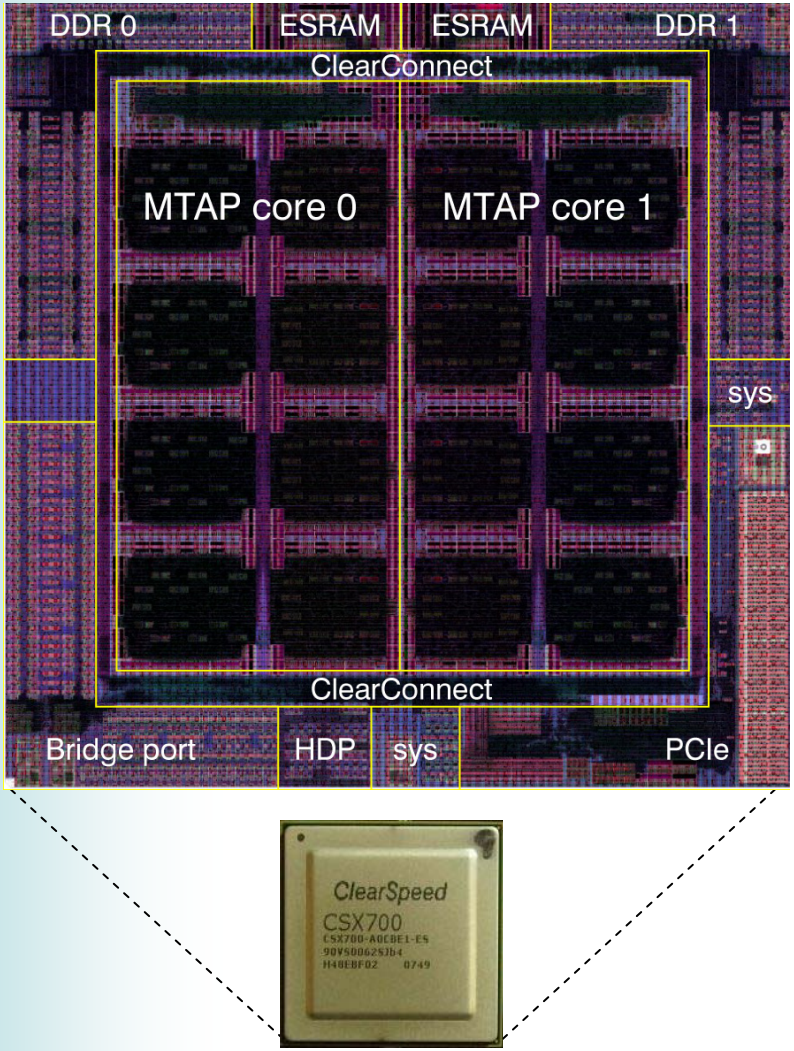
ClearSpeed™

A next-generation many-core processor with reliability, fault tolerance and adaptive power management features optimized for embedded and high performance computing applications

