Distributed GPU password cracking

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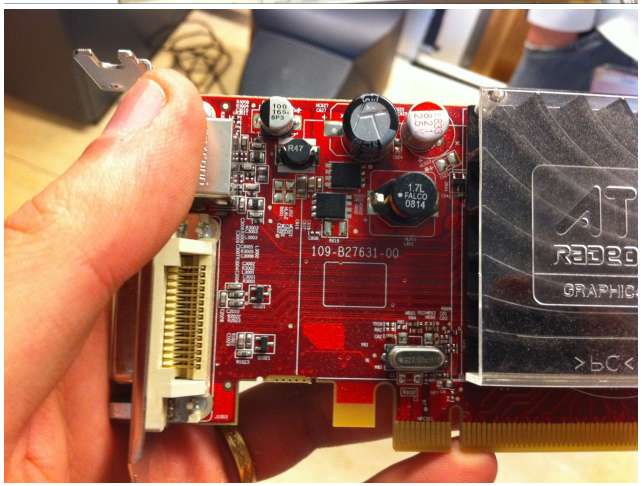
- Introduction
- Password cracking
- Graphics processing unit
- Distributed architectures
- Evaluation
- Conclusions

Research Question

What is the best possible way to do password cracking with GPU processing power in a distributed environment?

KPMG

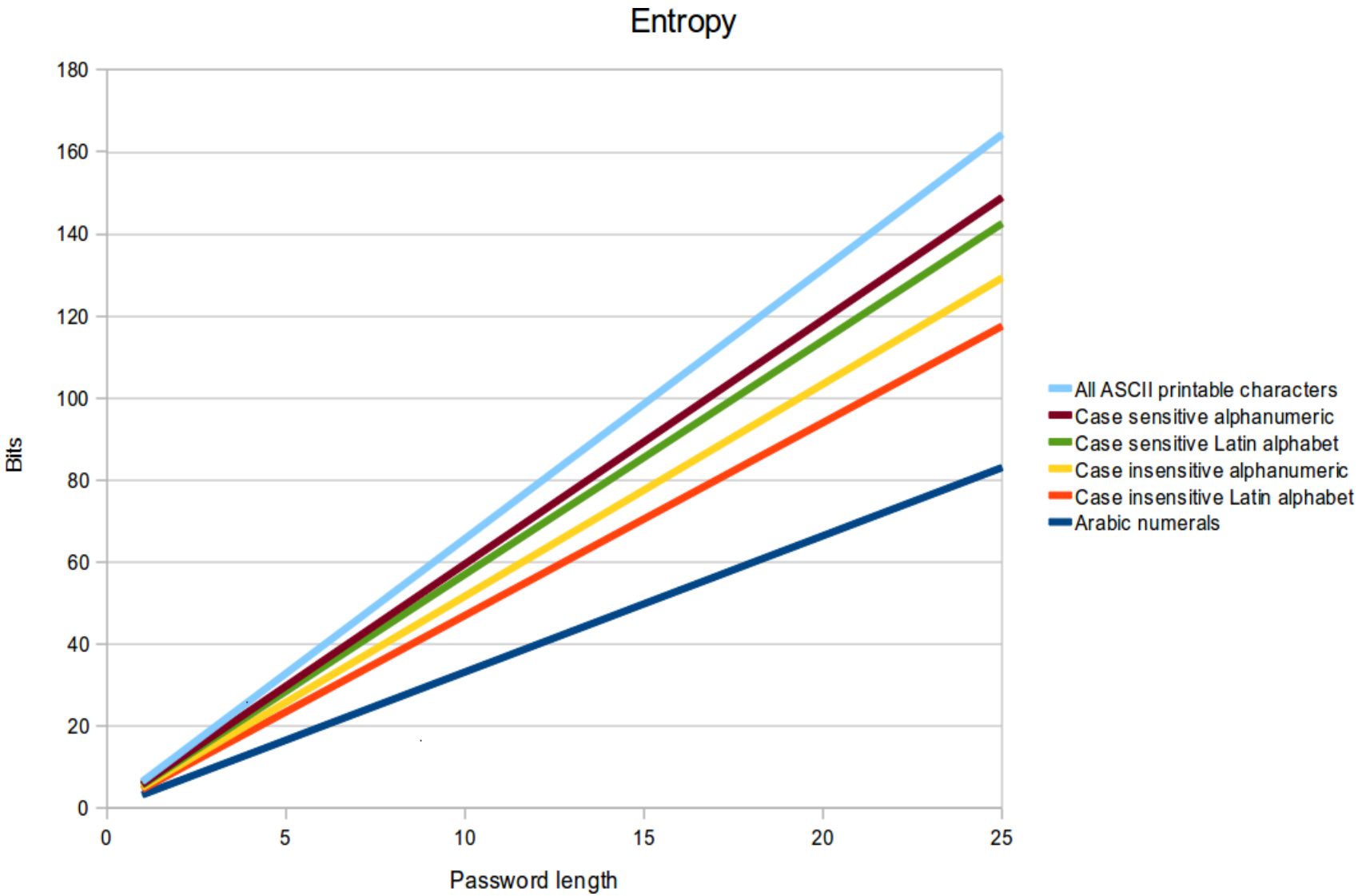
- MPI Cluster
  - Patched version of John the Ripper
- Super GPU machine
  - 2x NVIDIA
  - 1x ATI
- A lot of unused GPUs



