Part A. PERSONAL INFORMATION

		CV date	09/12/2025

First name	Gabriel		
Family name	Gómez López		
Gender (*)	Male	Birth date (dd/mm/yyyy)	04/02/1997
Social Security, Passport, ID number	49212573W		
e-mail	Gabriel.gomez@uclm.es	URL Web	https://ggomezlo.es
Open Researcher and Contributor ID (ORCID) (*)			0000-0002-8604-6901

(*) Mandatory

A.1. Current position

Position	Adjunct Lecturer
Initial date	01/09/2025
Institution	University of Castilla-La Mancha
Department/Center	Department of Computing Systems
Country	Spain	Teleph. number	
Key words	Interconnection Networks, InfiniBand, BXI, Ultra Ethernet, Data Centers, Simulation, Topology, Congestion Control

A.2. Previous professional status (including breaks in research career, according to what is indicated in the call, indicate total months)

Period	Position/Institution/Country/Interruption cause
2020-2025	Researcher Assistant / UCLM / Spain

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Advanced Computing Technologies	UCLM / Spain	2025
Master's Degree in Computer Engineering	UCLM / Spain	2021
Bachelor's Degree in Computer Engineering	UCLM / Spain	2020

Part B. CV SUMMARY *(max. 5000 characters, including spaces)*

My scientific career has been developed at the **Computing Systems Department** and the **Institute of Research in Informatics of Albacete (I3A)** at the University of Castilla-La Mancha (UCLM). I obtained my Bachelor's Degree in Computer Engineering in 2020 and my Master's Degree in 2021. Since 2020, I have been hired as a researcher under various projects, culminating in my PhD thesis titled *"Feasible Solutions for the Implementation and Analysis of Commercial High-Performance Interconnection Network Architectures"* (defended Dec 2025).

1. **Scientific Contributions:** My research focuses on **High-Performance Interconnection Networks**, addressing critical challenges such as topology design, congestion control (CC), and simulation of next-generation architectures. My contributions can be categorized into three main lines:
   - **Implementation of Hybrid Topologies in Real Systems:** I achieved the first known implementation of the **KNS (k-ary n-tree s-indirect)** topology in a real cluster using **InfiniBand (IB)** technology. This work involved developing and implementing the **Hybrid-DOR** algorithm into the **OpenSM**. This work was published in the *Journal of Supercomputing* (2024, **Q2**).
   - **Congestion Control (CC) via Fine-Grain Monitoring:** I proposed a novel strategy to improve the efficiency of injection-throttling CC mechanisms in IB networks. By integrating a lightweight monitor (**LIMITLESS**) with OpenSM, I enabled dynamic reconfiguration of CC parameters based on real-time telemetry (performance

counters). This solution mitigates the overreaction of mechanisms and improves performance under congestion situations. This research resulted in a publication in *IEEE Micro* (2023, **Q2**) and a paper at the *IEEE Symposium on High-Performance Interconnects (HOTI)*.

- **Simulation of New Network Architectures:** I extended the **SAURON** simulator to model advanced architectures, including **BXIv3**. Within the European **RED-SEA project**, I integrated SAURON with the COSSIM processor simulator. This framework allows for the evaluation of new interconnection architectures. These results have been published in *Microprocessors and Microsystems* (2024, **Q2**), the *Journal of Supercomputing* (2025, **Q2**), and a paper at the *Euro-PAR* conference (2024)

2. **Internationalization and Leadership:** My trajectory is marked by strong international collaboration. I completed a **5-month research stay at CERN** in Switzerland (2022**)**. There, I modeled the Data Acquisition (DAQ) network for the **ATLAS experiment**, evaluating technologies like RoCE, InfiniBand, and Ethernet. Additionally, I completed a **1-month stay at FORTH (Greece)** in 2024, funded by an Erasmus+ grant. I collaborated with the CARV laboratory to study and model the "Accurate" CC mechanism and the Mezzanine prototype. I have been an active member of the **RED-SEA project** (EuroHPC/H2020), collaborating with leading European partners such as **Eviden, Exapsys, FORTH, and ETH Zürich**, contributing to the design of BXIv3.

3. **Participation in R&D Projects** I have participated in the following projects:
   - **European:** *Network Solution for Exascale Architectures (RED-SEA)* (H2020/EuroHPC).
   - **National:** *Desarrollo y mejora de aplicaciones, servicios e infraestructuras en HPC* (PID2021), *Redes de Interconexión de Centros de Datos de Alta Eficiencia Energética* (TED2021), and *Cátedra CHIP* (PERTE Chip, NextGenerationEU).
   - **Regional/Other:** *TETRA-2* (JCCM) and the **BBVA Foundation Leonardo Grant**.

4. **Dissemination, Outreach, and Technology Transfer**
   I have regularly presented research progress at the SARTECO Conferences (2021, 2023, 2024), covering topics ranging from multipath algorithms to network monitoring. I have also presented poster results at the UCLM Doctoral Workshops (2023, 2025).
   My commitment to outreach is reflected in my participation in the "Three Minute Thesis" (3MT) competition (2025), where I presented the social relevance of my research. In teaching, I have encouraged technological vocations through Raspberry Pi workshops, an experience presented at the JENUI 2023 teaching innovation conference. Transfer of my results is direct, since BXI is a commercial technology that plays a key role in European technological sovereignty.

