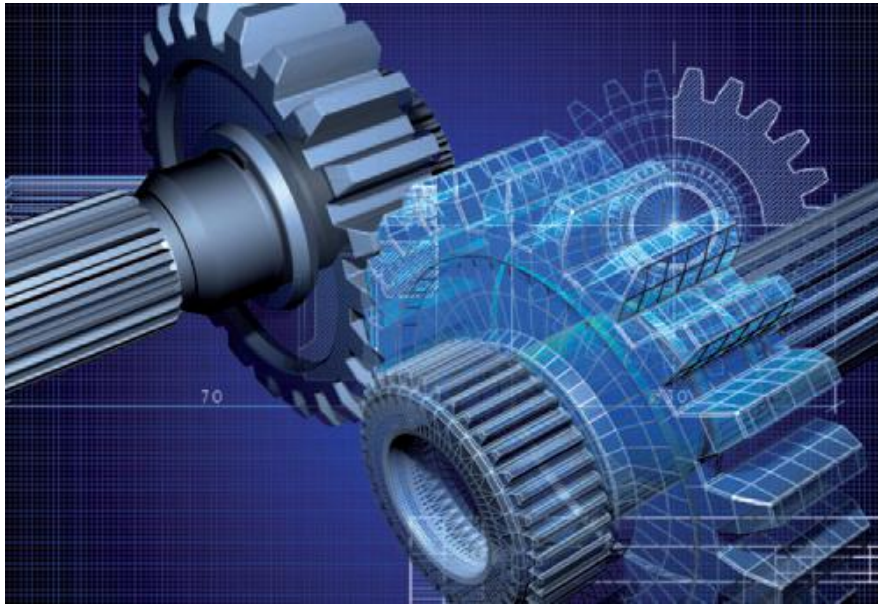
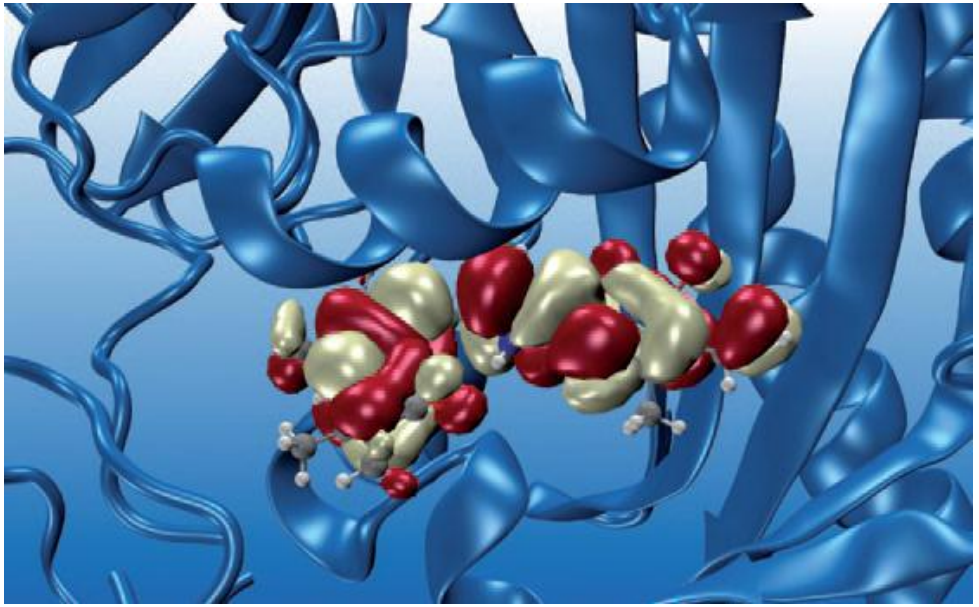
Who can beat X86?

Piero Altoè

Workstation . Server . Storage & Solutions





E4® Computer Engineering S.p.A. specializes in the manufacturing of high performance IT systems of medium and high range. Our products aim to accomplish both industrial and scientific research requirements and space from universities to computing centers.

Thanks to the established experience and quality in this circle, E4® has become a valued technology's supplier and it is acknowledged and appreciated by famous and prestigious organizations such as C.E.R.N. in Geneva.

HARDWARE AGNOSTICS

Our “hardware agnostic” approach allows us to provide highly personalized solutions of outstanding quality, which adhere to the customer’s needs without favoring one technology over another.

We offer state of the art informatics at the best possible price/performance ratio and we even give the opportunity to test the system from remote or in loco, so as to further help the customer in choosing the right product and making a thoughtful purchase free from unexpected events.

E4® PRODUCT RANGE

Our product range is as diverse as our customer base

- Workstation for scientific/engineering applications

(CAD, CAE, CFD, FEM, etc.)

- Workstation for professional editing
- Computing Server
- Virtualization Server data center/ISP
- Cluster Server in high availability
- Storage server/NAS
- Storage/SAN in high availability
- HPC storage
- HPC cluster
- GPU cluster
- Advanced visualization systems (stereoscopy, 3D cave …)
- Data centers

R&D

Our R&D department is made of engineers specialized in hardware, software and applications. Research focuses on intense studies of the most innovative technologies so as to increase the Company's technical/scientific knowledge. With the acquired know-how we develop and create prototypes, then the first pilot series up to the finished product, ready to be manufactured.

Our staff's knowledge and efficiency, paired to their daily relationship with the main manufacturers of technology, allow E4® to offer ever innovative products with the best Time to Market available, to ensure the effectiveness of our customers' IT investments.

CERTIFICATIONS

- *ISO 9001:2008*
- *ISO 14001:2004*
- *Intel Platinum Technology Provider*
- *Tesla Preferred Provider*
- *AMD Platinum Premier*
- *VMware – professional solution provider*
- *Microsoft Gold certified*
- *Intel Cluster Ready*

CORPORATE SOCIAL RESPONSIBILITY

Definition from EU is : «The responsibility of enterprises for their impacts on society»

For E4, which has always been committed in this area, being socially responsible means not only fulfilling legal obligations, but also going beyond compliance and investing in human capital, in relations with stakeholders and sustainable development.

case history

CERN – Geneva (Switzerland)

5.357 dual socket mainboards
68.476 cores
34.300 server grade hard disks
67PB

Ref: Olof Barring, Fatima Najeh

INFN

Tier 1 (CNAF)

> 12PB HPC storage (DDN with GPFS)

> 1.000 server dual socket (~ 10k computing cores)

Several GPU systems

4h intervention times

Tier 2-3

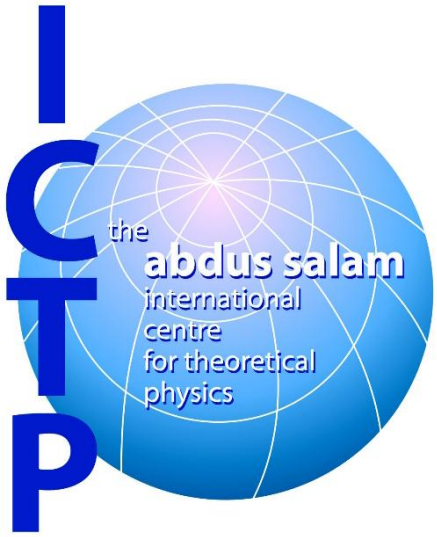
> 5PB direct attached storage (Alice – CMS)

> 3.500 server dual socket (~ 30k computing cores)

Several GPU systems

NBD intervention times

Ref: Mauro Morandin, Gianpaolo Carlino, Alessandro De Salvo



ICTP - Trieste (Italy)

High Performance Computing Cluster:

212 dual socket server
> 1.500 computing cores
Infiniband Host Channel adapter QDR 40Gbps
Infiniband Switch QDR 40Gbps
Networking
E4 HPC Suite

Ref: Clement Onime, Ulrich Singe

ENEA Italian National Agency for New Technologies, Energy and Sustainable Economic Development - Roma (Italy)