Passwords

- Symbol sequence
- Used for authentication
- Hashing
  - One way
  - Avoids plain text
  - Prone to interception and replay

Password Strength



Attack Methods

- Brute force
  - Computational intensive
  - Simple to implement
- Dictionary attack
  - Smart dictionaries
  - I/O intensive
- Pre computation
  - Rainbow tables
  - I/O intensive

Graphics Processing Unit

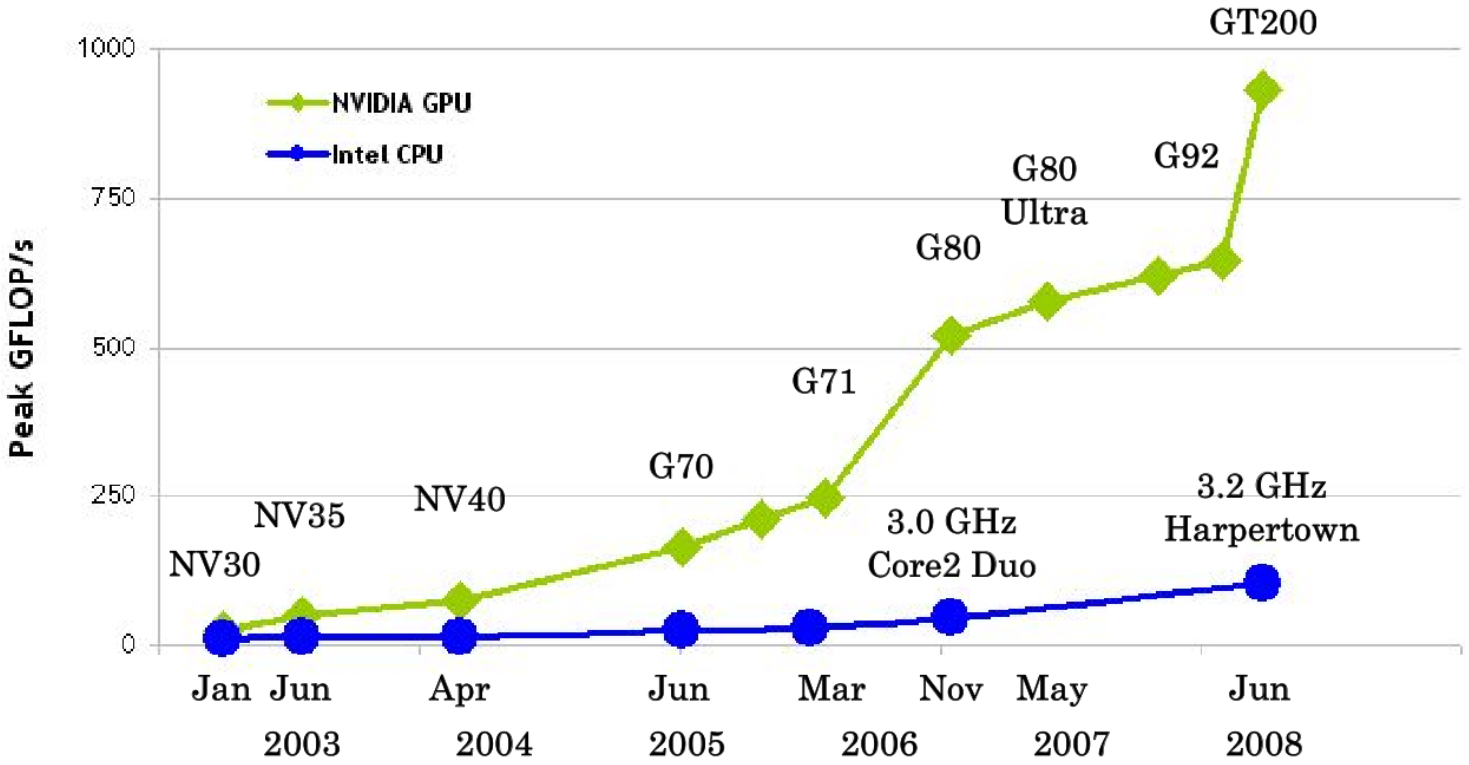
- GPU vs CPU

[1]

- Suitable for "embarrassingly parallel" tasks
- Bottleneck is bandwidth

[1] NVIDIA CUDA Programming guide v2.0 - 2008

Speed Comparison



GT200 = GeForce GTX 280	G71 = GeForce 7900 GTX	NV35 = GeForce FX 5950 Ultra
G92 = GeForce 9800 GTX	G70 = GeForce 7800 GTX	NV30 = GeForce FX 5800
G80 = GeForce 8800 GTX	NV40 = GeForce 6800 Ultra	

[2]

