-128, 14-round AES-256, RC4, and SNOW 2.0. Note, however, that RC4 has been **broken**, and that TRIVIUM has only an **80-bit key**.

0.1 Should some ciphers be discarded?

There are several reasons that some users will limit their choices of ciphers.

A user who wants more than **128-bit security**—let’s say **192-bit security**—will discard HC-128, LEX, NLS, and Rabbit. (In theory LEX has a 192-bit version, but no software was submitted to eSTREAM.) The remaining choices are CryptMT, Dragon, HC-256, Salsa20/8, Salsa20/12, Salsa20/20, and Sosemanuk.

A user who wants exactly 256-bit security will also discard Salsa20/8 (a known attack costs 2^{251}) and Sosemanuk (a known attack costs 2^{226}). See my paper [1] for a much more comprehensive discussion of known attacks against eSTREAM submissions. The remaining choices are CryptMT, Dragon, HC-256, Salsa20/12, Salsa20/20, and Sosemanuk.

A user who wants timing-attack protection will need new implementations of some ciphers. Presumably there are considerable slowdowns for the variable-index constant-table lookups in Dragon, LEX, NLS, and Sosemanuk, and larger slowdowns for the variable-index variable-table lookups in HC-128 and HC-256. These implementations have not been written, let alone benchmarked, so for the moment the only remaining choices are CryptMT, Rabbit, Salsa20/8, Salsa20/12, and Salsa20/20.

A user who wants a cipher that also fits into small hardware will discard CryptMT, Dragon, HC-128, and HC-256. The remaining choices are LEX, NLS, Rabbit, Salsa20/8, Salsa20/12, Salsa20/20, and Sosemanuk.

All of the “phase 3 software” ciphers are free for non-commercial use. A user who wants a cipher that is also free for commercial use will discard CryptMT and Rabbit (although CryptMT will be made free if it appears in the final eSTREAM portfolio). The remaining choices are Dragon, HC-128, HC-256, LEX, NLS, Salsa20/8, Salsa20/12, Salsa20/20, and Sosemanuk.

1 Intel Core 2 Quad Q6600 6fb, amd64 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|--|--|--|--|---|---|
| Salsa20/8 <small>251</small> 1.88 | Salsa20/8 <small>251</small> 2.86 | Salsa20/8 <small>251</small> 2.24 | Salsa20/8 <small>251</small> 2.06 | Salsa20/8 <small>251</small> 10.79 | Salsa20/8 <small>251</small> 11.47 |
| HC-128 <small>128</small> 2.34 | CryptMTv3 <small>256</small> 2.95 | Rabbit <small>128</small> 2.80 | Salsa20/12 <small>256</small> 2.80 | Salsa20/12 <small>256</small> 12.67 | Salsa20/12 <small>256</small> 13.35 |
| Rabbit <small>128</small> 2.34 | Salsa20/12 <small>256</small> 3.53 | Salsa20/12 <small>256</small> 3.01 | Rabbit <small>128</small> 3.04 | CryptMTv3 <small>256</small> 13.93 | CryptMTv3 <small>256</small> 14.75 |
| Salsa20/12 <small>256</small> 2.54 | Rabbit <small>128</small> 3.66 | TRIVIUM 4.11 | Salsa20/20 <small>256</small> 4.24 | LEX v2 <small>128</small> 15.74 | Salsa20/20 <small>256</small> 16.87 |
| CryptMTv3 <small>256</small> 2.71 | TRIVIUM 4.75 | Salsa20/20 <small>256</small> 4.55 | TRIVIUM 4.81 | Salsa20/20 <small>256</small> 16.19 | LEX v2 <small>128</small> 19.87 |
| Sosemanuk <small>226</small> 3.54 | Salsa20/20 <small>256</small> 4.88 | NLS v2 <small>128</small> 4.57 | SNOW 2.0 <small>256</small> 5.19 | Rabbit <small>128</small> 17.68 | TRIVIUM 20.39 |
| HC-256 <small>256</small> 3.66 | SNOW 2.0 <small>256</small> 5.57 | SNOW 2.0 <small>256</small> 4.65 | CryptMTv3 <small>256</small> 5.21 | AES-128 <small>128</small> 18.60 | SNOW 2.0 <small>256</small> 24.06 |
| TRIVIUM 3.66 | NLS v2 <small>128</small> 6.65 | Sosemanuk <small>226</small> 4.72 | NLS v2 <small>128</small> 5.39 | TRIVIUM 19.57 | AES-128 <small>128</small> 26.75 |
| Salsa20/20 <small>256</small> 3.91 | Sosemanuk <small>226</small> 6.66 | CryptMTv3 <small>256</small> 4.99 | Sosemanuk <small>226</small> 5.77 | SNOW 2.0 <small>256</small> 22.44 | Rabbit <small>128</small> 27.81 |
| NLS v2 <small>128</small> 4.11 | LEX v2 <small>128</small> 7.26 | LEX v2 <small>128</small> 6.24 | LEX v2 <small>128</small> 6.95 | Sosemanuk <small>226</small> 23.99 | AES-256 <small>256</small> 34.74 |
| SNOW 2.0 <small>256</small> 4.16 | Dragon <small>256</small> 9.30 | RC4 10.15 | AES-128 <small>128</small> 12.79 | NLS v2 <small>128</small> 24.19 | NLS v2 <small>128</small> 37.16 |
| LEX v2 <small>128</small> 5.83 | HC-128 <small>128</small> 10.83 | AES-128 <small>128</small> 12.72 | RC4 13.74 | AES-256 <small>256</small> 24.68 | Sosemanuk <small>226</small> 40.81 |
| Dragon <small>256</small> 7.33 | RC4 13.91 | HC-128 <small>128</small> 15.59 | AES-256 <small>256</small> 17.95 | Dragon <small>256</small> 49.85 | Dragon <small>256</small> 52.23 |
| RC4 7.47 | AES-128 <small>128</small> 14.39 | AES-256 <small>256</small> 17.88 | Dragon <small>256</small> 20.54 | RC4 144.92 | RC4 147.58 |
| AES-128 <small>128</small> 12.59 | HC-256 <small>256</small> 16.51 | Dragon <small>256</small> 18.80 | HC-128 <small>128</small> 36.63 | HC-128 <small>128</small> 498.93 | HC-128 <small>128</small> 499.79 |
| AES-256 <small>256</small> 17.75 | AES-256 <small>256</small> 19.87 | HC-256 <small>256</small> 34.18 | HC-256 <small>256</small> 82.76 | HC-256 <small>256</small> 1145.68 | HC-256 <small>256</small> 1146.48 |

These measurements were collected on a computer named `latour` in the Coding and Cryptography Computer Cluster at Technische Universiteit Eindhoven. This computer has a four-core 2394MHz Intel Core 2 Quad Q6600 6fb processor. Measurements used one core of the processor.