High Performance Computing Cluster (Cresco 4):

256 dual socket server
4.096 computing cores
Infiniband Host Channel adapter QDR 40Gbps
Infiniband Switch 336 QDR 40Gbps ports
Networking
E4 HPC Suite

Ref: Giovanni Bracco, Silvio Migliori

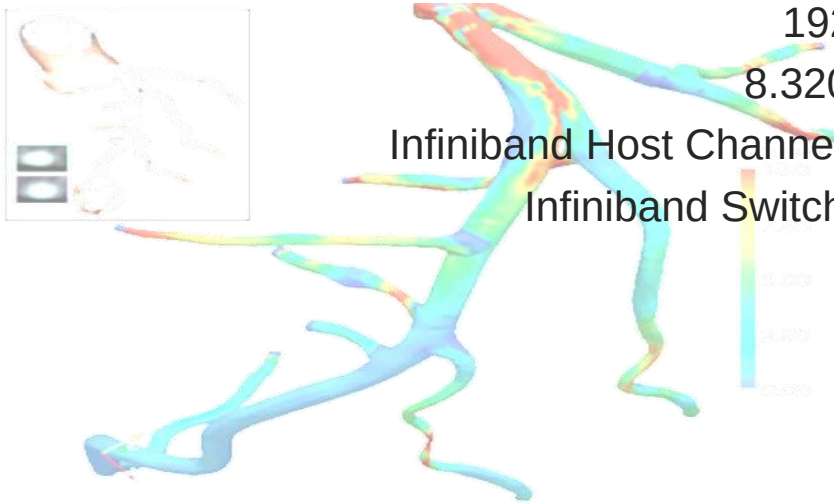
delivery scheduled for Sept.'13

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

EPFL - Lausanne (Switzerland)

Prof. Efthimios Kaxiras

High Performance Computing Hybrid (GPU/CPU) Cluster:



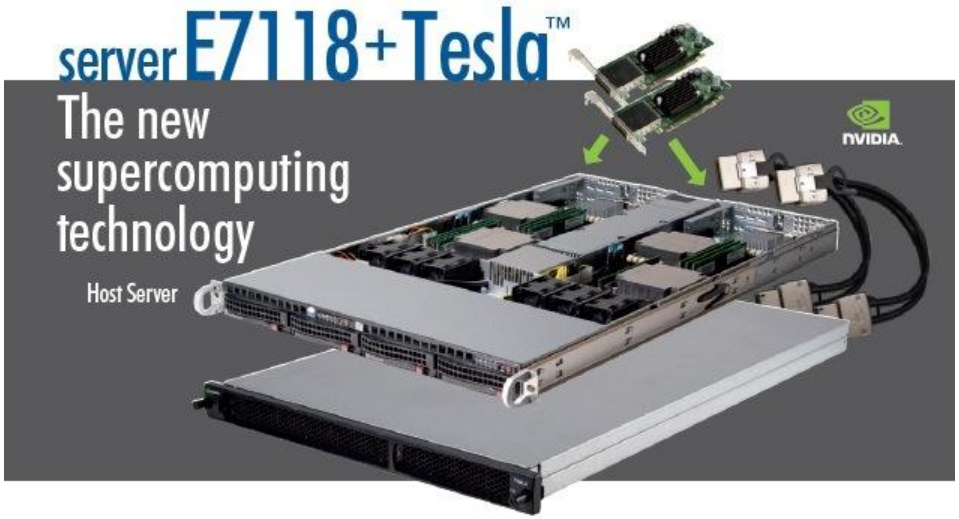
192 CPU computing cores
8.320 GPU computing cores
Infiniband Host Channel adapter QDR 40 Gbps
Infiniband Switch 36 QDR 40Gbps ports
Networking
E4 HPC Suite

Ref: Simone Melchionna

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

ETH - Zurich (Switzerland)



HPC Hybrid (GPU/CPU) Cluster:

432 CPU computing cores
16.128 GPU computing cores
Infiniband Host Channel adapter QDR 40 Gbps
Infiniband Switch 432 QDR 40Gbps ports
1PB Lustre Storage (sustained 20Gb/s)
180 TB Panasas Storage

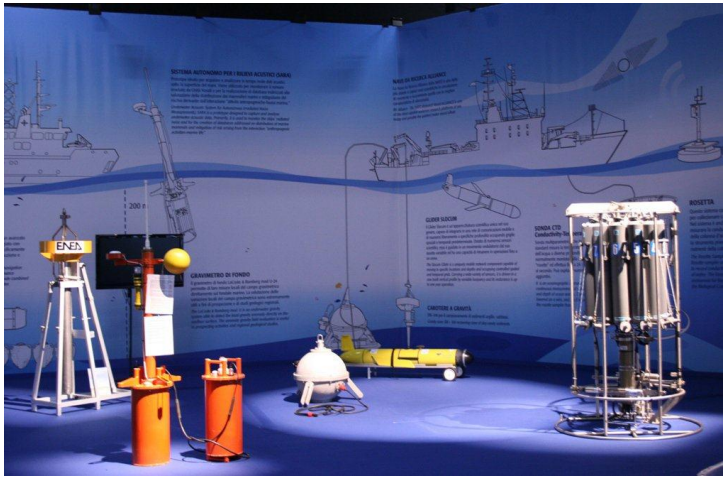
Ref: Olivier Byrde, Teodoro Brasacchio

NURC
PARTNERING FOR MARITIME INNOVATION

Nato Undersea Research Center - La Spezia (Italy)

Computing Server & HPC Storage:

> 1.000 CPU computing cores
>10.000 GPU computing cores
HPC Storage Panasas > 100TB



Ref: Francesco Baralli

European Synchrotron Radiation Facility - Grenoble (France)

Servers for X-ray beam data acquisition

Ref: Pierre Pinel

Istituto Europeo di Oncologia
Istituto di Ricovero e Cura a Carattere Scientifico

European Institute of Oncology – Milano (Italy)

> 500TB ZFS Storage

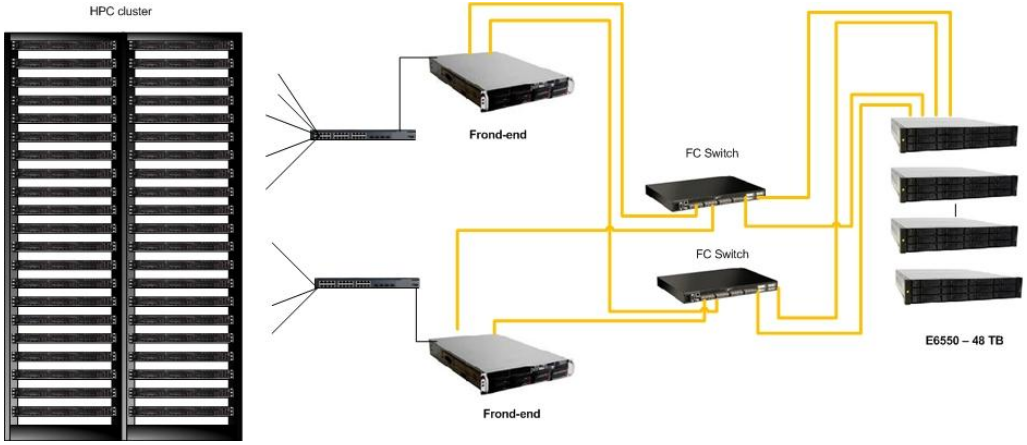
Ref: Alessandro Della Vedova

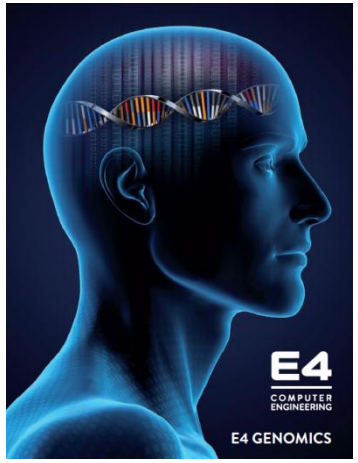
NOVARTIS

Novartis - Siena (Italy)