Simon McIntosh-Smith, VP of Applications,
simon@clearspeed.com

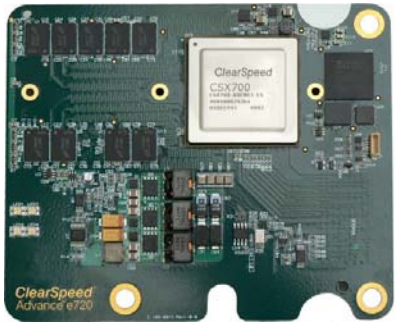
HPEC, September 2008

The CSX700 Processor



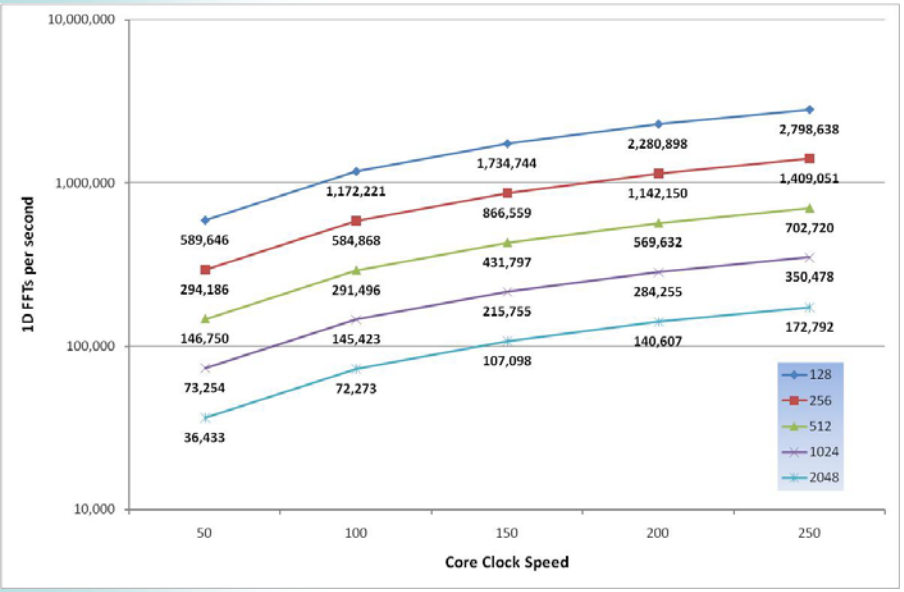
- Includes dual MTAP cores:
  - 96 GFLOPS peak (32 & 64-bit)
  - 48 GMACS peak (16x16 → 32+64)
  - 10W max power consumption
  - 250MHz clock speed
  - 192 Processing Elements (2x96)
  - 8 spare PEs for resiliency
  - ECC on all internal memories
- On-die temperature sensors
- Active power management
- Dual integrated 64-bit DDR2 memory controllers with ECC
- Integrated PCI Express x16
- CCBR chip-to-chip bridge port
- IBM 90nm process
- 266 million transistors
- Shipping to customers since June 08

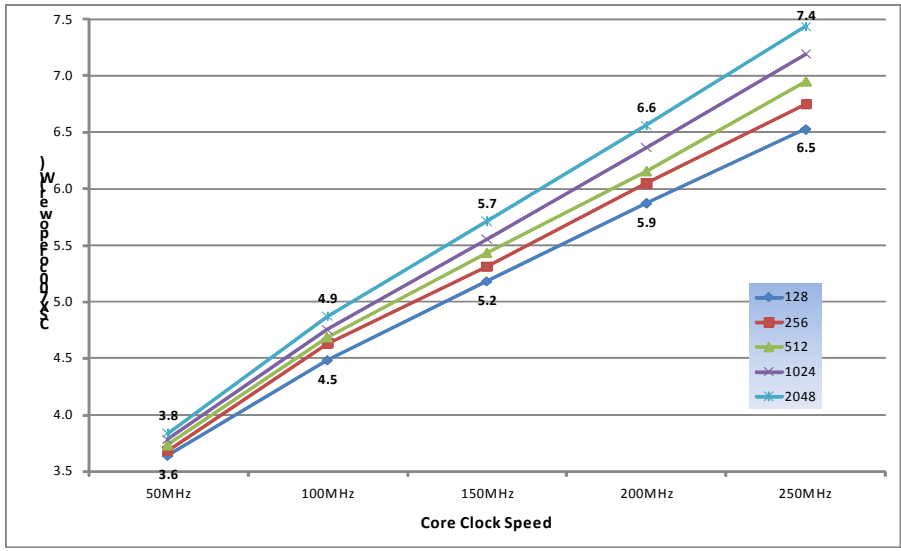
The ClearSpeed Advance™ e710, e720 and CATS-700