These measurements used `estreambench-20080326`. The LEX v2 measurements reflect recent speedups from Peter Schwabe.

2 IBM Cell PPE, ppc64 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|---|---|---|---|---|---|
| Salsa20/8 <small>251</small> 6.75 | Salsa20/8 <small>251</small> 10.07 | Salsa20/8 <small>251</small> 7.56 | Salsa20/8 <small>251</small> 7.20 | Salsa20/8 <small>251</small> 41.10 | Salsa20/8 <small>251</small> 43.76 |
| Salsa20/12 <small>256</small> 9.75 | Salsa20/12 <small>256</small> 13.09 | Salsa20/12 <small>256</small> 10.63 | Salsa20/12 <small>256</small> 10.20 | LEX v2 <small>128</small> 42.92 | Salsa20/12 <small>256</small> 48.46 |
| TRIVIUM 9.81 | TRIVIUM 13.76 | TRIVIUM 11.17 | TRIVIUM 12.92 | Salsa20/12 <small>256</small> 45.80 | LEX v2 <small>128</small> 53.77 |
| HC-128 <small>128</small> 11.02 | LEX v2 <small>128</small> 17.72 | LEX v2 <small>128</small> 14.50 | LEX v2 <small>128</small> 16.36 | Salsa20/20 <small>256</small> 54.41 | Salsa20/20 <small>256</small> 58.56 |
| LEX v2 <small>128</small> 12.59 | Salsa20/20 <small>256</small> 19.26 | NLS v2 <small>128</small> 16.97 | Salsa20/20 <small>256</small> 16.46 | TRIVIUM 55.42 | TRIVIUM 62.02 |
| NLS v2 <small>128</small> 15.18 | Dragon <small>256</small> 23.06 | Salsa20/20 <small>256</small> 17.05 | NLS v2 <small>128</small> 21.28 | AES-128 <small>128</small> 70.90 | AES-128 <small>128</small> 80.20 |
| Salsa20/20 <small>256</small> 16.07 | Sosemanuk <small>226</small> 23.68 | SNOW 2.0 <small>256</small> 25.07 | SNOW 2.0 <small>256</small> 25.99 | NLS v2 <small>128</small> 81.95 | AES-256 <small>256</small> 108.68 |
| HC-256 <small>256</small> 16.08 | NLS v2 <small>128</small> 24.12 | Sosemanuk <small>226</small> 28.29 | Sosemanuk <small>226</small> 32.23 | AES-256 <small>256</small> 83.97 | NLS v2 <small>128</small> 124.20 |
| Dragon <small>256</small> 17.70 | SNOW 2.0 <small>256</small> 26.23 | AES-128 <small>128</small> 36.82 | AES-128 <small>128</small> 36.92 | Sosemanuk <small>226</small> 85.63 | SNOW 2.0 <small>256</small> 131.75 |
| Sosemanuk <small>226</small> 21.11 | HC-128 <small>128</small> 38.61 | Rabbit <small>128</small> 37.42 | Rabbit <small>128</small> 39.84 | Rabbit <small>128</small> 112.04 | Rabbit <small>128</small> 169.43 |
| SNOW 2.0 <small>256</small> 22.46 | Rabbit <small>128</small> 40.34 | HC-128 <small>128</small> 53.77 | AES-256 <small>256</small> 60.57 | SNOW 2.0 <small>256</small> 124.29 | CryptMTv3 <small>256</small> 180.81 |
| CryptMTv3 <small>256</small> 26.79 | AES-128 <small>128</small> 41.68 | RC4 57.24 | CryptMTv3 <small>256</small> 72.65 | CryptMTv3 <small>256</small> 174.56 | Sosemanuk <small>226</small> 239.92 |
| Rabbit <small>128</small> 35.03 | HC-256 <small>256</small> 60.94 | AES-256 <small>256</small> 60.67 | RC4 77.00 | Dragon <small>256</small> 266.21 | Dragon <small>256</small> 275.56 |
| AES-128 <small>128</small> 35.83 | RC4 60.98 | CryptMTv3 <small>256</small> 61.79 | HC-128 <small>128</small> 119.48 | RC4 522.27 | RC4 533.53 |
| RC4 44.17 | CryptMTv3 <small>256</small> 67.60 | HC-256 <small>256</small> 140.97 | Dragon <small>256</small> 150.39 | HC-128 <small>128</small> 1613.00 | HC-128 <small>128</small> 1618.20 |
| AES-256 <small>256</small> 60.18 | AES-256 <small>256</small> 90.68 | Dragon <small>256</small> 143.85 | HC-256 <small>256</small> 329.97 | HC-256 <small>256</small> 4579.75 | HC-256 <small>256</small> 4587.27 |

These measurements were collected on a computer named `nmips3` in the NMI Build and Test Lab at the University of Wisconsin at Madison. This computer is a Sony Playstation 3 with a 3192MHz Sony-Toshiba-IBM Cell processor. Measurements used one thread on one core of the processor, specifically the “PPE.” The “SPE” cores were not used.

These measurements used `estreambench-20080326`. The LEX v2 measurements reflect recent speedups from Peter Schwabe.

