

NEWSLETTER

Project meetings

The plenaries in the second year of WiPLASH were held by Zoom due to the restriccions imposed by the Covid 19 pandemic.

[27.04.2021] Fourth plenary meeting. [02.12.2021] Fifth plenary meeting.

In this reunions the action points set during previous meetings were reviewed. The results obtained to date by each Work Package (WP) are presented and discussed.

Each team g a brief summary of their WP goals, tasks progress, achievements and setbacks encountered in the previous 6 months.

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Oct 2020-Sept 2021

Although the plenaries took place online, they included the participacion of several representatives of all partners. After the presentations of each group, a debate is opened to answer the concerns of other WiPLASH members. Bilateral discussions included graphene antenna technology, on-chip wireless communications and Artificial Intellingence hardware architectures. The work plans for the next 6 months and the next deliverables are defined.





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 863337.



Second Year

Meet the WiPLASH's Partners



PhD Student Elana Pereira de Santana explains the role of University of Siegen (UoS) within the WiPLASH project.

Directed by Prof. Peter Haring Bolívar, UoS leads the WP 1 that is dedicated to the **Radiofrequency (RF) Design and Implementation.**

WP 1 studies the RF, mm-Wave and THz components that are needed to assess the intra-chip and inter-chip wireless communication channels in a computing package.

Elana comments that the most frustrating part of her research is that the experiments don't always go as planned. Belonging to a project that is at the forefront of a new topic implies patience and perseverance. Link



Dr Zhenxing Wang from AMO GmbH explains the role of the company within WiPLASH.

AMO GmbH leads WP 2 devoted to Technological the Integration aiming to graphene integration in wafer scale with the high performance required for the target application. Also, they try to develop a monolithic integrated circuit based on graphene that will allow the integration of graphene antennas and tranceivers.

Dr Zhenging explains that one of the biggest difficulties with WP2 is scalability. To embed graphene on a wafer scale it is required a consistent and reliable performance which is challenging at this stage of the research. **Link**





Selected Publications

Journals

- K. Rouhi et al. "Multi-Channel Near-Field Terahertz Communications Using Reprogrammable Graphene-Based Digital Metasurface," IEEE/OSA Journal of Lightwave Technology, 2021.
- Y. M. Qureshi et al. "Gem5-X: A Many-Core Heterogeneous Simulation Platform for Architectural Exploration and Optimization," ACM Transactions on Architecture and Code Optimization (TACO), 2021
- C.-Y. Fan et al. "Fully Integrated 2.4-GHz Flexible Rectifier Using Chemical-Vapor-Deposition Graphene MMIC Process," IEEE Transactions on Electron Devices, 68 (1326), 2021.
- M. Saeed et al. "Voltage-Tunable Thin Film Graphene-diode-based Microwave Harmonic Generator," IEEE Microwave and Wireless Components Letters, 2021.
- Z. Wang et al. "Graphene in 2D/3D Heterostructure Diodes for High Performance Electronics and Optoelectronics ," Adv. Electron. Mat., 2021.
- F. Glaser et al. "Energy-Efficient Hardware-Accelerated Synchronization for Shared-Ll-Memory Multiprocessor Clusters," IEEE Transactions on Parallel and Distributed Systems, 32(3), 633-648, 2021.
- A. Burrello et al. "DORY: Automatic End-to-End Deployment of Real-World DNNs on Low-Cost IoT MCUs," IEEE Transactions on Computers, 2021.

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The paper by Y. M. Qureshi et al. presents the new gem5-X simulation platform for the exploration of many-cores heterogeneous architectures to optimization allow of performance and energy consumption of new emerging applications. Gem5-X enables assessment of cluster the configurations of computer cores. The Gem5-X simulator is open-source and is available for downloading (link). There is available a reference also gem5-X manual for that a start guide and includes different instruction on architectures usage (link).







Conferences

- R. Guirado et al., "Dataflow-Architecture Co-Design for 2.5D DNN Accelerators using Wireless Network-on-Package," in Proc. Asia and South Pacific Design Automation Conference (ASP-DAC), Tokyo, Japan, January 2021.
- M. A. Rios et al., "Running Efficiently CNNs on the Edge Thanks to Hybrid SRAM-RRAM In-Memory Computing," in Proc. Design, Automation and Test in Europe Conference (DATE), Virtual Conference and Exhibition, February 1–5, 2021
- G. Ottavi et al., "End-to-end 100-TOPS/W Inference With Analog In-Memory Computing: Are We There Yet?" in Proc. IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS), 2021.
- J. Klein et al., "Architecting More Than Moore - Wireless Plasticity for Massive Heterogeneous Computer Architectures (WiPLASH)" in Proc. ACM International Conference on Computing Frontiers (CF), 2021.
- A. Franques et al., "WiDir: A Wireless-Enabled Directory Cache Coherence Protocol," in Proc. HPCA-27, Seoul, South Korea, February 2021.
- A. Franques et al., "Fuzzy-Token: An Adaptive MAC Protocol for Wireless-Enabled Many-Core CMPs," in Proc. DATE 2021, Grenoble, France, February 2021

Second Year

R. Guirado presents at the 26th ASP-DAC 2021. DNN (Deep Neural Network) models grow over time complexity, in size and demanding higher computational power. To deliver efficiently, hardware this accelerators have been developed. The paper proposes a design methodology of 2.5D DNN accelerators based on wireless technology to scale out DNN accelerators in chiplet-based systems thanks to its unique broadcast capabilities. Link







Invited Talks

- Abadal, "Towards the S. Internet of Everything with Graphene Antennas and Reconfigurable Intelligent Surfaces," the 4th Keynote at International Emerging Conference on Technology Trends in Electronics, Communication and Networking, Surat, India, November 2021.
- S. Abadal and A. Jain, "Towards the internet of everything: THz wireless networks for next generation compute platforms," in the WWRF Workshop of THz Waves: Fast Lane Journey to 6G, Wireless World Research Forum, Virtual Event, April 2021.
- S. Abadal and I. Boybat, "Wireless communications at the chip scale for future multi-chip processors," Women's Week UPC, Universitat Politècnica de Catalunya, Spain, March 2021.
- D. Rossi, "Extending RISC V Platforms for ML at the Extreme Edge of the IoT" ISSCC FORUM, Feb. 2021.
- S. Abadal and M. Zapater, "Nanocomunicacions: Creant xarxes WiFi de la mida del vostre polze," Institut El Pi Gros, Sant Cebrià de Vallalta, Spain, Jan. 2021.

Oct 2020-Sept 2021

WiPLASH has devoted numerous efforts to the dissemination of the project. For this, many talks have been high from offered, school students to primary school students. On the occasion of Women's Week on March 10, 2021, Dr. Sergi Abadal and Dr. Irem Boybat gave a talk on Chip-scale wireless communications for future multichip processors at the Universitat Politécnica de Catalunya (Link)

Tutorial

[January.2021] Three partners of WiPLASH the tutorial: "Using gem5 and full- system RISC-V simulation to enable the optimization of heterogeneous architectures," High Performance and Embedded Architecture and Compilation (HiPEAC).





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WiPLASH's Collaborations

WiPLASH supports collaboration among projects to obtain greater dissemination and count on the inputs of multiple field experts for the development of joint contributions.



WiPLASH's Consortium







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