

**INtelligent, Fast, Interconnected and Efficient devices, for frontier exploitation in Research and Industry**

**Funding Scheme: FP7-PEOPLE-2012-ITN**

**Grant Agreement number: 317446**

**Project acronym: INFIERI**



**DELIVERABLE NAME:** *High Performance Computing (HPC): Advanced Heterogeneous architectures.*

**DELIVERABLE REF. N°:** 4.12

**WORK PACKAGE:** WP4

**NATURE OF THE DELIVERABLE:** R= Report, P = Prototyped Software, O= Software tools

**BENEFICIARY(IES) CONTRIBUTOR(S):** TRT

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**DISSEMINATION LEVEL:** RE, CO

**PU** = Public N/A IN THE INFIERI CONTEXT

**PP** = Restricted to other programme participants (including the Commission Services) N/A IN THE INFIERI CONTEXT

**RE** = Restricted to a group specified by the consortium (including the Commission Services) **HIGHLY SUGGESTED IN THE INFIERI CONTEXT**

**CO** = Confidential, only for members of the consortium (including the Commission Services) **HIGHLY SUGGESTED IN THE INFIERI CONTEXT**

### **Abstract:**

This research was focusing on designing agile high performance sensors sub-systems. Such real-time embedded sensors observe a physical environment using one or several capabilities among radar, sonar, cameras or RF receivers, and generally integrated or are directly connected to actuators that generate some response to the observed situation.

### **Work Description:**

The input data rates need a relatively high computation throughput, while the end-to-end latency between incoming signals and the adequate response is constrained by the kinematics of the observed environment to remain clearly below the second. Such sub-systems can be considered as high performance Cyber-Physical Systems (CPSs).

They make use of distributed computing architectures, typically using some tens of computing nodes to run intensive signal or image processing applications. Most of the time, limitations in size, weight

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Period covered: from 01/02/2013 to 31/01/2017

Project website: <http://infieri-network.eu>

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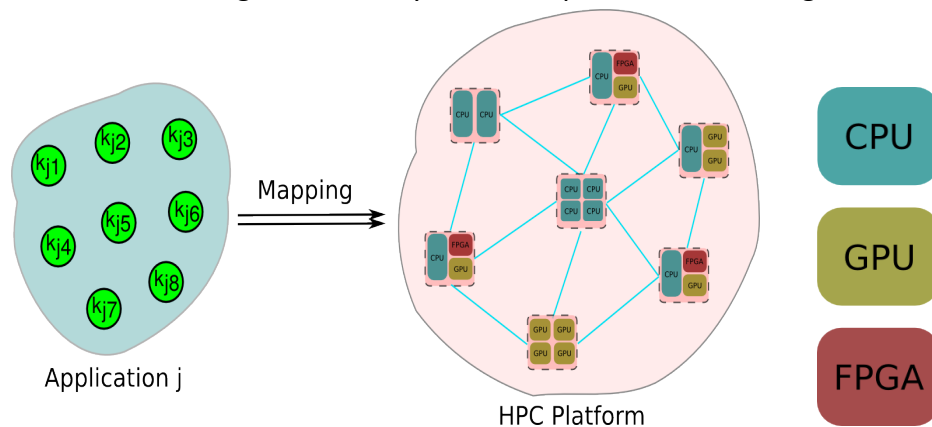
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and power (SWaP), together with the tight throughput and latency constraints, push to look for mapping and scheduling policies that utilize at best the capabilities of the underlying hardware with is more and more based on heterogeneous many-core as represented in the figure here below.



This in turn requires a sufficient level of control and guarantees on computation and communication delays within the computing nodes and network. In such a context, the state of the art implementations are often based on mapping and scheduling policies decided at design time for known applications under the assumption that only one application runs at a time.

The ambition in this research is to reconsider the computing platform architecture concepts in order to enable the deployment at run-time of potentially several known applications while guaranteeing for each of them a given level of quality of service (QoS) in particular related to time.

During this research, we addressed new resource management and load monitoring methods adequate to support run-time mapping and scheduling of applications in this particular context of highly constrained throughput and response times.

That means also to study new methods of dynamic allocation taking into account the heterogeneity of the computing nodes.

## Talks

Presentation by Wilder Lopes (TRT) at the 8<sup>th</sup> Workshop at FNAL, Batavia (Illinois-USA), October 17-21, 2016, on “Techniques for Dynamic Workload Partitioning in HPC Platforms with Heterogeneous Architectures”, October 20, 2016, in:

<https://indico.cern.ch/event/557734/overview>

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**Poster Presentation**

Poster by Wilder Lopes (TRT) at the 8<sup>th</sup> Workshop at FNAL, Batavia, October 17-21, 2016.

Poster by Wilder Lopes (TRT) at the 4<sup>th</sup> International Summer School at University of Sao Paulo, USP, (Brazil), 23/1-3/2, 2017, See poster session in the School website:

<http://www.usp.br/ime/infier2016>

**Youtube:** by Widler Lopes on his work as ER at Thales TRT

[https://www.youtube.com/watch?v=dWuXn1BePVM&list=PLzPw3Oyr7qZWE8jubsr\\_zzj0y9FpiUDZv&index=21](https://www.youtube.com/watch?v=dWuXn1BePVM&list=PLzPw3Oyr7qZWE8jubsr_zzj0y9FpiUDZv&index=21)