3 Intel Pentium D 930 f64, amd64 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|---|---|---|---|---|---|
| HC-128 <small>128</small> 3.88 | Sosemanuk <small>226</small> 7.26 | SNOW 2.0 <small>256</small> 5.62 | Salsa20/8 <small>251</small> 5.64 | LEX v2 <small>128</small> 23.99 | LEX v2 <small>128</small> 31.73 |
| SNOW 2.0 <small>256</small> 4.85 | Salsa20/8 <small>251</small> 7.34 | NLS v2 <small>128</small> 6.07 | SNOW 2.0 <small>256</small> 6.52 | AES-128 <small>128</small> 26.28 | Salsa20/8 <small>251</small> 33.03 |
| Salsa20/8 <small>251</small> 4.91 | SNOW 2.0 <small>256</small> 7.69 | Salsa20/8 <small>251</small> 6.86 | NLS v2 <small>128</small> 7.13 | NLS v2 <small>128</small> 29.77 | TRIVIUM 34.00 |
| HC-256 <small>256</small> 5.20 | TRIVIUM 8.29 | Sosemanuk <small>226</small> 6.86 | Salsa20/12 <small>256</small> 7.67 | Salsa20/8 <small>251</small> 30.38 | AES-128 <small>128</small> 34.02 |
| Sosemanuk <small>226</small> 5.31 | Salsa20/12 <small>256</small> 8.94 | TRIVIUM 7.07 | TRIVIUM 8.17 | Rabbit <small>128</small> 31.16 | SNOW 2.0 <small>256</small> 37.44 |
| NLS v2 <small>128</small> 5.59 | NLS v2 <small>128</small> 9.89 | LEX v2 <small>128</small> 8.28 | Sosemanuk <small>226</small> 8.38 | TRIVIUM 31.22 | Salsa20/12 <small>256</small> 38.74 |
| CryptMTv3 <small>256</small> 5.77 | LEX v2 <small>128</small> 10.23 | Salsa20/12 <small>256</small> 9.15 | LEX v2 <small>128</small> 9.19 | Sosemanuk <small>226</small> 32.54 | CryptMTv3 <small>256</small> 44.30 |
| TRIVIUM 6.28 | CryptMTv3 <small>256</small> 12.40 | Rabbit <small>128</small> 10.90 | Rabbit <small>128</small> 11.70 | SNOW 2.0 <small>256</small> 33.57 | NLS v2 <small>128</small> 47.55 |
| Salsa20/12 <small>256</small> 7.12 | Rabbit <small>128</small> 13.01 | CryptMTv3 <small>256</small> 11.98 | Salsa20/20 <small>256</small> 12.64 | Salsa20/12 <small>256</small> 36.09 | Rabbit <small>128</small> 49.19 |
| LEX v2 <small>128</small> 7.54 | Salsa20/20 <small>256</small> 13.03 | Salsa20/20 <small>256</small> 13.85 | CryptMTv3 <small>256</small> 13.18 | AES-256 <small>256</small> 38.76 | Salsa20/20 <small>256</small> 49.96 |
| Dragon <small>256</small> 9.93 | Dragon <small>256</small> 14.01 | AES-128 <small>128</small> 17.09 | AES-128 <small>128</small> 17.33 | CryptMTv3 <small>256</small> 41.75 | AES-256 <small>256</small> 53.85 |
| Rabbit <small>128</small> 10.30 | RC4 16.13 | HC-128 <small>128</small> 24.77 | AES-256 <small>256</small> 24.67 | Salsa20/20 <small>256</small> 47.31 | Sosemanuk <small>226</small> 58.59 |
| Salsa20/20 <small>256</small> 10.66 | HC-128 <small>128</small> 17.17 | Dragon <small>256</small> 26.39 | Dragon <small>256</small> 28.40 | Dragon <small>256</small> 72.52 | Dragon <small>256</small> 77.59 |
| RC4 11.98 | AES-128 <small>128</small> 20.03 | AES-256 <small>256</small> 26.49 | RC4 52.06 | RC4 587.04 | RC4 590.81 |
| AES-128 <small>128</small> 16.82 | HC-256 <small>256</small> 24.31 | RC4 27.35 | HC-128 <small>128</small> 57.81 | HC-128 <small>128</small> 833.20 | HC-128 <small>128</small> 836.39 |
| AES-256 <small>256</small> 24.39 | AES-256 <small>256</small> 28.96 | HC-256 <small>256</small> 60.67 | HC-256 <small>256</small> 150.43 | HC-256 <small>256</small> 2099.48 | HC-256 <small>256</small> 2102.03 |

These measurements were collected on a computer named `speed` at Technische Universiteit Eindhoven. This computer has a two-core 2992MHz Intel Pentium D 930 f64 processor. Measurements used one core of the processor.

These measurements used `estreambench-20080326`. The LEX v2 measurements reflect recent speedups from Peter Schwabe.