High Availability HPC Cluster (Genomics applications):

96 dual socket server
1.152 computing cores
Infiniband Host Channel adapter QDR 40Gbps
Infiniband Switch QDR 40Gbps ports
HPC Storage Panasas > 400TB
Networking
E4 HPC Suite





Ref: Riccardo Beltrami

E4 Solutions

WE ARE NOT GREEN

A simulation of 200 ns with 90 k atoms = 1week on 512 cores = 3200 kWh

Correspond to:

a) 1600 CO_2 kg

b) 340 € energy bill

c) 13000 km by car

WE ARE NOT GREEN

A NATIONAL SUPERCOMPUTING FACILITY HAS A YEARLY CO_2 FOOTPRINT COMPARABLE TO A TAKE OFF OF A SATURN V

=

Partnership

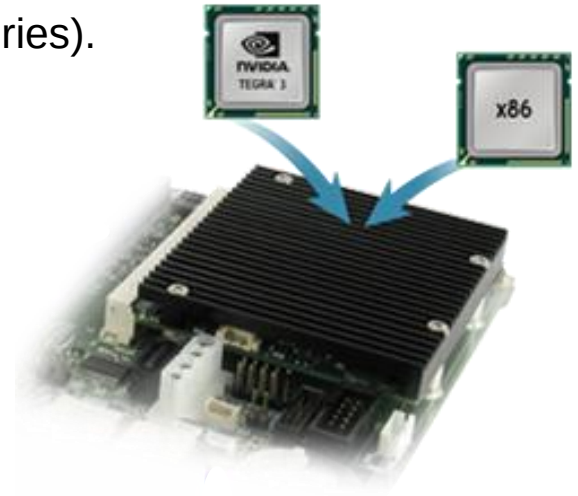
Established in 2002, **E4 Computer Engineering designs and manufactures high performance systems** which aim to accomplish both industrial and scientific research requirements and to reach a variety of customers ranging from universities to computing centers. E4's focus is on HPC although our expertise extends to all segments of IT.

SECO is an European designer and manufacturer of high integrated board computers and systems for embedded applications. Founded in 1979 in Italy, SECO attention is focused on developing innovative products with high performances, efficiency, low power consumption and increased functionality, offering in the meantime a short time-to-market.

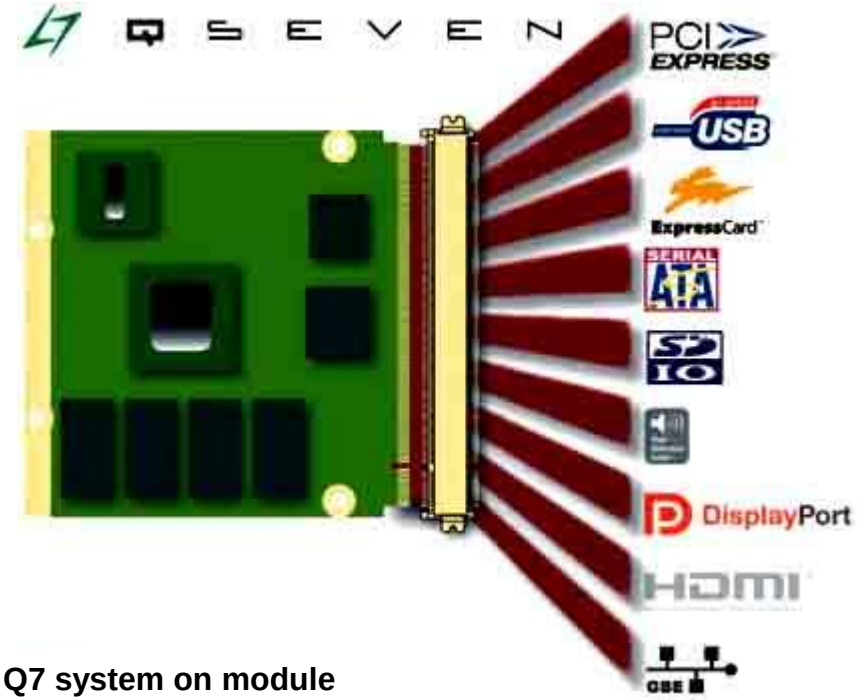
Modular Embedded Server (MES)

A MES is a stripped down server computer based on SoM optimized to minimize the use of physical space and energy.

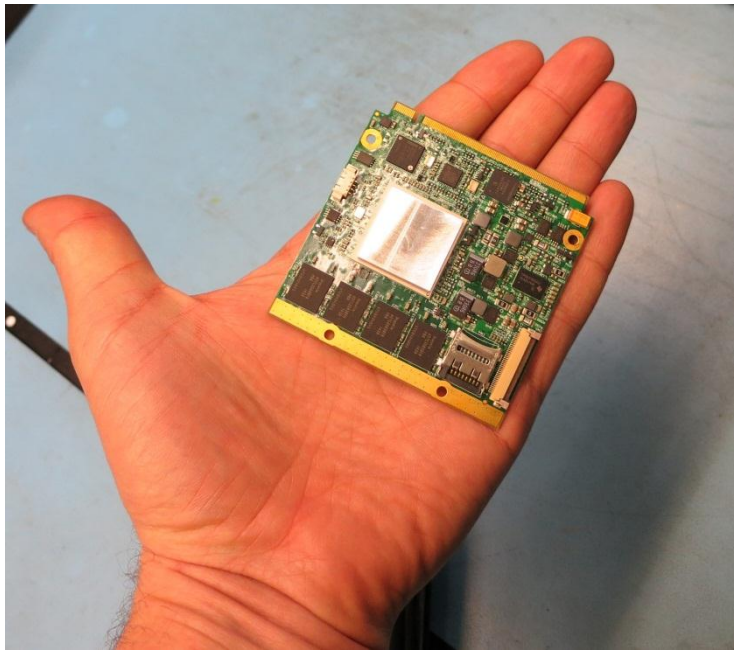
- Embedded CPUs, memory, controllers,...
- Equipped with low power CPUs (ARM, ATOM, G-Series).
- Based on System on Module (SoM)
- Easy to mantain



General purpose, power-efficient



Q7 system on module



ARKA MicroCluster Blade

SECO

Features	ARKA Blade
CPU	NVIDIA® Tegra® 3 ARM Cortex A9 Quad-Core
GPU	NVIDIA Quadro® 1000M with 96 CUDA Cores
Memory	2GB x CPU 2GB x GPU
Peak Performance	270 Single Precision GFGLOPS
Network	1x Gigabit Ethernet
Storage	1x SATA 2.0 Connector
USB	3x USB 2.0
Display	3x HDMI (serial console available)

