CODES@OEHI #2 **Virtual** Hackathon

Fabrizio Magugliani

E4 Computer Engineering SpA

Open Edge and HPC Initiative

HISTORY AND VISION

E4 Computer Engineering creates and provides hardware and software solutions for High Performance Computing, Cloud Computing (Private and Hybrid), Containers, High Performance Data Analytics, Artificial Intelligence, Deep Learning and Virtualization. The growth of our company over recent years has enabled us to employ various open source technologies such as OpenStack, Kubernetes and CI / CD tools in our products.

THE PATH TO INNOVATION WITH ARM…

From 2012-2013

First ARM+GPU server and first ARM cluster

THE PATH TO INNOVATION WITH ARM…

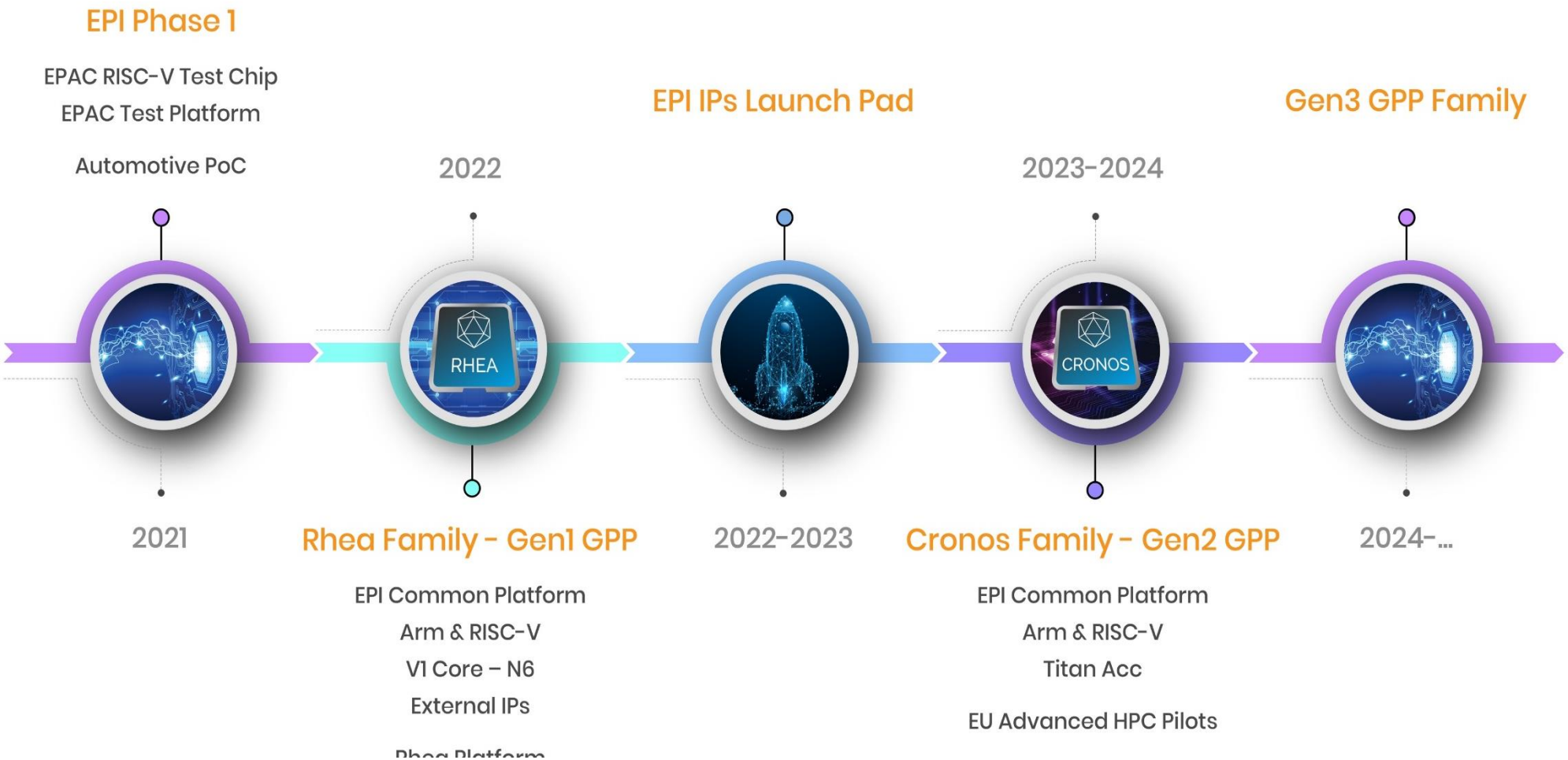
TO 2020

ARMIDA

(**ARM I**nfrastructure for the **D**evelopment of **A**pplications)