4 AMD Athlon 64 X2 3800+ 15,75,2, amd64 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|--|--|--|--|---|---|
| Rabbit <small>128</small> 2.86 | Rabbit <small>128</small> 4.62 | Rabbit <small>128</small> 3.40 | Salsa20/8 <small>251</small> 3.65 | Salsa20/8 <small>251</small> 10.58 | Salsa20/8 <small>251</small> 12.11 |
| HC-128 <small>128</small> 2.87 | Salsa20/8 <small>251</small> 4.79 | Salsa20/8 <small>251</small> 3.67 | Rabbit <small>128</small> 3.73 | Salsa20/12 <small>256</small> 12.79 | Salsa20/12 <small>256</small> 14.32 |
| Salsa20/8 <small>251</small> 3.47 | Sosemanuk <small>226</small> 5.35 | TRIVIUM 4.56 | Salsa20/12 <small>256</small> 5.04 | LEX v2 <small>128</small> 14.51 | Salsa20/20 <small>256</small> 18.78 |
| Sosemanuk <small>226</small> 4.06 | TRIVIUM 5.42 | NLS v2 <small>128</small> 4.65 | TRIVIUM 5.29 | Salsa20/20 <small>256</small> 17.25 | LEX v2 <small>128</small> 19.35 |
| TRIVIUM 4.08 | Salsa20/12 <small>256</small> 6.18 | Salsa20/12 <small>256</small> 5.09 | NLS v2 <small>128</small> 5.58 | AES-128 <small>128</small> 19.89 | CryptMTv3 <small>256</small> 22.10 |
| NLS v2 <small>128</small> 4.26 | SNOW 2.0 <small>256</small> 6.65 | Sosemanuk <small>226</small> 5.26 | SNOW 2.0 <small>256</small> 5.91 | CryptMTv3 <small>256</small> 20.29 | TRIVIUM 22.97 |
| HC-256 <small>256</small> 4.28 | LEX v2 <small>128</small> 7.00 | SNOW 2.0 <small>256</small> 5.40 | LEX v2 <small>128</small> 6.29 | TRIVIUM 21.20 | SNOW 2.0 <small>256</small> 27.17 |
| CryptMTv3 <small>256</small> 4.63 | NLS v2 <small>128</small> 7.23 | LEX v2 <small>128</small> 5.63 | Sosemanuk <small>226</small> 6.34 | Rabbit <small>128</small> 21.31 | AES-128 <small>128</small> 29.65 |
| SNOW 2.0 <small>256</small> 4.86 | CryptMTv3 <small>256</small> 8.64 | CryptMTv3 <small>256</small> 7.77 | Salsa20/20 <small>256</small> 7.84 | NLS v2 <small>128</small> 23.24 | Rabbit <small>128</small> 33.96 |
| Salsa20/12 <small>256</small> 4.86 | Salsa20/20 <small>256</small> 8.97 | Salsa20/20 <small>256</small> 7.94 | CryptMTv3 <small>256</small> 8.40 | Sosemanuk <small>226</small> 24.05 | NLS v2 <small>128</small> 35.02 |
| LEX v2 <small>128</small> 5.25 | Dragon <small>256</small> 10.02 | AES-128 <small>128</small> 13.45 | AES-128 <small>128</small> 13.58 | SNOW 2.0 <small>256</small> 24.49 | AES-256 <small>256</small> 38.43 |
| Salsa20/20 <small>256</small> 7.64 | HC-128 <small>128</small> 10.81 | HC-128 <small>128</small> 18.55 | AES-256 <small>256</small> 18.77 | AES-256 <small>256</small> 26.19 | Sosemanuk <small>226</small> 41.91 |
| Dragon <small>256</small> 7.76 | AES-128 <small>128</small> 16.22 | AES-256 <small>256</small> 18.65 | Dragon <small>256</small> 26.08 | Dragon <small>256</small> 61.40 | Dragon <small>256</small> 64.48 |
| AES-128 <small>128</small> 13.32 | HC-256 <small>256</small> 16.43 | RC4 23.59 | RC4 38.23 | RC4 357.69 | RC4 360.56 |
| RC4 14.45 | RC4 21.47 | Dragon <small>256</small> 24.45 | HC-128 <small>128</small> 43.44 | HC-128 <small>128</small> 590.50 | HC-128 <small>128</small> 592.51 |
| AES-256 <small>256</small> 18.52 | AES-256 <small>256</small> 23.11 | HC-256 <small>256</small> 64.17 | HC-256 <small>256</small> 159.78 | HC-256 <small>256</small> 2247.60 | HC-256 <small>256</small> 2250.18 |

These measurements were collected on a computer named `mace` in the Center for Research and Instruction in Technologies for Electronic Security (RITES) at the University of Illinois at Chicago. This computer has a two-core 2000MHz AMD Athlon 64 X2 3800+ 15,75,2 processor. Measurements used one core of the processor.

These measurements used `estreambench-20080326`. The LEX v2 measurements reflect recent speedups from Peter Schwabe.

5 Intel Pentium M LV 718 695, x86 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|---|---|---|---|---|---|
| HC-128 <small>128</small> 3.49 | Rabbit <small>128</small> 5.35 | Rabbit <small>128</small> 4.47 | Rabbit <small>128</small> 4.90 | Salsa20/8 <small>251</small> 19.09 | Salsa20/8 <small>251</small> 20.96 |
| Rabbit <small>128</small> 3.94 | SNOW 2.0 <small>256</small> 6.16 | SNOW 2.0 <small>256</small> 5.39 | Salsa20/8 <small>251</small> 5.54 | LEX v1 <small>128</small> 20.45 | Salsa20/12 <small>256</small> 24.63 |
| SNOW 2.0 <small>256</small> 4.72 | Salsa20/8 <small>251</small> 6.34 | NLS v2 <small>128</small> 5.62 | SNOW 2.0 <small>256</small> 6.12 | Salsa20/12 <small>256</small> 22.88 | CryptMTv3 <small>256</small> 25.51 |
| CryptMTv3 <small>256</small> 4.77 | TRIVIUM 6.56 | Salsa20/8 <small>251</small> 5.63 | NLS v2 <small>128</small> 6.82 | CryptMTv3 <small>256</small> 23.37 | AES-128 <small>128</small> 28.60 |
| HC-256 <small>256</small> 4.99 | Sosemanuk <small>226</small> 6.61 | TRIVIUM 6.16 | TRIVIUM 7.12 | Rabbit <small>128</small> 23.45 | TRIVIUM 31.03 |
| NLS v2 <small>128</small> 5.13 | CryptMTv3 <small>256</small> 7.98 | Salsa20/12 <small>256</small> 7.86 | Salsa20/12 <small>256</small> 7.71 | AES-128 <small>128</small> 23.69 | LEX v1 <small>128</small> 31.44 |
| Salsa20/8 <small>251</small> 5.30 | Salsa20/12 <small>256</small> 8.48 | Sosemanuk <small>226</small> 8.56 | CryptMTv3 <small>256</small> 8.66 | NLS v2 <small>128</small> 28.29 | Salsa20/20 <small>256</small> 31.87 |
| TRIVIUM 5.52 | NLS v2 <small>128</small> 8.58 | CryptMTv3 <small>256</small> 8.71 | Sosemanuk <small>226</small> 10.01 | TRIVIUM 29.03 | SNOW 2.0 <small>256</small> 32.57 |
| Sosemanuk <small>226</small> 5.60 | LEX v1 <small>128</small> 11.89 | LEX v1 <small>128</small> 10.02 | LEX v1 <small>128</small> 10.84 | SNOW 2.0 <small>256</small> 29.71 | Rabbit <small>128</small> 37.45 |
| Salsa20/12 <small>256</small> 7.44 | Salsa20/20 <small>256</small> 12.74 | Salsa20/20 <small>256</small> 12.26 | Salsa20/20 <small>256</small> 11.97 | Salsa20/20 <small>256</small> 30.14 | NLS v2 <small>128</small> 43.42 |
| LEX v1 <small>128</small> 9.51 | HC-128 <small>128</small> 15.46 | AES-128 <small>128</small> 16.17 | AES-128 <small>128</small> 16.30 | Sosemanuk <small>226</small> 34.28 | AES-256 <small>256</small> 50.79 |
| Salsa20/20 <small>256</small> 11.70 | Dragon <small>256</small> 15.58 | RC4 21.84 | AES-256 <small>256</small> 25.30 | AES-256 <small>256</small> 35.19 | Sosemanuk <small>226</small> 63.18 |
| RC4 12.65 | RC4 15.81 | HC-128 <small>128</small> 23.84 | Dragon <small>256</small> 32.40 | Dragon <small>256</small> 83.41 | Dragon <small>256</small> 88.23 |
| Dragon <small>256</small> 13.38 | AES-128 <small>128</small> 18.04 | AES-256 <small>256</small> 25.16 | RC4 36.40 | RC4 356.42 | RC4 359.64 |
| AES-128 <small>128</small> 15.96 | HC-256 <small>256</small> 22.50 | Dragon <small>256</small> 29.99 | HC-128 <small>128</small> 56.27 | HC-128 <small>128</small> 767.88 | HC-128 <small>128</small> 770.03 |
| AES-256 <small>256</small> 24.98 | AES-256 <small>256</small> 28.79 | HC-256 <small>256</small> 50.96 | HC-256 <small>256</small> 124.39 | HC-256 <small>256</small> 1727.68 | HC-256 <small>256</small> 1729.22 |

