Performance Analysis

14.12.2012

Reasons

- Use of the resources
- Optimization / Tuning

Metrics

- Time
  - Execution (Seconds)
  - Efficiency (Flops)
- Memory
  - Cache (Hit ratio)
  - Ram (Bytes)

Metrics

- Networking
  - Latency (Seconds)
  - Bandwidth (Bits / Second)
- Parallelism
  - MPI, OpenMP
  - Combination of time, networking

Methodologies

- Non invasive
  - Same code
- Invasive
  - Customized code
  - Preprocess before compiling
  - Compile with special flags

Methodologies

- Virtual hardware
  - Exact measurements
  - Simulation of the running
- Actual hardware
  - Hardware counters / Timing instructions
  - True performance

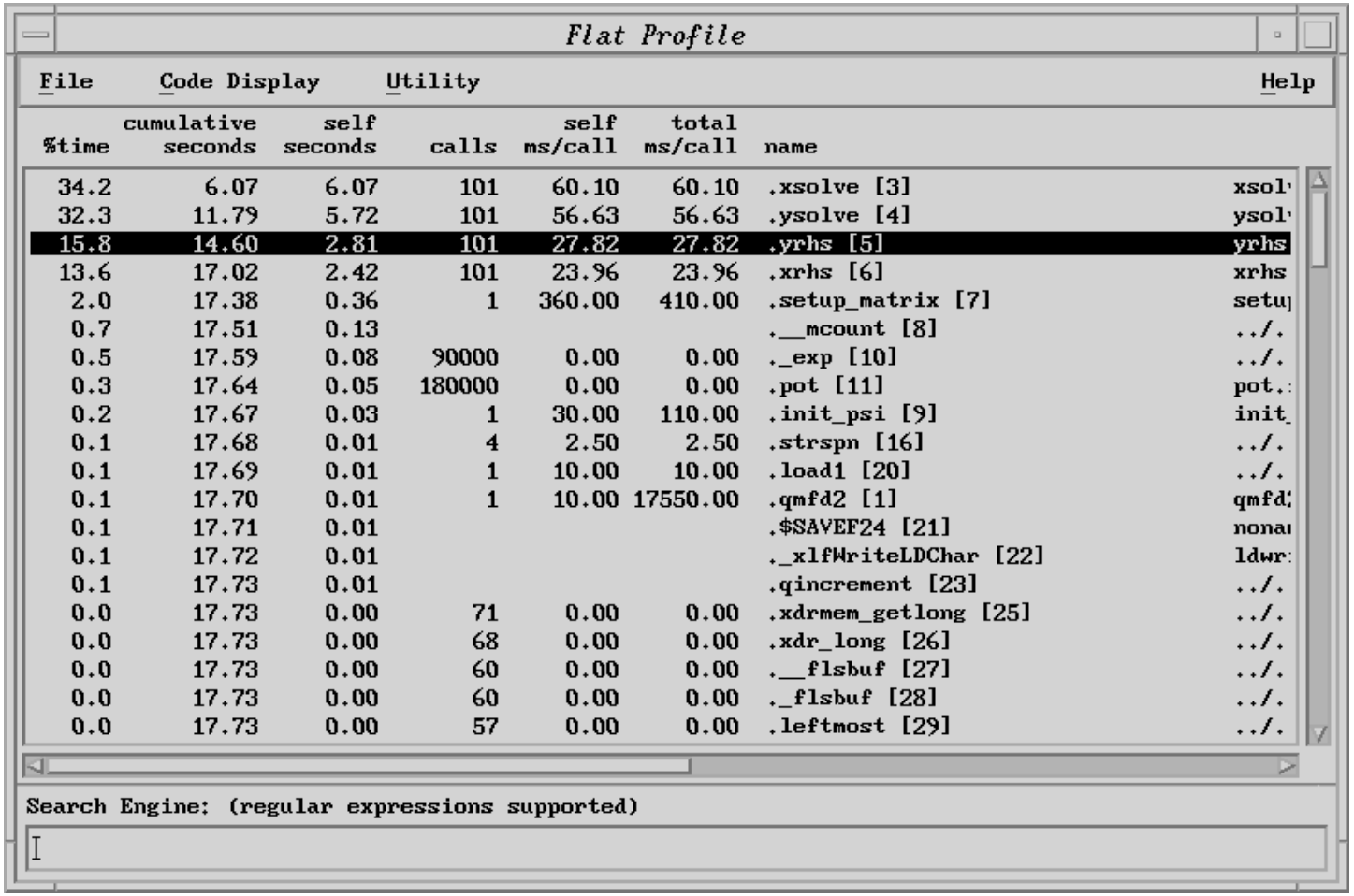
Tools

- Different tools = different metrics
- Different tools = different methodologies
- Be sure to pick the correct tool

