



PICO

tiny mighty machines

ILLIAC IV



Pico Computing Cluster Architecture

- Start with Small Form Factor FPGA Board
 - ExpressCard/34
- Xilinx Virtex-5 FPGA
- Scalable – Can start with 7 FPGA's
- Scale up to 100 FPGA's



Pico Computing Products

- Small Form Factor
 - ExpressCard/34
 - E-16
 - Virtex-5 LX50
 - 32MB PS RAM
 - X1 PCIe Interface



HPC in a Laptop

- Random Number Generator Example
 - 9.1x Faster than CoreDuo
 - 20 Instances
 - 740 Million/Second
 - Integers
 - Approximately 50% of FPGA (LX50) Used



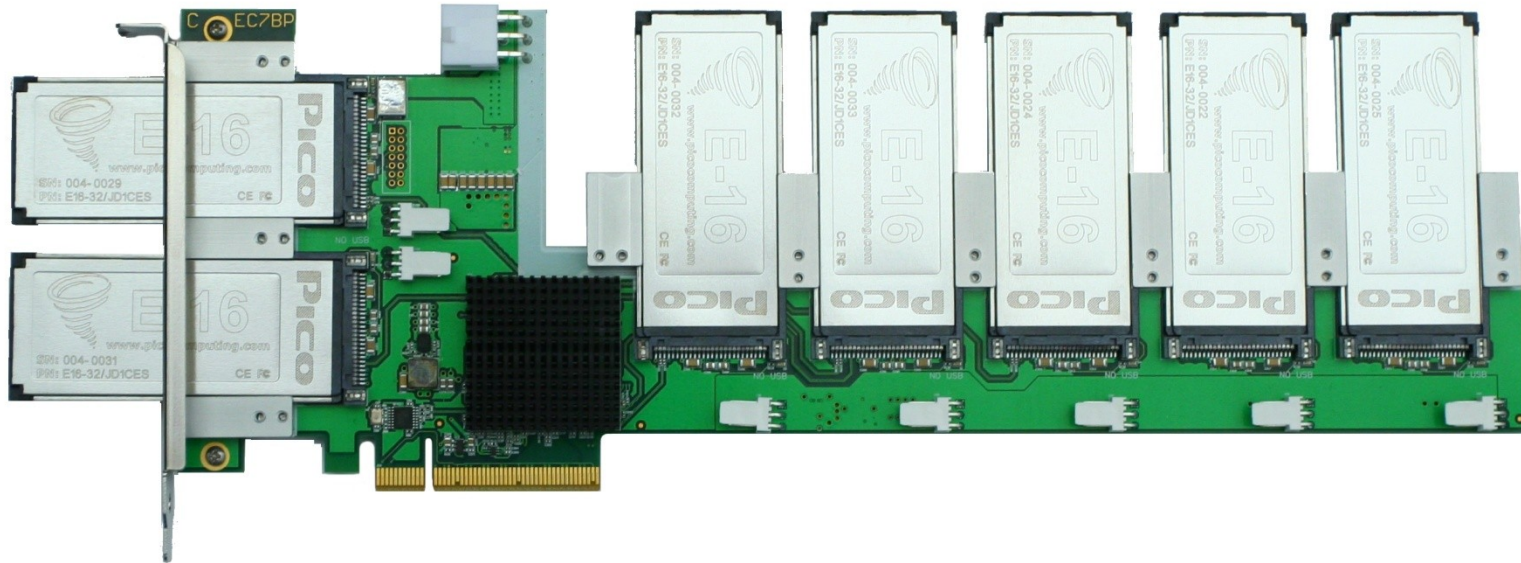
HPC in a Laptop

- Bluetooth Pin Cracking Example
 - 1 Instance
 - 10 Million/Second
 - Approximately 50% of FPGA (LX50) Used



Scalability

- Up to 7 E-16 Cards
- Fits a x8 or x16 PCIe Slot
- Full x1 PCIe Lane to each card