These measurements were collected on a computer named `whisper` owned by me. This computer has a one-core 1300MHz Intel Pentium M LV 718 695 processor.

These measurements used `estreambench-20080209`. This `estreambench` version predates the first LEX v2 implementation, so LEX v1 is listed instead of LEX v2.

6 Intel Pentium 4 HT 530 f41, x86 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|---|---|---|---|---|---|
| HC-128 <small>128</small> 4.53 | Sosemanuk <small>226</small> 7.76 | SNOW 2.0 <small>256</small> 6.19 | Salsa20/8 <small>251</small> 6.95 | LEX v2 <small>128</small> 24.53 | LEX v2 <small>128</small> 32.87 |
| SNOW 2.0 <small>256</small> 5.19 | SNOW 2.0 <small>256</small> 7.89 | NLS v2 <small>128</small> 6.66 | SNOW 2.0 <small>256</small> 7.29 | Rabbit <small>128</small> 26.78 | Salsa20/8 <small>251</small> 34.80 |
| CryptMTv3 <small>256</small> 5.57 | Salsa20/8 <small>251</small> 8.24 | Salsa20/8 <small>251</small> 7.42 | NLS v2 <small>128</small> 8.90 | AES-128 <small>128</small> 29.92 | AES-128 <small>128</small> 37.73 |
| NLS v2 <small>128</small> 5.64 | Salsa20/12 <small>256</small> 10.30 | Rabbit <small>128</small> 8.50 | Salsa20/12 <small>256</small> 8.98 | Salsa20/8 <small>251</small> 31.88 | Salsa20/12 <small>256</small> 40.31 |
| Sosemanuk <small>226</small> 5.72 | Rabbit <small>128</small> 10.44 | Sosemanuk <small>226</small> 9.39 | Rabbit <small>128</small> 9.12 | Salsa20/12 <small>256</small> 37.39 | Rabbit <small>128</small> 41.30 |
| Salsa20/8 <small>251</small> 5.79 | TRIVIUM 11.10 | TRIVIUM 10.11 | Sosemanuk <small>226</small> 11.16 | Sosemanuk <small>226</small> 38.54 | CryptMTv3 <small>256</small> 45.81 |
| HC-256 <small>256</small> 6.26 | CryptMTv3 <small>256</small> 12.45 | Salsa20/12 <small>256</small> 10.12 | TRIVIUM 11.81 | CryptMTv3 <small>256</small> 42.61 | SNOW 2.0 <small>256</small> 48.44 |
| Salsa20/12 <small>256</small> 7.76 | NLS v2 <small>128</small> 12.87 | LEX v2 <small>128</small> 11.18 | LEX v2 <small>128</small> 12.28 | SNOW 2.0 <small>256</small> 42.91 | Salsa20/20 <small>256</small> 50.93 |
| Rabbit <small>128</small> 8.02 | LEX v2 <small>128</small> 13.23 | CryptMTv3 <small>256</small> 12.83 | CryptMTv3 <small>256</small> 13.09 | AES-256 <small>256</small> 43.07 | TRIVIUM 51.21 |
| TRIVIUM 9.03 | Salsa20/20 <small>256</small> 14.05 | Salsa20/20 <small>256</small> 14.78 | Salsa20/20 <small>256</small> 13.32 | Salsa20/20 <small>256</small> 47.94 | AES-256 <small>256</small> 58.74 |
| LEX v2 <small>128</small> 10.49 | HC-128 <small>128</small> 17.44 | AES-128 <small>128</small> 19.17 | AES-128 <small>128</small> 19.52 | TRIVIUM 48.14 | NLS v2 <small>128</small> 87.26 |
| Salsa20/20 <small>256</small> 11.77 | Dragon <small>256</small> 18.17 | AES-256 <small>256</small> 28.21 | AES-256 <small>256</small> 28.64 | NLS v2 <small>128</small> 53.00 | Sosemanuk <small>226</small> 91.29 |
| Dragon <small>256</small> 13.41 | RC4 20.23 | HC-128 <small>128</small> 28.50 | Dragon <small>256</small> 34.68 | Dragon <small>256</small> 95.21 | Dragon <small>256</small> 100.35 |
| RC4 16.44 | AES-128 <small>128</small> 22.02 | Dragon <small>256</small> 30.95 | RC4 55.96 | RC4 585.16 | RC4 589.22 |
| AES-128 <small>128</small> 18.81 | HC-256 <small>256</small> 24.41 | RC4 31.64 | HC-128 <small>128</small> 67.54 | HC-128 <small>128</small> 887.98 | HC-128 <small>128</small> 891.06 |
| AES-256 <small>256</small> 28.05 | AES-256 <small>256</small> 32.46 | HC-256 <small>256</small> 68.64 | HC-256 <small>256</small> 168.08 | HC-256 <small>256</small> 2345.04 | HC-256 <small>256</small> 2348.07 |

These measurements were collected on a computer named `svlin002` at Technische Universiteit Eindhoven. This computer has a one-core 2992MHz Intel Pentium 4 HT 530 f41 processor.