Gprof [1]

- Time
  - Function level analysis
- Invasive
  - Recompilation with: -pg
- Actual hardware
- Command Line Interface
- Free
  - Shipped with gcc

Gprof



Flat Profile

File Code Display Utility Help

%time	cumulative seconds	self seconds	calls	self ms/call	total ms/call	name	
34.2	6.07	6.07	101	60.10	60.10	.xsolve [3]	xsol
32.3	11.79	5.72	101	56.63	56.63	.ysolve [4]	ysol
15.8	14.60	2.81	101	27.82	27.82	.yrhs [5]	yrhs
13.6	17.02	2.42	101	23.96	23.96	.xrhs [6]	xrhs
2.0	17.38	0.36	1	360.00	410.00	.setup_matrix [7]	setu
0.7	17.51	0.13				.__mcount [8]	../.
0.5	17.59	0.08	90000	0.00	0.00	._exp [10]	../.
0.3	17.64	0.05	180000	0.00	0.00	.pot [11]	pot.
0.2	17.67	0.03	1	30.00	110.00	.init_psi [9]	init_
0.1	17.68	0.01	4	2.50	2.50	.strspn [16]	../.
0.1	17.69	0.01	1	10.00	10.00	.load1 [20]	../.
0.1	17.70	0.01	1	10.00	17550.00	.qmfd2 [1]	qmfd
0.1	17.71	0.01				.$SAVEF24 [21]	nona
0.1	17.72	0.01				._xlfWriteLDChar [22]	ldwr
0.1	17.73	0.01				.qincrement [23]	../.
0.0	17.73	0.00	71	0.00	0.00	.xdrmem_getlong [25]	../.
0.0	17.73	0.00	68	0.00	0.00	.xdr_long [26]	../.
0.0	17.73	0.00	60	0.00	0.00	.__flsbuf [27]	../.
0.0	17.73	0.00	60	0.00	0.00	._flsbuf [28]	../.
0.0	17.73	0.00	57	0.00	0.00	.leftmost [29]	../.

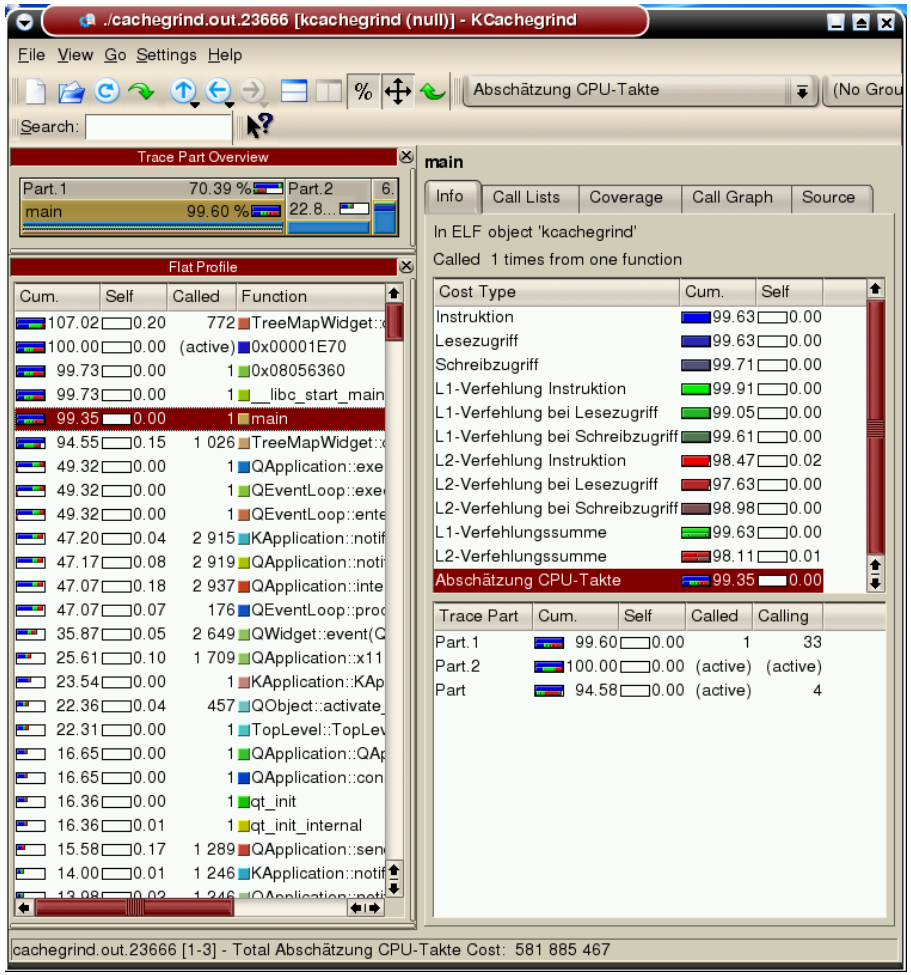
Search Engine: (regular expressions supported)