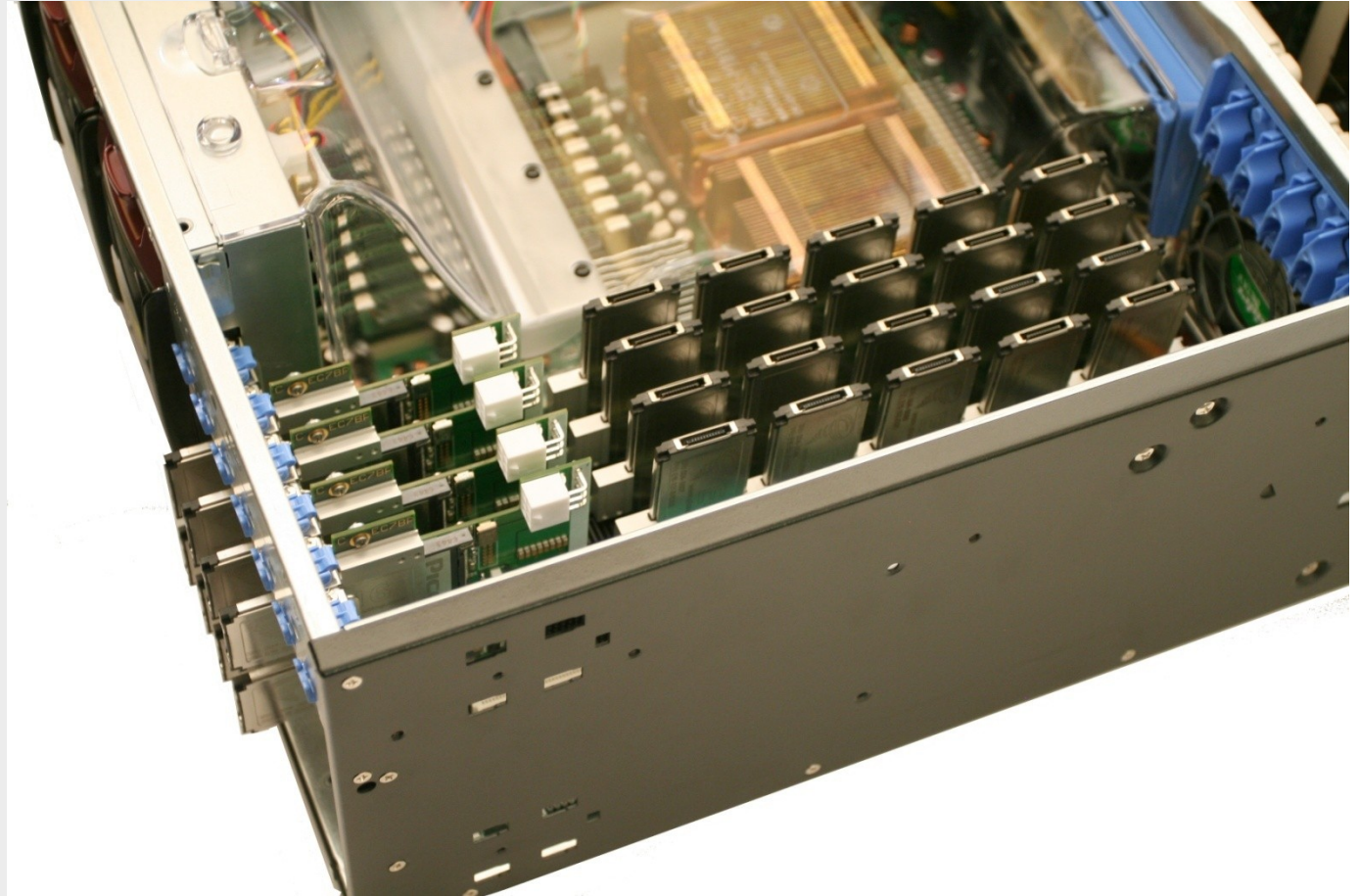
SC3 SuperCluster

- Up to 28 E-16 LX50 Cards
(28 Virtex-5 LX50 FPGA's)
- Intel Xenon Host CPU
- PCIe Backplane
- COTS Components



SC3 SuperCluster

- 28 E-16LX50 Cards
- Only Consumes Approximately 160 Watts
- Generates less heat than RAM



SuperCluster Performance

Key Recovery	Standard Core2Duo Processor	SC2 Cluster 15 E-12LX25	SC3 Cluster 28 E-16LX50
Lanman (all typable characters)	20 Days 5M/sec	24 Minutes 5.6B/sec	8 Minutes 17B/sec
WPA (1 million word list)	4 Hours 90/sec	155 Seconds 6,450/sec	55 Seconds 18,060/sec
WEP (40bit key)	42 Days 300K/sec	2 Hours 135M/sec	50 Minutes 364M/sec
Blue Tooth Pin (10 digit pin)	2.4 Days 48K/Sec	66 Seconds 150M/sec	23 Seconds 420M/sec