These measurements used `estreambench-20080326`.

7 IBM PowerPC G5 970FX, ppc64 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|--|---|--|--|---|---|
| Salsa20/8 <small>251</small> 3.24 | Salsa20/8 <small>251</small> 5.80 | Salsa20/8 <small>251</small> 3.45 | Salsa20/8 <small>251</small> 3.33 | Salsa20/8 <small>251</small> 11.18 | Salsa20/8 <small>251</small> 11.84 |
| HC-128 <small>128</small> 4.22 | Salsa20/12 <small>256</small> 7.32 | Salsa20/12 <small>256</small> 4.98 | Salsa20/12 <small>256</small> 4.83 | Salsa20/12 <small>256</small> 13.53 | Salsa20/12 <small>256</small> 14.32 |
| Salsa20/12 <small>256</small> 4.74 | TRIVIUM 7.62 | TRIVIUM 5.53 | TRIVIUM 6.32 | LEX v2 <small>128</small> 17.95 | Salsa20/20 <small>256</small> 18.97 |
| TRIVIUM 5.02 | Sosemanuk <small>226</small> 9.12 | NLS v2 <small>128</small> 6.40 | NLS v2 <small>128</small> 7.35 | Salsa20/20 <small>256</small> 18.16 | TRIVIUM 26.09 |
| NLS v2 <small>128</small> 5.93 | SNOW 2.0 <small>256</small> 9.76 | SNOW 2.0 <small>256</small> 7.40 | Salsa20/20 <small>256</small> 7.89 | TRIVIUM 23.71 | SNOW 2.0 <small>256</small> 30.91 |
| HC-256 <small>256</small> 6.06 | NLS v2 <small>128</small> 10.14 | LEX v2 <small>128</small> 7.95 | SNOW 2.0 <small>256</small> 8.00 | NLS v2 <small>128</small> 24.43 | CryptMTv3 <small>256</small> 32.39 |
| SNOW 2.0 <small>256</small> 6.68 | Salsa20/20 <small>256</small> 10.33 | Salsa20/20 <small>256</small> 8.14 | LEX v2 <small>128</small> 8.78 | AES-128 <small>128</small> 27.96 | AES-128 <small>128</small> 34.05 |
| Sosemanuk <small>226</small> 6.99 | LEX v2 <small>128</small> 10.49 | Sosemanuk <small>226</small> 8.97 | Sosemanuk <small>226</small> 10.61 | Rabbit <small>128</small> 28.68 | NLS v2 <small>128</small> 38.06 |
| LEX v2 <small>128</small> 7.28 | Dragon <small>256</small> 12.43 | Rabbit <small>128</small> 10.89 | Rabbit <small>128</small> 11.52 | SNOW 2.0 <small>256</small> 28.97 | Rabbit <small>128</small> 43.50 |
| Salsa20/20 <small>256</small> 7.81 | Rabbit <small>128</small> 13.36 | CryptMTv3 <small>256</small> 12.79 | CryptMTv3 <small>256</small> 14.09 | CryptMTv3 <small>256</small> 30.82 | AES-256 <small>256</small> 48.24 |
| CryptMTv3 <small>256</small> 8.18 | CryptMTv3 <small>256</small> 14.06 | RC4 17.33 | AES-128 <small>128</small> 18.67 | Sosemanuk <small>226</small> 36.61 | LEX v2 <small>128</small> 64.98 |
| Dragon <small>256</small> 8.39 | RC4 14.21 | AES-128 <small>128</small> 18.59 | RC4 30.02 | AES-256 <small>256</small> 38.85 | Dragon <small>256</small> 75.87 |
| RC4 9.44 | HC-128 <small>128</small> 19.25 | HC-128 <small>128</small> 23.80 | AES-256 <small>256</small> 31.14 | Dragon <small>256</small> 71.97 | Sosemanuk <small>226</small> 94.55 |
| Rabbit <small>128</small> 10.42 | AES-128 <small>128</small> 22.22 | AES-256 <small>256</small> 31.00 | Dragon <small>256</small> 35.72 | RC4 306.25 | RC4 310.67 |
| AES-128 <small>128</small> 18.50 | HC-256 <small>256</small> 28.65 | Dragon <small>256</small> 34.27 | HC-128 <small>128</small> 55.20 | HC-128 <small>128</small> 739.03 | HC-128 <small>128</small> 740.58 |
| AES-256 <small>256</small> 30.69 | AES-256 <small>256</small> 36.30 | HC-256 <small>256</small> 58.48 | HC-256 <small>256</small> 141.02 | HC-256 <small>256</small> 1955.50 | HC-256 <small>256</small> 1957.12 |

These measurements were collected on a computer named `geespaz` in the NMI Build and Test Lab at the University of Wisconsin at Madison. This computer has two 2000MHz IBM PowerPC G5 970FX processors. Measurements used one processor.

These measurements used `estreambench-20080326`. The LEX v2 measurements reflect recent speedups from Peter Schwabe.