- **8 node cluster powered by the Marvell Thunder-X 2**
- **Currently installed in E4's R&D lab**
- **Coupled with NVIDIA Tesla V100 GPUs**

EUROPEAN PROCESSOR INITIATIVE ROADMAP



CODES@OEHI #2 Virtual Hackathon using ARMIDA

Open Edge and HPC Initiative and CINECA

CODES@OEHI #2 Virtual Hackathon

November 3rd – 5 th, 2020

To register:
www.e4company.com/e4lab

CODES@OEHI #2 Virtual Hackathon

- Objectives:
  - put application developers together with experts in programming and performance
  - enable developers, scientists, researchers and engineers to accelerate and optimize their applications on Nvidia GPUs.
  - share experiences in a highly collaborative environment

- **Participants**: developers interested in porting applications to Arm-based systems with or without the acceleration provided by GPU (Nvidia Tesla V100-PCIe), and/or in improving the performances of an already ported application

- **Context**: Arm-based architectures only

- **Scope**: learning how to maximize the performance of codes, algorithms, applications and libraries on Arm-based systems

CODES@OEHI #2 Virtual Hackathon

November 3rd, 2020

13:00	13:45	Introduction & logistics	Fabrizio Magugliani/E4 Computer Engineering

The hosting site:

13:45	14:00	CINECA	Mirko Cestari/CINECA

The building blocks:

14:00	14:30	ARM Overview	Phil Ridley/ARM
14:30	15:00	Computing on GPU-accelerated Arm HPC platforms	Filippo Spiga /NVIDIA

15:00	15:15	break	

The testbed systems:

15:15	15:30	ARMIDA	Fabrizio Magugliani/E4 Computer Engineering
15:30	15:45	JUAWEI	Dirk Pleiter/Jülich Supercomputing Centre

CODES@OEHI #2 Virtual Hackathon

November 3rd, 2020

ARM, NVIDIA, CINECA, E4 Computer Engineering and Julich will be available for the 3 days on virtual room to reply to questions, providing advice and address issues.

15:45 onwards Hackathoners at work (self-paced activities)

17:00 17:30 Hackathoners speak out!

Short presentations of the hackathoner/teams about the selected applications, the intended goals, the roadblocks (if any) met so far, any questions about the testbed systems and the system software

CODES@OEHI #2 Virtual Hackathon

November 4th, 2020

All day&night	Hackathoners at work (self-paced activities)

CODES@OEHI #2 Virtual Hackathon

November 5th, 2020

Hackathoners at work (self-paced activities)

14:00 15:00 Hackathoners' presentations
Short presentations of the hackathoners/teams about the results, the good, the bad, the ugly of these days, and the follow-ons.

15:00 Wrap up and adjourn

CODES@OEHI #2 Virtual Hackathon

Logistics

You are now in the main room

SIX more rooms are available for different groups of discussion.

Details (and link to this rooms) will be given by the “responsible of the room” specifically to the attendees for each group.

E4

COMPUTER
ENGINEERING

WHEN PERFORMANCE MATTERS

CODES@OEHI #2 **Virtual** Hackathon

ARMIDA

(**ARM I**nfrastructure for the **D**evelopment of **A**pplications)

Fabrizio Magugliani

E4 Computer Engineering SpA

Open Edge and HPC Initiative

CODES@OEHI #2 Virtual Hackathon

- You can submit jobs to the following SLURM queues:

```
PARTITION TIMELIMIT  NODES  NODELIST
debug*    infinite      8  armida-[01-07],armida-fe
gpu       infinite      4  armida-[04-07]
```

```
[fmagugliani|armida-fe] ~ # df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        128G     0  128G   0% /dev
tmpfs           128G     0  128G   0% /dev/shm
tmpfs           128G  4.1G  124G   4% /run
tmpfs           128G     0  128G   0% /sys/fs/cgroup
/dev/sdb4       217G   97G  120G  45% /
/dev/sda2       205G   42G  163G  21% /opt/share
/dev/sdb2      1014M  149M  866M  15% /boot
/dev/sda1       1.6T  520G  1.1T  33% /home
/dev/sdb1       2.0G  8.8M  2.0G   1% /boot/efi
tmpfs            26G     0   26G   0% /run/user/1000
[fmagugliani|armida-fe] ~ #
```