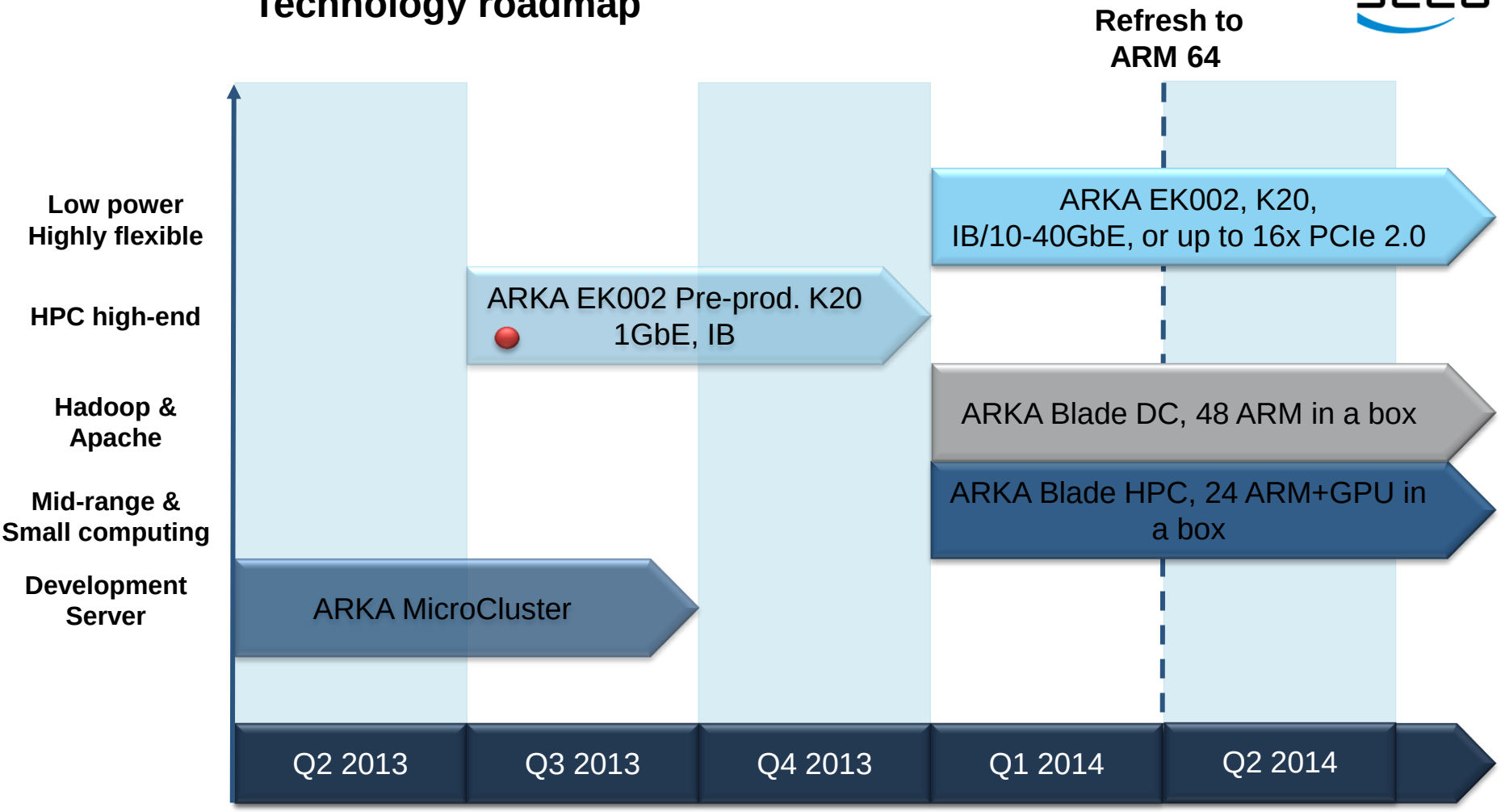
based on CARMA Devkit developed by **SECO**

ARKA SHOC Test

The Scalable Heterogeneous Computing Benchmark Suite (SHOC) is a collection of benchmark programs testing performance and stability (using CUDA and/or openCL)

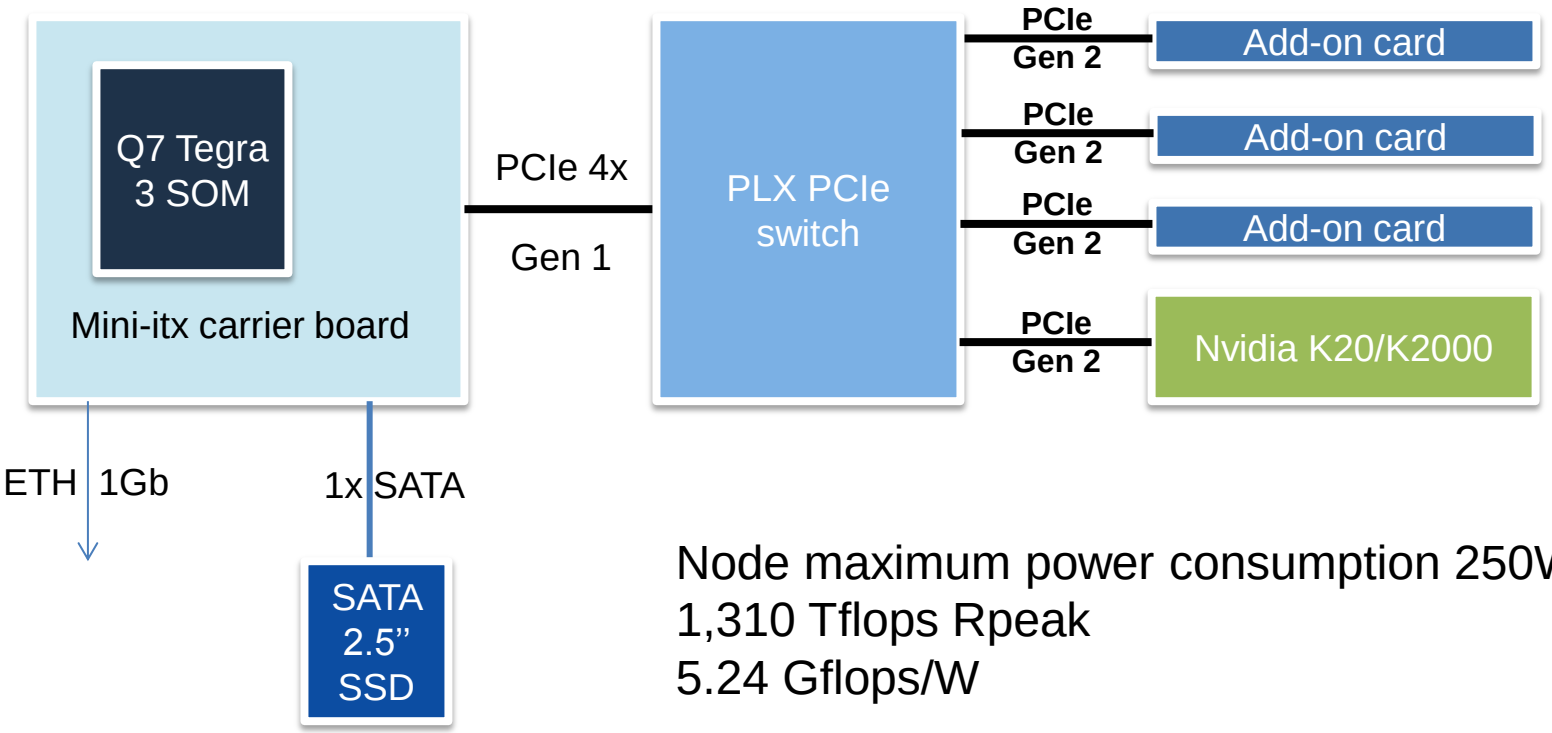
Test	ARKA	Intel+M2075	Units	ARKA/M2075
Maxspflops	263.12	1001.31	GFlops	26%
fft_sp	23.343	162.524	GFlops	14%
sgemm_n	132.482	666.272	GFlops	20%
dgemm_n	21.5152	315.110	GFlops	7%
md_sp_bw	5.5301	25.3975	GB/s	22%
Reduction	23.1895	92.7343	GB/s	25%
Sort	0.3090	1.6296	GB/s	19%
triad_bw	0.4279	6.0163	GB/s	7%