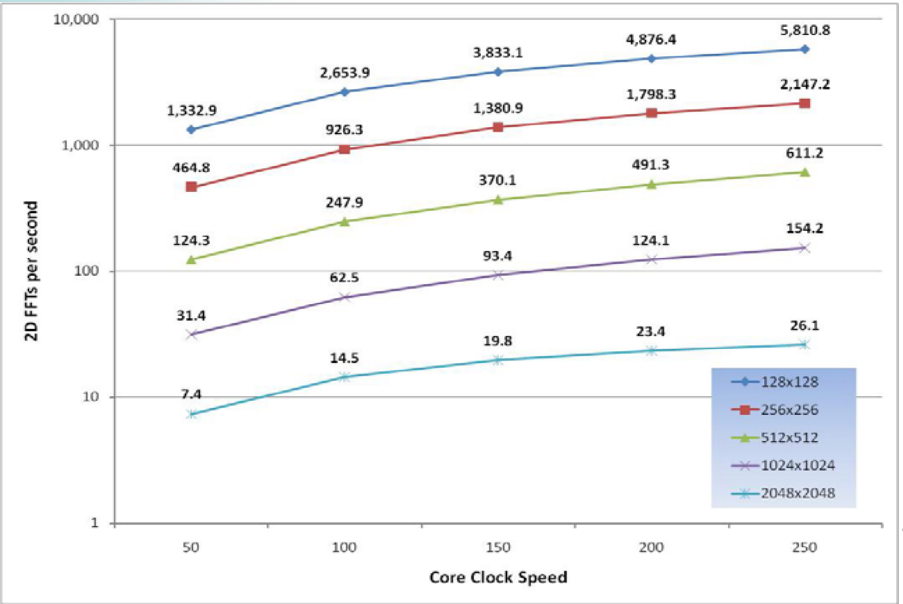
- **96 GFLOPS e710 & e720 fit standard 1U & HP blade servers**
  - Low power consumption of 25W max, small, light, passively cooled
  - Designed for high reliability (MTBF)
  - *All* memory is error protected; no moving parts (e.g. fans) are required
- **CATS-700 1U system**
  - 1.152 TFLOPS 32- and 64-bit floating point
  - 96 GBytes/s memory bandwidth to 24 GB of ECC protected DDR2
  - 300W typical power consumption
- **Easy to use Software Development Kit**
  - ANSI C compiler, gdb-based debugger, advanced profiler

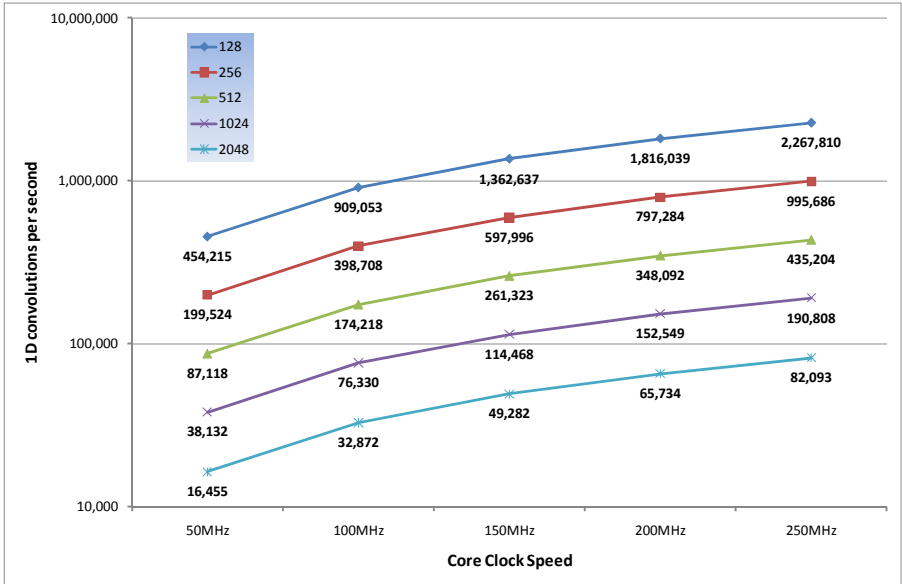
CSX700 FFT performance and e710 power consumption





1D FFT performance up to 20 GFLOPS, 2D FFT performance up to 16 GFLOPS
1D convolution performance up to 22 GFLOPS, ~3 GFLOPS/watt on FFTs





CSX700 and beyond

- The CSX700 is much more power efficient than cell and GPUs for embedded processing.
  - E.g. for single precision complex 1024x1024 2D FFT:

– Cell (8 SPE):	38 GFLOPS	40W	0.95 GFLOP/watt
– S870 (Tesla) GPU:	50 GFLOPS	170W	0.07 GFLOP/watt
– x86 core:	3 GFLOPS	25W	0.12 GFLOP/watt
– **CSX700:**	**20 GFLOPS**	**7W**	**2.86 GFLOP/watt**

- Next generation processor “Carnac” in design now
  - Focusing on 1- and 2D FFT performance
  - Design goal is 100 GFLOPS/watt sustained on 2D FFTs

- ClearSpeed Federal Systems launched to support defense programs