8 Sun UltraSPARC III Cu, sparcv9 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|------------------------------|
| TRIVIUM 5.96 | Salsa20/8 251 7.54 | TRIVIUM 6.57 | Salsa20/8 251 6.76 | LEX v2 128 22.11 | Salsa20/8 251 26.06 |
| HC-128 128 6.03 | TRIVIUM 7.67 | NLS v2 128 6.84 | TRIVIUM 7.50 | Salsa20/8 251 24.56 | LEX v2 128 28.13 |
| NLS v2 128 6.52 | LEX v2 128 9.51 | Salsa20/8 251 6.97 | NLS v2 128 8.54 | Salsa20/12 256 28.66 | Salsa20/12 256 30.14 |
| Salsa20/8 251 6.64 | Sosemanuk 226 9.89 | LEX v2 128 7.77 | LEX v2 128 8.79 | TRIVIUM 28.94 | TRIVIUM 33.52 |
| LEX v2 128 7.21 | Salsa20/12 256 10.21 | Salsa20/12 256 9.66 | Salsa20/12 256 9.32 | Salsa20/20 256 32.94 | Salsa20/20 256 34.54 |
| HC-256 256 7.85 | SNOW 2.0 256 10.99 | SNOW 2.0 256 9.91 | SNOW 2.0 256 10.53 | Rabbit 128 34.80 | SNOW 2.0 256 46.99 |
| Sosemanuk 226 8.47 | Dragon 256 12.27 | Sosemanuk 226 11.94 | Sosemanuk 226 13.46 | NLS v2 128 41.98 | Rabbit 128 51.95 |
| SNOW 2.0 256 8.80 | NLS v2 128 12.68 | Rabbit 128 13.14 | Rabbit 128 13.95 | Sosemanuk 226 42.87 | AES-128 128 54.67 |
| Dragon 256 8.82 | Rabbit 128 15.09 | Salsa20/20 256 14.85 | Salsa20/20 256 14.46 | SNOW 2.0 256 42.89 | NLS v2 128 62.66 |
| Salsa20/12 256 9.21 | Salsa20/20 256 15.24 | CryptMTv3 256 24.40 | CryptMTv3 256 26.70 | AES-128 128 49.10 | CryptMTv3 256 70.93 |
| Rabbit 128 12.21 | RC4 19.50 | RC4 27.21 | AES-128 128 29.86 | CryptMTv3 256 66.40 | Sosemanuk 226 82.63 |
| CryptMTv3 256 13.38 | CryptMTv3 256 25.31 | AES-128 128 29.74 | Dragon 256 45.93 | AES-256 256 82.91 | AES-256 256 99.18 |
| Salsa20/20 256 14.34 | AES-128 128 32.43 | HC-128 128 35.59 | RC4 46.80 | Dragon 256 96.36 | Dragon 256 103.73 |
| RC4 15.10 | HC-128 128 36.95 | Dragon 256 43.99 | AES-256 256 64.93 | RC4 472.63 | RC4 477.03 |
| AES-128 128 29.45 | HC-256 256 58.42 | AES-256 256 64.91 | HC-128 128 82.58 | HC-128 128 1115.14 | HC-128 128 1117.68 |
| AES-256 256 64.60 | AES-256 256 69.66 | HC-256 256 80.54 | HC-256 256 195.89 | HC-256 256 2726.91 | HC-256 256 2729.73 |

These measurements were collected on a computer named `nmisolaris10` in the NMI Build and Test Lab at the University of Wisconsin at Madison. This computer has two 1200MHz Sun UltraSPARC III Cu processors. Measurements used one processor.

These measurements used `estreambench-20080326`. The LEX v2 measurements reflect recent speedups from Peter Schwabe.

9 Intel Pentium 4 1.9 f12, x86 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|--|--|--|--|--|--|
| HC-128 <small>128</small> 4.03 | Salsa20/8 <small>251</small> 7.18 | SNOW 2.0 <small>256</small> 6.09 | Salsa20/8 <small>251</small> 5.99 | Salsa20/8 <small>251</small> 21.83 | Salsa20/8 <small>251</small> 24.18 |
| SNOW 2.0 <small>256</small> 5.18 | SNOW 2.0 <small>256</small> 8.13 | Salsa20/8 <small>251</small> 6.38 | SNOW 2.0 <small>256</small> 7.22 | LEX v2 <small>128</small> 22.67 | Salsa20/12 <small>256</small> 29.42 |
| HC-256 <small>256</small> 5.33 | Salsa20/12 <small>256</small> 9.31 | NLS v2 <small>128</small> 7.18 | Salsa20/12 <small>256</small> 8.21 | AES-128 <small>128</small> 27.01 | LEX v2 <small>128</small> 35.96 |
| CryptMTv3 <small>256</small> 5.37 | Rabbit <small>128</small> 9.79 | Rabbit <small>128</small> 8.44 | Rabbit <small>128</small> 9.39 | Salsa20/12 <small>256</small> 27.05 | AES-128 <small>128</small> 37.23 |
| Salsa20/8 <small>251</small> 5.40 | TRIVIUM 10.21 | Salsa20/12 <small>256</small> 8.83 | NLS v2 <small>128</small> 9.79 | Salsa20/20 <small>256</small> 37.49 | Salsa20/20 <small>256</small> 39.87 |
| NLS v2 <small>128</small> 6.02 | Sosemanuk <small>226</small> 10.72 | TRIVIUM 9.30 | TRIVIUM 10.84 | SNOW 2.0 <small>256</small> 38.14 | SNOW 2.0 <small>256</small> 42.74 |
| Salsa20/12 <small>256</small> 7.51 | CryptMTv3 <small>256</small> 12.88 | LEX v2 <small>128</small> 10.59 | LEX v2 <small>128</small> 11.68 | AES-256 <small>256</small> 39.20 | CryptMTv3 <small>256</small> 45.33 |
| Rabbit <small>128</small> 7.54 | LEX v2 <small>128</small> 13.47 | CryptMTv3 <small>256</small> 12.16 | CryptMTv3 <small>256</small> 12.09 | Rabbit <small>128</small> 39.41 | TRIVIUM 47.40 |
| TRIVIUM 8.29 | NLS v2 <small>128</small> 13.52 | Salsa20/20 <small>256</small> 13.82 | Salsa20/20 <small>256</small> 12.67 | CryptMTv3 <small>256</small> 41.75 | Rabbit <small>128</small> 66.37 |
| Sosemanuk <small>226</small> 9.74 | Salsa20/20 <small>256</small> 13.66 | Sosemanuk <small>226</small> 14.45 | Sosemanuk <small>226</small> 16.90 | TRIVIUM 44.54 | AES-256 <small>256</small> 72.03 |
| LEX v2 <small>128</small> 9.91 | Dragon <small>256</small> 17.61 | AES-128 <small>128</small> 17.19 | AES-128 <small>128</small> 17.58 | Sosemanuk <small>226</small> 57.27 | Dragon <small>256</small> 93.11 |
| Salsa20/20 <small>256</small> 11.74 | RC4 18.91 | RC4 26.02 | AES-256 <small>256</small> 29.50 | NLS v2 <small>128</small> 61.95 | NLS v2 <small>128</small> 96.21 |
| Dragon <small>256</small> 12.57 | HC-128 <small>128</small> 19.28 | AES-256 <small>256</small> 28.24 | Dragon <small>256</small> 31.22 | Dragon <small>256</small> 84.89 | Sosemanuk <small>226</small> 127.73 |
| RC4 14.20 | AES-128 <small>128</small> 20.20 | Dragon <small>256</small> 29.21 | RC4 45.22 | RC4 451.46 | RC4 458.36 |
| AES-128 <small>128</small> 16.98 | HC-256 <small>256</small> 26.57 | HC-128 <small>128</small> 45.25 | HC-128 <small>128</small> 110.25 | HC-128 <small>128</small> 1570.07 | HC-128 <small>128</small> 1572.65 |
| AES-256 <small>256</small> 28.41 | AES-256 <small>256</small> 33.28 | HC-256 <small>256</small> 64.34 | HC-256 <small>256</small> 158.26 | HC-256 <small>256</small> 2215.76 | HC-256 <small>256</small> 2218.11 |

