



Italian National Agency for New Technologies,
Energy and Sustainable Economic Development

TEXTAROSSA

Progetto sottomesso ad EUROHPC-01

Portici, 12/02/2020

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Il progetto TEXTAROSSA

**TOWARDS EXTREME SCALE TECHNOLOGIES AND
ACCELERATORS FOR EUROHPC HW/SW SUPERCOMPUTING
APPLICATIONS FOR EXASCALE**

increase efficiency of computation with extreme efficiency in HW and new arithmetic, as well as providing methods and tools for seamless integration of reconfigurable accelerators in heterogeneous HPC multi-node platforms.

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increase **efficiency of computation** with extreme efficiency in HW and new arithmetic, as well as providing methods and tools for seamless integration of reconfigurable accelerators in heterogeneous HPC multi-node platforms.

Obiettivo globale del progetto è aumentare l'efficienza di calcolo, punto chiave per realizzare macchine nella classe exascale. Efficienza coniugata in tutte le sue accezioni (energetica, nei trasferimenti dati, nell'utilizzo delle risorse, nella realizzazione di moduli dedicati)

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Efficienza nell'HW perseguita con
un efficiente sistema di raffreddamento bifase

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Efficienza nell'HW perseguita con l'implementazione di moduli dedicati (IP) per il trasferimento efficiente dei dati (lossy DMA) e per il calcolo, convergendo verso gli obiettivi della European Processor Initiative



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Efficienza nell'HW perseguita con un sistema di monitoraggio e controllo run-time del consumo di potenza, adottando politiche di gestione del calcolo che risultino power-aware

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Efficienza nell'HW perseguita con
l'adozione di acceleratori programmabili che sono caratterizzati da basso consumo di potenza ed alta efficienza di utilizzo

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Viene introdotto l'uso di nuovi tipi di dato floating point a precisione ridotta (Posit e float16) che consentono di avere prestazioni elevate con ridotto consumo di risorse. Si basano su una differente distribuzione dei numeri rappresentati in floating point; vengono rappresentati con maggiore densità i numeri nell'intorno di 1 – proprietà rilevante per il ML.



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Grazie all'adozione di rappresentazioni a precisione limitata, viene praticamente raddoppiata la banda verso la memoria e, di conseguenza, molti algoritmi che sono limitati dai tempi di accesso alla memoria godranno del conseguente speed-up

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Per la natura general purpose del sistema Textarossa, che dovrà supportare le più svariate classi di applicazioni, verranno implementati modelli computazionali sia task-based che streaming-based

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Verranno utilizzati flussi di compilazione che consentiranno l'impiego efficiente dei nuovi tipi di dato e verranno definite strutture HW e SW per consentire la comunicazione inter/intra - nodo dei moduli acceleratori

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Verrà customizzato e ulteriormente sviluppato, in modalità Open Source, il flusso di progettazione di alto livello denominato QuickPlay, che consente di programmare dispositivi FPGA tramite la definizione di una rete di kernel C comunicanti tra loro mediante canali dedicati



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Verranno realizzati due dimostratori:

one type of node based on OpenSequana with host processors and accelerators of last generation, to be used to test the two-phase cooling technology on dense blades without additional air-cooling (Atos)

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Verranno realizzati due dimostratori:

one type of node based on ARM processor and FPGA accelerator, that will be used to test the integrated FPGA ecosystem (E4)

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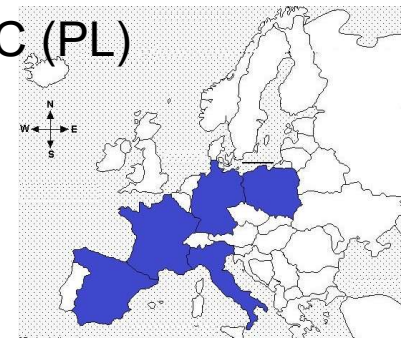
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L'implementazione prototipale della piattaforma Exascale verrà testata e validata su una molteplicità di casi test

«...such as general-purpose numerical kernels, High Energy Physics (HEP), Oil & Gas, climate modelling, and emerging domains such as High Performance Data Analytics (HPDA) and High Performance Artificial Intelligence (HPC-AI). »

Il progetto TEXTAROSSA: i partner

1. ENEA (Coordinator) (IT)
2. Fraunhofer Gesellschaft Zur Förderung der Angewandten Forschung (DE)
3. Consorzio Interuniversitario per l'Informatica CINI (IT)
4. Inst. National de Recherche en Informatique et en Automatique INRIA (FR)
5. Bull SAS ATOS (FR)
6. E4 Computer Engineering SpA (IT)
7. Barcelona Supercomputing Center (ES)
8. Instytut Chemii Bioorganicznej Polskiej Akademii Nauk PSNC (PL)
9. INFN (IT)
10. CNR (IT)
11. In Quattro Srl (IT)



Il progetto TEXTAROSSA: effort

	Mesi/uomo
1. ENEA (IT)	113
2. Fraunhofer (DE)	95
3. CINI (IT)	188
4. INRIA (FR)	127
5. ATOS (FR)	167
6. E4 (IT)	134
7. BSC(ES)	86
8. PSNC (PL)	54
9. INFN (IT)	72
10. CNR (IT)	40
11. InQuattro (IT)	59

1134 person/month ~100 anni/uomo

