Parallel Computing



2020/21 *A.J.Proença*

TOP500 & MACC (online)

(most slides are borrowed)

AJProença, Parallel Computing, MiEI, UMinho, 2020/21

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Suggestion of homework for discussion in this session

- 1. Go to the TOP500 website and analyse & comment:
 - i. The country distribution over the past 25 years, in #systems and aggregate performance in the TOP500 list
 - ii. The evolution of the key PU chip technologies and the accelerator families in the past 25 years
 - iii. The overall impact of each processor technology and accelerator family in the past 3 years
- 2. EuroHPC is funding 8 supercomputing centres selected in June 2019: 3 pre-exascale & 5 petascale
 - i. Find & identify these 8 supercomputing centres
 - ii. Characterize the architecture of Deucalion in MACC
- 3. Chracterize the microarchitecture of the Apple A14 Bionic chip (in the new iPhone 12)

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Country distribution over the past 20 years: # systems

500

The List

TOP



Country distribution over the past 8 years: TOP aggregate performance The List 100 Show all Europe 13.46% 90 80 70 Japan 23.92% 60 50 China 40 25.64% 30 20 **USA** 28.18% 10 AJP 4 2012 2013 2014 2015 2016 2017 2018 2019



Country distribution in Jun'20: #systems & performance





Chip technology from 1993 to 2018



Nov'17







Processor generations Nov'17 & Nov'18

Nov'18





Processor generations Jun'20





Accelerator families from 2006 to 2018























[+] None	[+] NVIDIA Volta		
Supercomputer Fugaku, A64FX 48C		IBM Power System	PRIMERGY NVID
			Bul Ap
			IBM Pow
	Relevant Cr Fu		
			Apol Bu
	Le Le Cr Len	IBM Power System	PowerEdg NVID
Sunway MPP, Su			
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		NVIDIA Pascal NVIDIA Kepler	[+] Matrix-2000
Bull Se HPE CINECA SGI Th Cray X	(C Bul H ThinkSy Int		TH-IVB-FEP Clus
SGI Cra Bu			
		Proli SGI [+] I	Ampere [+] N/A
Bu Bul Cra HPE Cra Cra	Cra Cra Fuj Thi		DGX A100 PRI Powered by ZingChart



Cray XK T-P iDa Clu

Cra Cra

Gene/O. Po

ver BOC 1

AJProença,

Bull Se Bul

ray X Cra

#1

K computer, SPARC64

BUC I POW ATT R COMPUTER, SPARCO4 E BX9 HP Cra Cra Cra Cra BX9 LUT ACCC F

Bullx B

Powe Sun Cray

Accelerator families evolution 2012 - 2020



Blue HPE Cray XC





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EuroHPC supercomputers

200 peak PFLOPS

200 peak PFLOPS

current #2 in TOP500

15.2 peak PFLOPS

10 peak PFLOPS

4 peak PFLOPS

6.8 peak PFLOPS

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EuroHPC selected 8 supercomputer centres for funding

- **3 exascale** supercomputers:
 - MareNostrum 5 (BSC, Spain): 200 peak PFLOPS
 - Leonardo (CINECA, Italy):
 - LUMI (CSC, Finland):
- **5 petascale** supercomputers:
 - Meluxina (LuxConnect, Luxembourg): 18 peak PFLOPS
 - EURO IT4I (IT4 Innov. Nat. Superc. Center, Czech Rep.:

current #29 in TOP500

- **Deucalion** (MACC, Portugal):
- Vega (IZUM, Slovenia):
- **PetaSC** (Sofiatech, Bulgaria):

Advanced Computing Portugal 2030 (1)



Advanced Computing Portugal 2030: **Progress** achieved and new challenges

From the Declaration of Rome, 2017, to the installation of the petasacle machine Deucalion, 2021

> Entramos em direto em breve





23rd October 2020

11am – 1pm Venue: University of Minho – Guimarães

Advanced Computing Portugal 2030 (2)



Advanced Computing Portugal 2030 (3)



Advanced Computing Portugal 2030 (4)



Advanced Computing Portugal 2030 (5)



Advanced Computing Portugal 2030 (6)



Advanced Computing Portugal 2030 (7)

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DEUCALION OVERALL ARCHITECTURE



Advanced Computing Portugal 2030 (8)



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https://en.wikipedia.org/wiki/Apple-designed_processors



Apple A14 Bionic SoC





Apple A14 Bionic SoC

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powerful image recognition, natural language learning, motion analysis, ...



Apple A14 Bionic SoC





Unsubstantiated claims for A14 Bionic

Oct 15, 2020, 03:22pm EDT

Apple Claims The IPhone 12's A14 Bionic 'Challenges Laptops' But Gives No Details



Patrick Moorhead Senior Contributor ()

Cloud I write about disruptive companies, technologies and usage models.



. . .

I always liked Apple's "think different" claim, but when it comes to undocumented and unsubstantiated processor performance claims, I wish it would be more open and forthright.

"Apple Silicon" (A14?) for MacBook

Bloomberg **Technology**

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Apple to Launch MacBooks With Own Chips Next Week

By <u>Mark Gurman</u> and <u>Debby Wu</u> November 2, 2020, 5:28 PM GMT *Updated on November 3, 2020, 1:17 AM GMT*

• Company readies MacBook Pros, MacBook Air with in-house chips

Smaller Mac Pro and iMac with Apple chips also in development

- - -

The first Mac processors from Apple will be based on the A14 chip found in the latest iPhones and iPad Air, and tests inside Apple indicate improved power efficiency over the Intel parts they are replacing. The new machines will also have Apple-designed graphics and machine-learning processors.



Please join us for a special Apple Event from Apple Park. Watch it online at apple.com.

November 10, 2020 10:00 a.m. PST