These measurements were collected on a computer named `fireball` in the Center for Research and Instruction in Technologies for Electronic Security (RITES) at the University of Illinois at Chicago. This computer has one 1900MHz Intel Pentium 4 1.9 f12 processor.

These measurements used `estreambench-20080326`.

10 Motorola PowerPC G4 7410, ppc32 architecture

| long | agility | 1500 | 576 | 40 | 40k |
|--|--|--|--|---|---|
| Salsa20/8 <small>251</small> 1.99 | Salsa20/8 <small>251</small> 2.64 | Salsa20/8 <small>251</small> 2.17 | Salsa20/8 <small>251</small> 2.14 | Salsa20/8 <small>251</small> 9.68 | Salsa20/8 <small>251</small> 11.42 |
| Salsa20/12 <small>256</small> 2.74 | Salsa20/12 <small>256</small> 3.40 | Salsa20/12 <small>256</small> 2.94 | Salsa20/12 <small>256</small> 2.88 | Salsa20/12 <small>256</small> 10.88 | Salsa20/12 <small>256</small> 12.62 |
| Salsa20/20 <small>256</small> 4.24 | Salsa20/20 <small>256</small> 4.90 | Salsa20/20 <small>256</small> 4.48 | Salsa20/20 <small>256</small> 4.38 | Salsa20/20 <small>256</small> 13.29 | Salsa20/20 <small>256</small> 15.03 |
| HC-128 <small>128</small> 4.80 | Sosemanuk <small>226</small> 7.10 | NLS v2 <small>128</small> 6.82 | SNOW 2.0 <small>256</small> 8.40 | LEX v2 <small>128</small> 22.80 | LEX v2 <small>128</small> 27.29 |
| HC-256 <small>256</small> 6.17 | SNOW 2.0 <small>256</small> 8.24 | SNOW 2.0 <small>256</small> 7.74 | NLS v2 <small>128</small> 8.73 | AES-128 <small>128</small> 28.21 | AES-128 <small>128</small> 33.33 |
| Sosemanuk <small>226</small> 6.17 | LEX v2 <small>128</small> 9.27 | LEX v2 <small>128</small> 8.19 | LEX v2 <small>128</small> 9.17 | SNOW 2.0 <small>256</small> 31.82 | SNOW 2.0 <small>256</small> 34.52 |
| NLS v2 <small>128</small> 6.22 | Dragon <small>256</small> 10.03 | Sosemanuk <small>226</small> 9.17 | Sosemanuk <small>226</small> 10.61 | Sosemanuk <small>226</small> 32.37 | CryptMTv3 <small>256</small> 40.84 |
| SNOW 2.0 <small>256</small> 7.06 | NLS v2 <small>128</small> 11.16 | TRIVIUM 13.21 | Rabbit <small>128</small> 15.16 | Rabbit <small>128</small> 36.15 | AES-256 <small>256</small> 52.24 |
| LEX v2 <small>128</small> 7.62 | TRIVIUM 13.06 | Rabbit <small>128</small> 14.39 | TRIVIUM 15.16 | CryptMTv3 <small>256</small> 38.70 | Rabbit <small>128</small> 52.75 |
| Dragon <small>256</small> 8.39 | RC4 13.95 | CryptMTv3 <small>256</small> 15.10 | CryptMTv3 <small>256</small> 17.00 | AES-256 <small>256</small> 44.62 | TRIVIUM 62.67 |
| CryptMTv3 <small>256</small> 8.92 | Rabbit <small>128</small> 14.83 | RC4 17.42 | AES-128 <small>128</small> 18.52 | NLS v2 <small>128</small> 46.05 | NLS v2 <small>128</small> 69.29 |
| RC4 11.16 | CryptMTv3 <small>256</small> 15.98 | AES-128 <small>128</small> 17.88 | RC4 27.34 | TRIVIUM 59.77 | Dragon <small>256</small> 70.27 |
| TRIVIUM 11.91 | HC-128 <small>128</small> 16.43 | HC-128 <small>128</small> 25.40 | Dragon <small>256</small> 28.86 | Dragon <small>256</small> 66.90 | Sosemanuk <small>226</small> 77.50 |
| Rabbit <small>128</small> 13.89 | AES-128 <small>128</small> 20.57 | Dragon <small>256</small> 27.14 | AES-256 <small>256</small> 34.97 | RC4 245.45 | RC4 248.77 |
| AES-128 <small>128</small> 17.75 | HC-256 <small>256</small> 26.79 | AES-256 <small>256</small> 34.98 | HC-128 <small>128</small> 58.21 | HC-128 <small>128</small> 779.70 | HC-128 <small>128</small> 781.49 |
| AES-256 <small>256</small> 34.80 | AES-256 <small>256</small> 37.62 | HC-256 <small>256</small> 54.08 | HC-256 <small>256</small> 130.33 | HC-256 <small>256</small> 1798.00 | HC-256 <small>256</small> 1800.19 |

These measurements were collected on a computer named `gggg` in the Center for Research and Instruction in Technologies for Electronic Security (RITES) at the University of Illinois at Chicago. This computer has two 533MHz Motorola PowerPC G4 7410 processors. Measurements used one processor.

These measurements used `estreambench-20080326`. The LEX v2 and AES-128 measurements reflect recent speedups from Peter Schwabe.

References

1. Daniel J. Bernstein, *Which eSTREAM ciphers have been broken?*, eSTREAM report 2008/010 (2008). URL: <http://www.ecrypt.eu.org/stream/papers.html>. Citations in this document: §0.1.