[2] NVIDIA CUDA Programming guide v2.0 - 2008

GPGPU

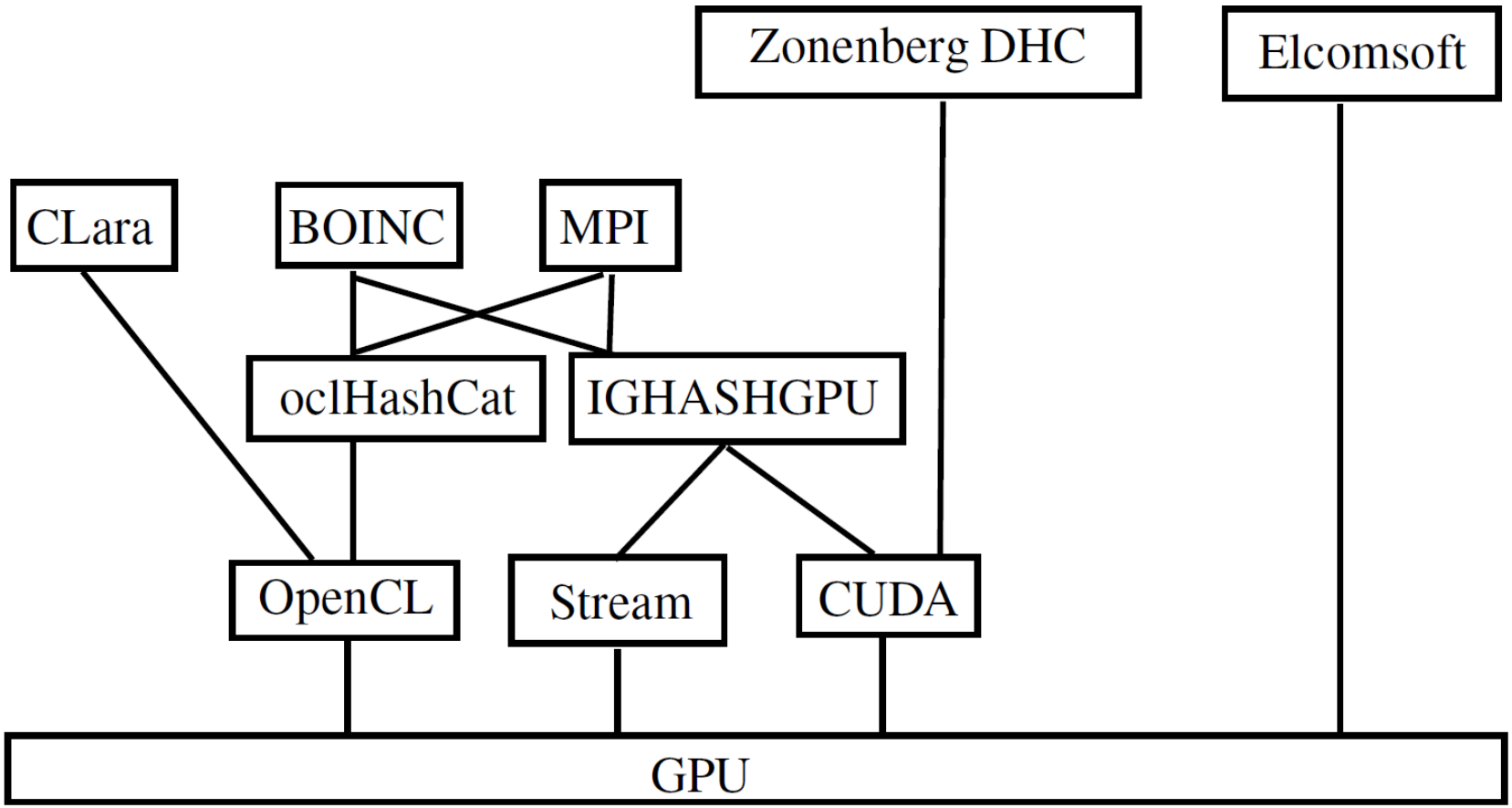
- General processing for GPU (GPGPU)
  - Starts in 2003 with NVIDIA and ATI
  - Support for integer function
- GPGPU APIs
  - Suitable for
    - linear algebra, scientific simulations, pattern recognition, video encoding, image scaling and ...
    - password cracking
  - CUDA, Stream SDK, OpenCL
  - Support for multiple GPUs on one host machine

OpenCL

Distributed GPU architectures

- Approaches for distributed GPU password cracking
  - Process distribution for CPU and GPU by software
  - Combination with GPGPU API
  - Existing software for password cracking on GPU

Architecture overview



Criteria

- Distributing the key space
- GPU support
- Recovery and error handling
- Different hash types (extensible)
- Current KPMG cluster

Evaluation

	BOINC	MPI	CLara	IGHASH GPU	oclHash Cat	DHC	Elcomsoft
Distributing key space	+	-	-	–	–	++	++
GPU support	+	-	-	++	++	++	++
Recovery & error handling	+	+/-	+	–	–	?	?
Different hash types (extensible)	c	c	c	+	+	–	+/-
API, Documentation & support	–	+	–	-	-	–	+/-
KPMG cluster	+	++	+	+	+	+	–

C = custom application development required ; ? = unknown

Conclusions

- Practical solutions
  - An open-source password cracking tool which supports distributed GPUs
  - MPI + OpenCL
- For the long term - CLara
  - Custom application development allows for tweaks
  - OpenCL is open source implemented by NVIDIA & ATI cards
  - Support for heterogeneous systems including Cell, FPGA, Playstation...

A & Q

- Acknowledgements
  - Michiel van Veen & Marc Smeets
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- **Questions?**