Technology roadmap



PRODUCT AVAILABLE

ARKA EK002 diagram

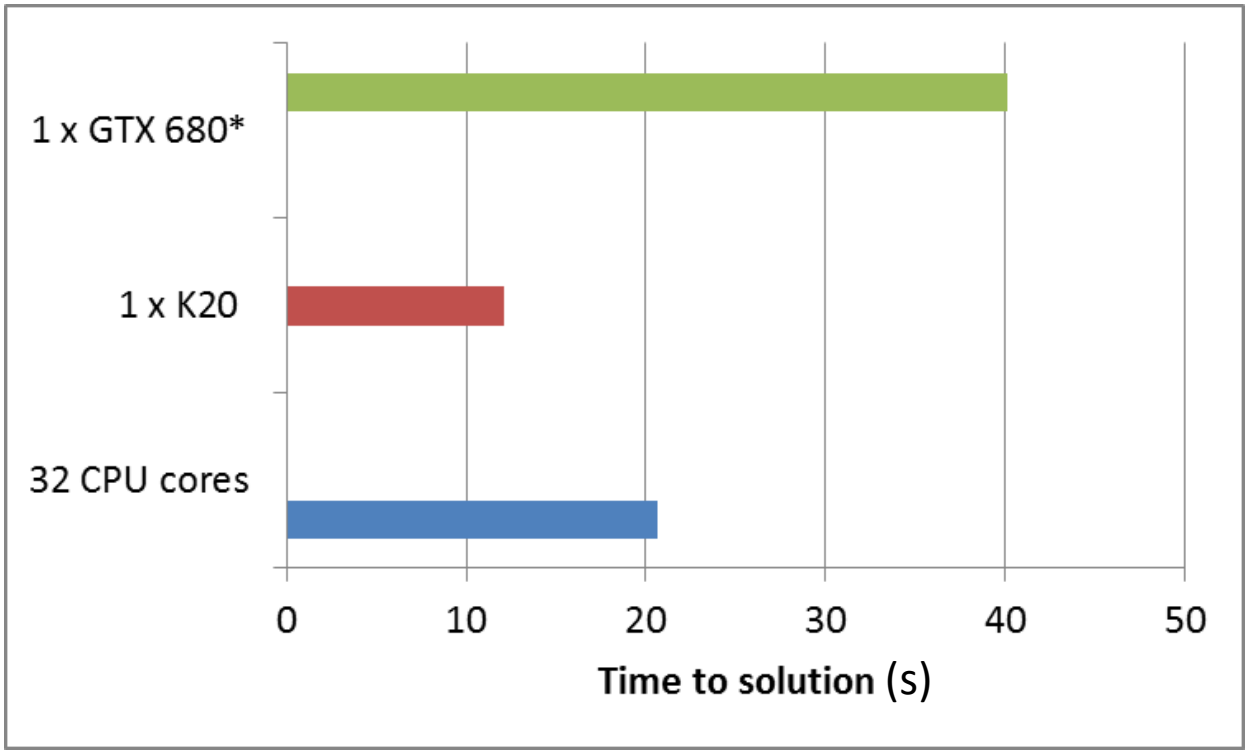


Node maximum power consumption 250W
1,310 Tflops Rpeak
5.24 Gflops/W


E4
ARKA
SECO
XEAL
NVIDIA TESLA


E4
ARKA

LAMMPS



***run in a ARM+GPU environment**

BSC PEDRAFORCA: first EK002 installation

Computing node:
74 or more pre-production EK002 server: ARM T30, K20, IB QDR

OS
Ubuntu derivative for ARM