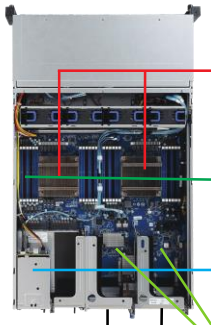
CODES@OEHI #2 Virtual Hackathon

```
[fmagugliani|armida-fe] ~ # module avail
------------------------ /opt/share/e4/modulefiles -------------------------
GCC/10.1.0                    Openmpi-4.0.3/gcc-10.1.0/openmpi
Openmpi-4.0.3/armpl-20.3/openmpi  Openmpi-4.0.3/pgi-19.3/openmpi
Openmpi-4.0.3/gcc-9.2.0/openmpi   Openmpi-4.0.3/pgi-20.9/openmpi


---------------------- /opt/share/arm/20.3/modulefiles -----------------------
Generic-AArch64/RHEL/8/arm-linux-compiler-20.3/armpl/20.3.0
Generic-AArch64/RHEL/8/arm-linux-compiler/20.3
Generic-AArch64/RHEL/8/gcc-9.3.0/armpl/20.3.0
Generic-AArch64/RHEL/8/gcc/9.3.0
ThunderX2CN99/RHEL/8/arm-linux-compiler-20.3/armpl/20.3.0
ThunderX2CN99/RHEL/8/gcc-9.3.0/armpl/20.3.0


-------------------- /opt/share/nvidia/hpcsdk/modulefiles --------------------
nvhpc-byo-compiler/20.9  nvhpc-nompi/20.9  nvhpc/20.9
[fmagugliani|armida-fe] ~ #
```

ARMIDA



CPU INFO:
Architecture: aarch64
CPU(s): 64
Thread(s) per core: 1
Version: Cavium ThunderX2(R) CPU CN9980 v2.1 @2.20GHz
Turbo Mode up to 2.5Ghz

MEM INFO
16 slot DDR4-2666 Reg Ecc 16Gb DR (256Gb installed)

STORAGE INFO
SSD 240Gb OS
SSD 1,92Tb used as NFS share /home and /opt/share
Shared Folder /home/tetramax for tetramax-andreas users

GPU INFO
WIP - any GPU present in this moment

CONNECTIVITY INFO
2x 10GbE BaseT (current 1x conneted at 1Gb)
2x 25Gbe SPF28 (currently not in use)
1x 100Gb IB EDR

OS

OS INFO
Red Hat Enterprise Linux release 8.0
Kernel 4.18.0-80.el8.aarch64
gcc version 8.3.1 20190507 (Red Hat 8.3.1-4) (GCC)

CUDA	10.2.91
OFED	4.7-1.0.0.1
Slurm	18.08.8
ARM forge	20.1

Available with Module:
ARM compiler
ThunderX2CN99/RHEL/8/arm-hpc-compiler-19.3/armpl/19.3.0
ThunderX2CN99/RHEL/8/arm-linux-compiler-20.0/armpl/20.0.0
gcc
Generic-AArch64/RHEL/8/gcc/9.2.0
Generic-AArch64/RHEL/8/gcc/10.1.0
OpenMPI
Openmpi-4.0.3/armpl-20.0/openmpi
Openmpi-4.0.3/gcc-9.2.0/openmpi
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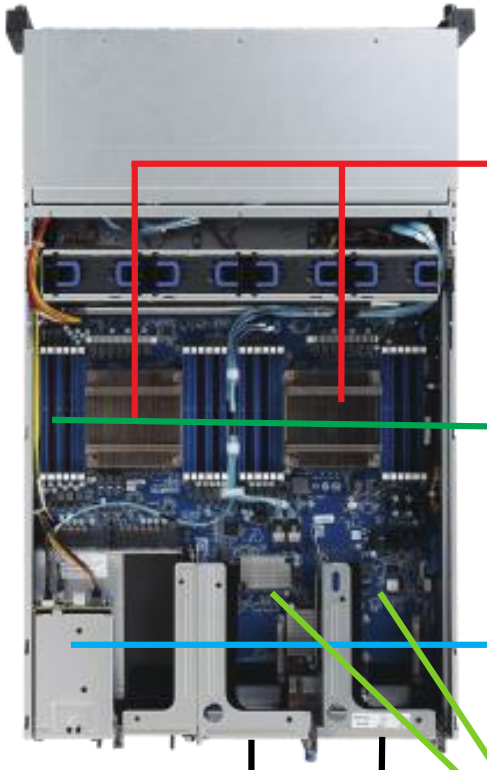
ARMIDA



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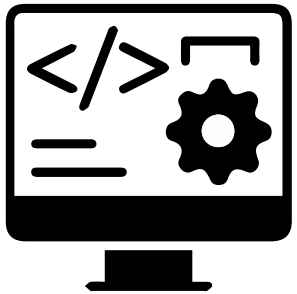

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ThunderX2CN99/RHEL/8/arm-linux-compiler-20.0/armpl/20.0.0
gcc
Generic-AArch64/RHEL/8/gcc/9.2.0
Generic-AArch64/RHEL/8/gcc/10.1.0
OpenMPI
Openmpi-4.0.3/armpl-20.0/openmpi
Openmpi-4.0.3/gcc-9.2.0/openmpi
Openmpi-4.0.3/gcc-10.1.0/openmpi

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Slides will be posted today

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