Source: http://cfile3.uf.tistory.com/image/18086A434E69BEB932AAE5

Valgrind [2]

- Time
- Memory
  - Cache
  - Ram
- Non invasive
- Virtual hardware
- Command Line Interface
- Free

Valgrind



Source: http://kcachegrind.sourceforge.net/html/Shot1Large.html

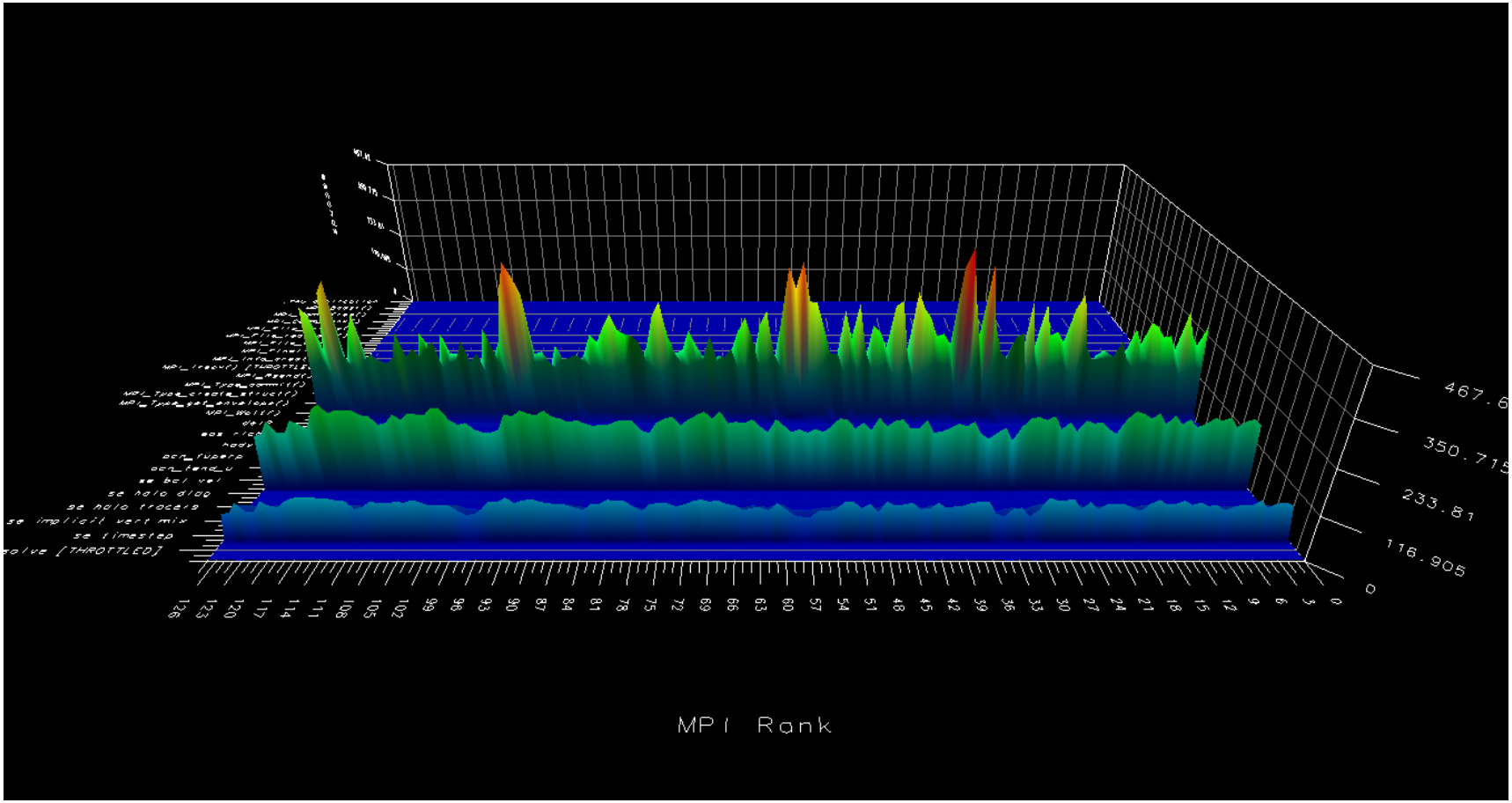
PAPI [3]

- Time
- Memory
  - Cache
- Actual Hardware
  - Hardware counters reader
- Invasive
  - C Library
- Free

Tau [4]

- Time
- Memory
  - Cache
  - Ram
- Parallelism
- Invasive
- Actual hardware
- Command Line Interface + Visualization Application
- Free