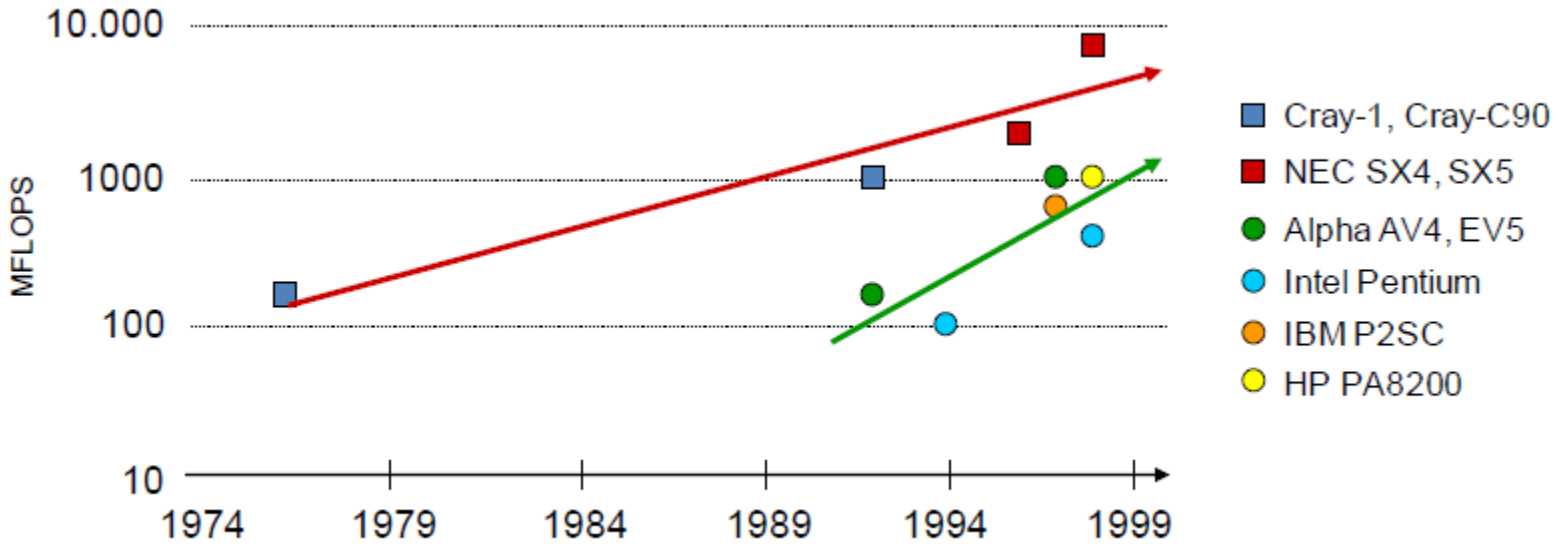
Development tool

Cluster, monitoring, management tools

FP7- Project
http://www.montblanc-project.eu/

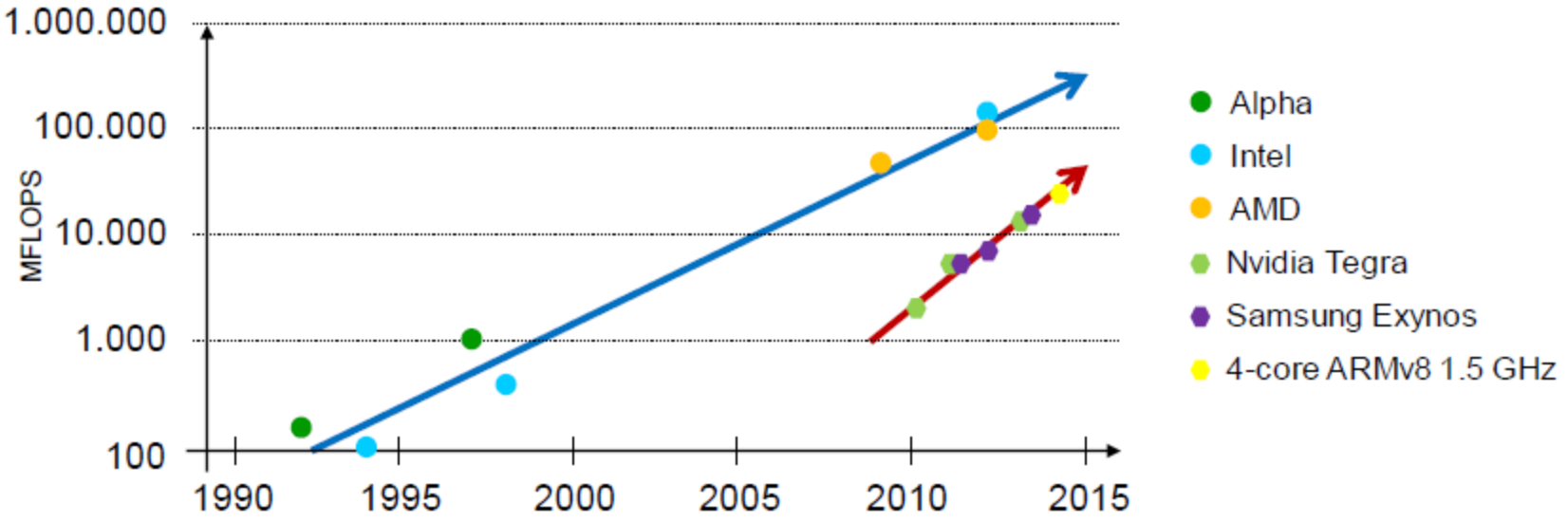
Pedraforca 2,506.4 m, Catalonia, Spain

Past Killer Microprocessor



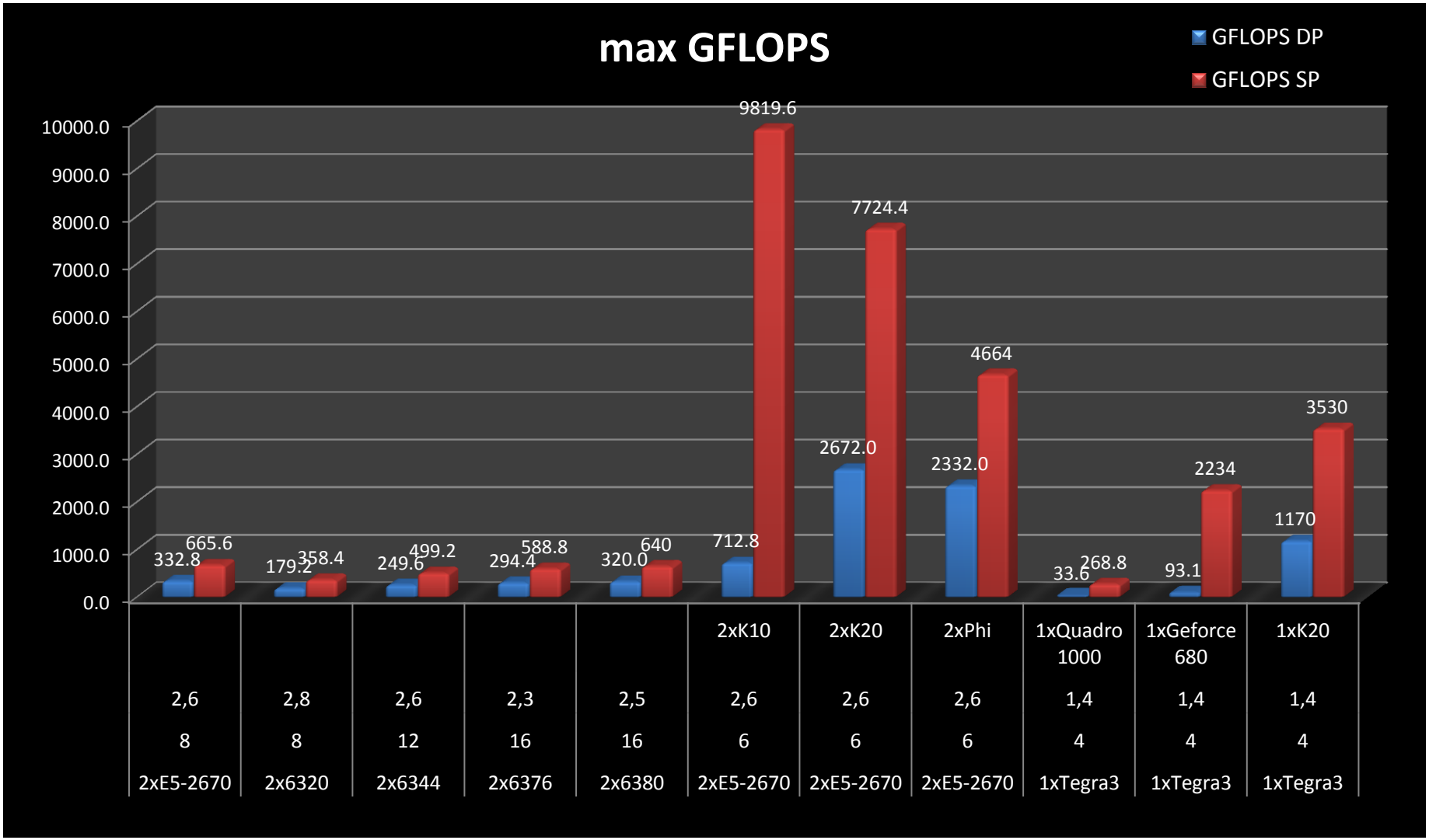
History may be about to repeat itself …
– Mobile processor are not faster …
– … but they are significantly cheaper and greener

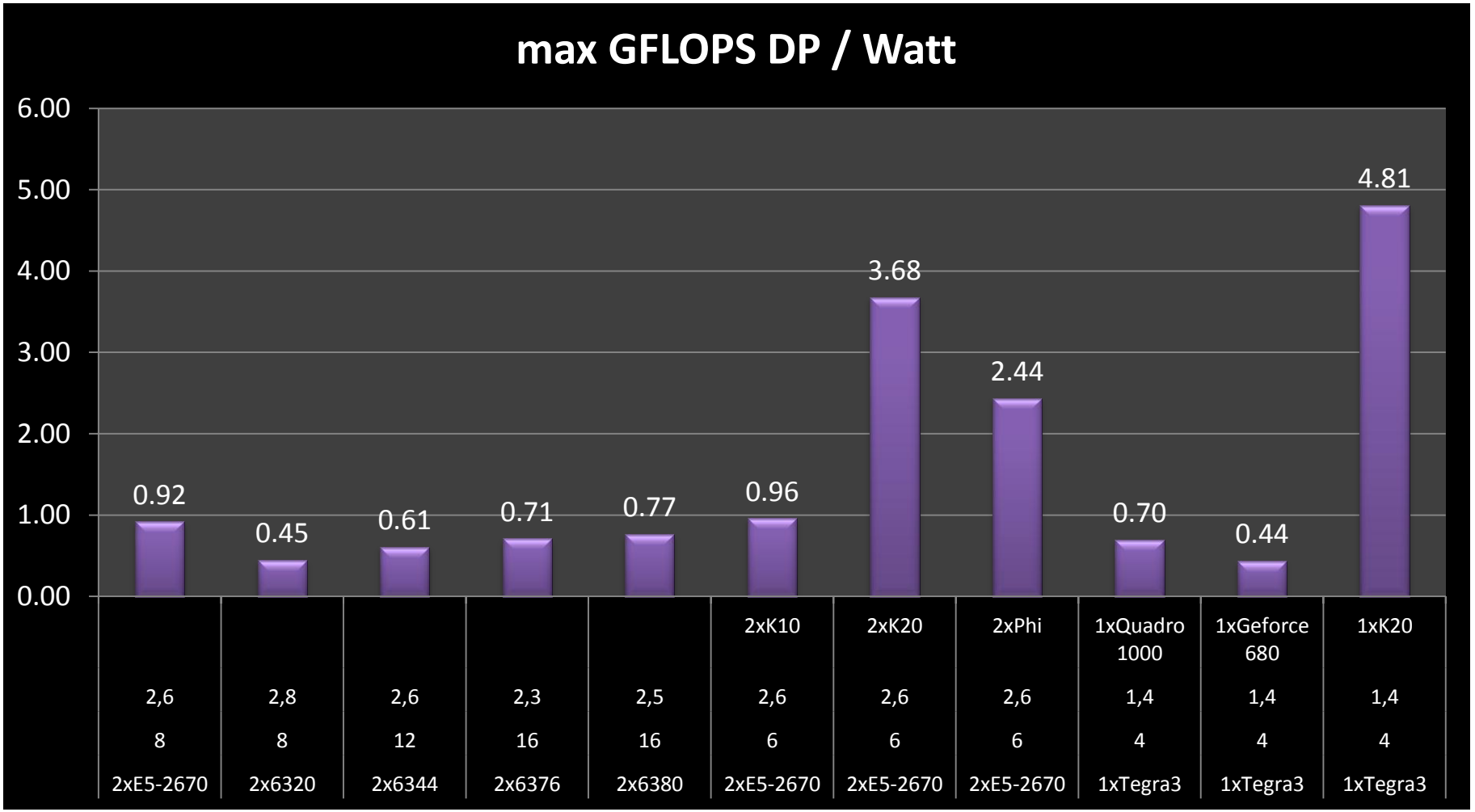
Present Killer Microprocessor

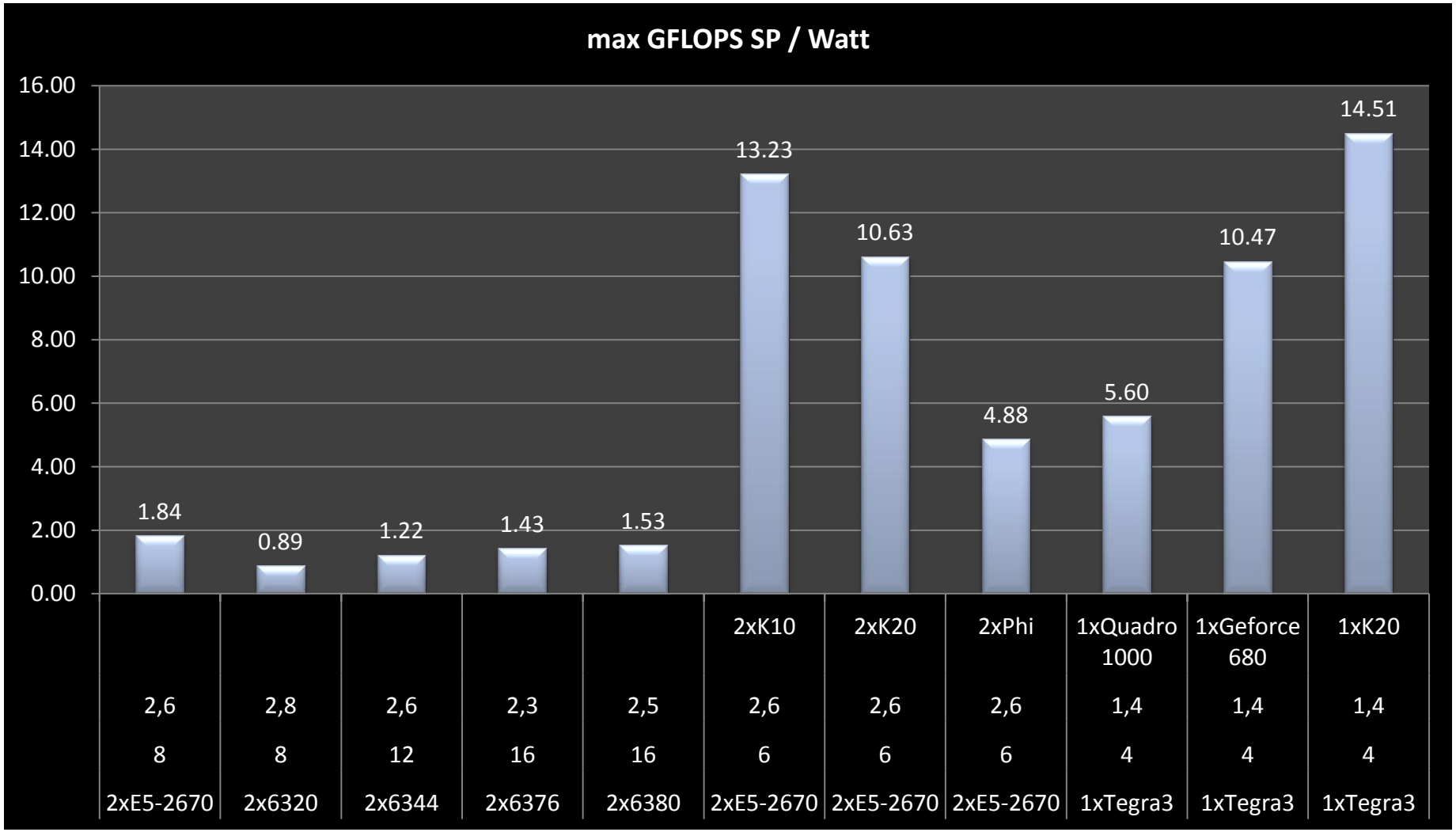


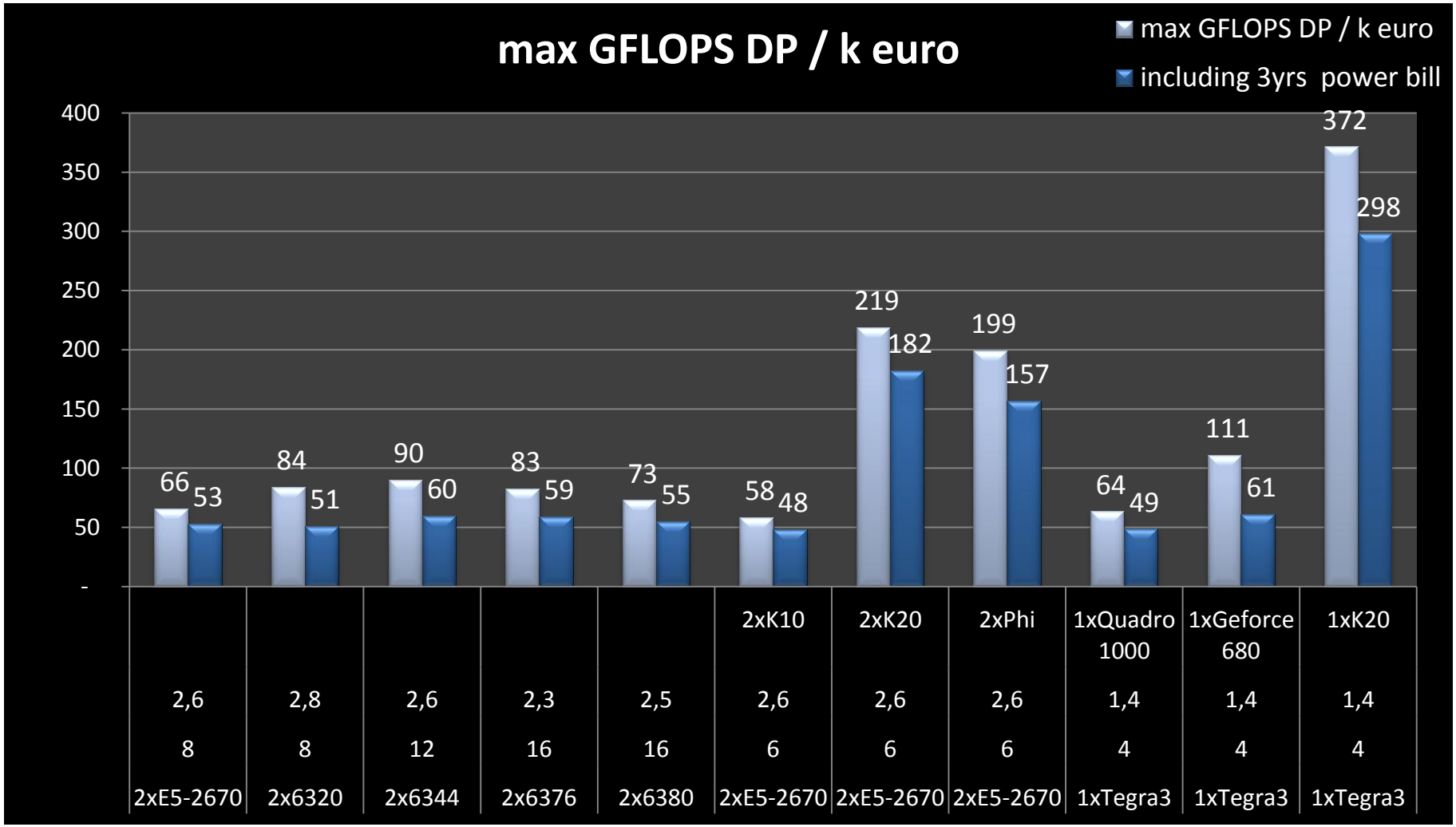
History may be about to repeat itself …
– Mobile processor are not faster …
– … but they are significantly cheaper and greener