Tau

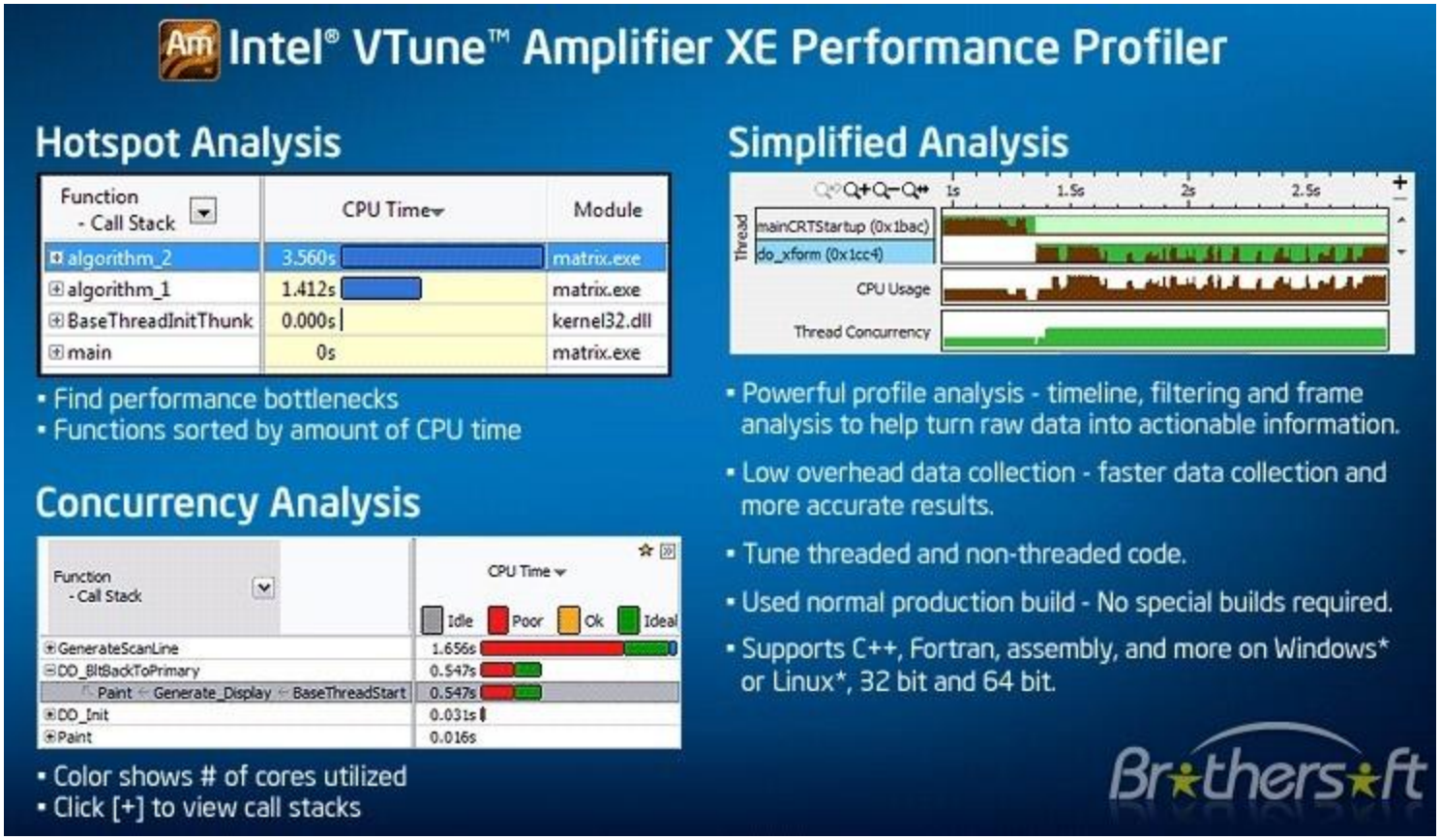


Source: http://www.tau.uoregon.edu/mediawiki-tau/images/1/18/MPI_wait-computation-correlation.png

Intel VTune Amplifier [5]

- Time
- Memory
  - Cache
- Parallelism
- Non Invasive
- Actual hardware
- CLI / GUI
- Commercial

Intel VTune Amplifier



Source: http://www.brothersoft.com/intel-vtune-amplifier-xe-431561.html

Thank You for the Attention

Questions are welcome

References

[1] - http://www.cs.utah.edu/dept/old/texinfo/as/gprof_toc.html
[2] - http://valgrind.org/
[3] - http://icl.cs.utk.edu/papi/
[4] - http://www.cs.uoregon.edu/Research/tau/home.php
[5] - http://software.intel.com/en-us/intel-vtune-amplifier-xe