Benchmarks


max GFLOPS
GFLOPS DP
GFLOPS SP
10000.0
9000.0
8000.0
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
332.8
665.6
179.2
358.4
249.6
499.2
294.4
588.8
320.0
640
712.8
9819.6
2672.0
7724.4
2332.0
4664
33.6
268.8
93.1
2234
1170
3530
2xK10
2xK20
2xPhi
1xQuadro 1000
1xGeforce 680
1xK20
2,6
2,8
2,6
2,3
2,5
2,6
2,6
2,6
1,4
1,4
1,4
8
8
12
16
16
6
6
6
4
4
4
2xE5-2670
2x6320
2x6344
2x6376
2x6380
2xE5-2670
2xE5-2670
2xE5-2670
1xTegra3
1xTegra3
1xTegra3


max GFLOPS DP / Watt
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.92
0.45
0.61
0.71
0.77
0.96
3.68
2.44
0.70
0.44
4.81
2xK10
2xK20
2xPhi
1xQuadro 1000
1xGeforce 680
1xK20
2,6 8 2xE5-2670
2,8 8 2x6320
2,6 12 2x6344
2,3 16 2x6376
2,5 16 2x6380
2,6 6 2xE5-2670
2,6 6 2xE5-2670
2,6 6 2xE5-2670
1,4 4 1xTegra3
1,4 4 1xTegra3
1,4 4 1xTegra3


max GFLOPS SP / Watt
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1.84
0.89
1.22
1.43
1.53
13.23
10.63
4.88
5.60
10.47
14.51
2xK10
2xK20
2xPhi
1xQuadro 1000
1xGeforce 680
1xK20
2,6 8 2xE5-2670
2,8 8 2x6320
2,6 12 2x6344
2,3 16 2x6376
2,5 16 2x6380
2,6 6 2xE5-2670
2,6 6 2xE5-2670
2,6 6 2xE5-2670
1,4 4 1xTegra3
1,4 4 1xTegra3
1,4 4 1xTegra3


max GFLOPS DP / k euro
max GFLOPS DP / k euro
including 3yrs power bill
400
350
300
250
200
150
100
50
-
66
53
84
51
90
60
83
59
73
55
58
48
219
182
199
157
64
49
111
61
372
298
2xK10
2xK20
2xPhi
1xQuadro 1000
1xGeforce 680
1xK20
2,6
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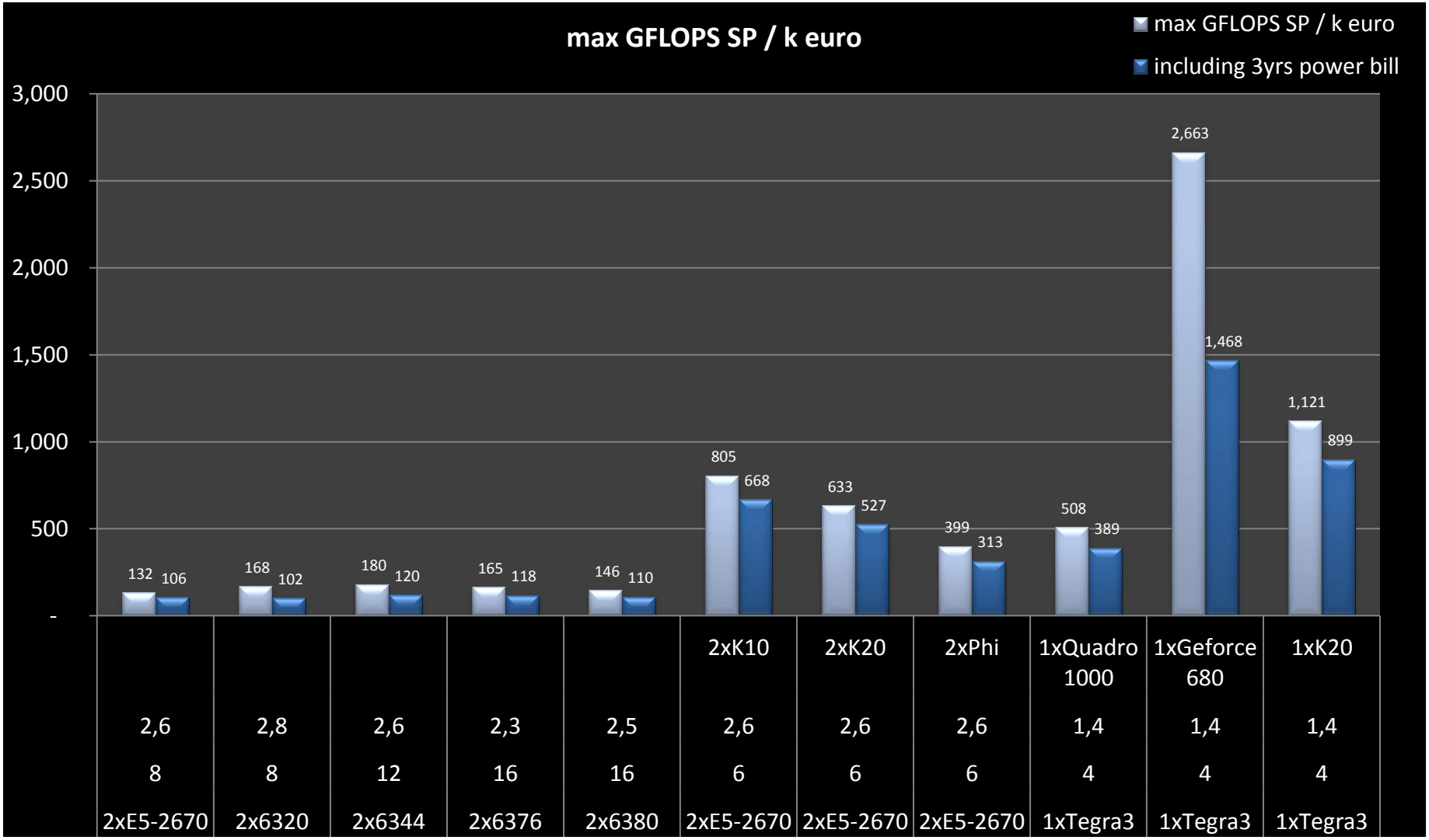
2xE5-2670
2x6320
2x6344
2x6376
2x6380
2xE5-2670
2xE5-2670
2xE5-2670
1xTegra3
1xTegra3
1xTegra3


max GFLOPS SP / k euro
max GFLOPS SP / k euro
including 3yrs power bill
3,000
2,500
2,000
1,500
1,000
500
-
132
106
168
102
180
120
165
118
146
110
805
668
633
527
399
313
508
389
2,663
1,468
1,121
899
2xK10
2xK20
2xPhi
1xQuadro 1000
1xGeforce 680
1xK20
2,6
2,8
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2x6320
2x6344
2x6376
2x6380
2xE5-2670
2xE5-2670
2xE5-2670
1xTegra3
1xTegra3
1xTegra3


Workstation . Server . Storage & Solutions
E4
COMPUTER
ENGINEERING
E4 COMPUTER ENGINEER