Part C. RELEVANT MERITS

C.1. Publications

1. N. Tampouratzis (AC), I. Papaefstathiou, <u>G. Gomez-Lopez</u>, M. Sánchez de la Rosa, J. Escudero-Sahuquillo, P.J. Garcia. "Distributed Fast and Accurate Simulation platform for advanced ARM and RISC-V based HPC Systems". The Journal of Supercomputing (Published Online), Springer (2025). **(3/6)**. DOI: 10.1007/s11227-025-07972-7.
2. M. Sánchez de la Rosa (AC), <u>G. Gomez-Lopez (AC)</u>, F.J. Andújar, J. Escudero-Sahuquillo, J.L. Sánchez, F.J. Alfaro-Cortés, P.A. Lagadec. "Quality-of-service provision for BXIv3-based interconnection networks". The Journal of Supercomputing, Vol 81, Issue 4, p. 601. Springer (2025). **(2/7)**. DOI: 10.1007/s11227-025-07069-1.
3. <u>G. Gomez-Lopez (AC)</u>, M.S. de la Rosa, J. Escudero-Sahuquillo, P.J. Garcia, F.J. Quiles, P.A. Lagadec. "Hybrid Congestion Control for BXI-Based Interconnection Networks". Euro-Par 2024: Parallel Processing. Lecture Notes in Computer Science, vol 14802. Springer (2024). **(1/6)**. DOI: 10.1007/978-3-031-69766-1_17.

4. **M.E. Gómez (AC), J. Sahuquillo, A. Biagioni, ..., S. Pickartz.** "RED-SEA Project: Towards a new-generation European interconnect". Microprocessors and Microsystems, Vol 110, 105102. Elsevier (2024). **(38/63)**. DOI: 10.1016/j.micpro.2024.105102.

5. <u>**G. Gomez-Lopez (AC),**</u> **J. Escudero-Sahuquillo, P.J. Garcia, F.J. Quiles.** "Implementation and testing of a KNS topology in an InfiniBand cluster". The Journal of Supercomputing, Vol 80, pp 21306–21338. Springer (2024). **(1/4)**. DOI: 10.1007/s11227-024-06214-6.

6. **A. Cascajo (AC),** <u>**G. Gomez-Lopez,**</u> **J. Escudero-Sahuquillo, P.J. Garcia, D.E. Singh, F. Alfaro-Cortés, F.J. Quiles, J. Carretero.** "Monitoring InfiniBand Networks to React Efficiently to Congestion". IEEE Micro, Vol 43, Issue 2, pp. 120-130 (2023). **(2/8).** DOI: 10.1109/MM.2023.3241840.

7. **J. Escudero-Sahuquillo (AC), M. Martínez Iniesta, J. L. Sánchez, P. J. García, F. J. Alfaro, F. J Quiles, C. Garrido-Hidalgo, L. Roda-Sanchez, A. Morán, C. Olmedilla,** <u>**G. Gomez-Lopez,**</u> **M. Sánchez de la Rosa** "Experiencias en la organización de un taller práctico usando Raspberry Pi". Actas de las JENUI, vol. 8, pp. 209-216. Granada, julio de 2023. ISSN: 2531-0607 **(11/12).**

8. **A. Cascajo,** <u>**G. Gomez-Lopez,**</u> **J. Escudero-Sahuquillo, P.J. Garcia, D.E. Singh, F. Alfaro-Cortés, F.J. Quiles, J. Carretero**. "Improving Congestion Control through Fine-Grain Monitoring of InfiniBand Networks". 2022 IEEE Symposium on High-Performance Interconnects (HOTI), pp. 29-38. IEEE Computer Society (2022). **(2/8).** DOI: 10.1109/HOTI55740.2022.00020.

C.2. Congress

1. <u>**G. Gomez-Lopez**</u>. "Implementación y evaluación de una topología KNS en un clúster InfiniBand". XII Jornadas Doctorales de la Universidad de Castilla-La Mancha, Cuenca, España (2025). **(Póster).**

2. **Gómez López, G.** Concurso Tesis en 3 Minutos (3MT), Universidad de Castilla-La Mancha, Albacete, España (2025). **(Oral Presentation).**

3. **M. Sánchez de la Rosa,** <u>**G. Gomez-Lopez,**</u> **F.J. Andújar, J. Escudero-Sahuquillo, J.L. Sánchez, F.J. Alfaro-Cortés, P.A. Lagadec.** "Quality-of-service provision for BXIv3-based interconnection networks". IEEE Symposium on High-Performance Interconnects (HOTI 2024), Online/USA (2024). **(Oral presentation).**

4. **C. Medrano Navalón,** <u>**G. Gomez-Lopez**</u>**, J. Escudero Sahuquillo, P.J. García, F.J. Quiles**. "Modelado de algoritmos de encaminamiento multicamino en un simulador basado en OMNeT++ utilizando diferentes topologías de red". XXXIII Jornadas de Paralelismo (Jornadas SARTECO 2024), A Coruña, España (2024). **(Oral Presentation).**

5. <u>**G. Gomez-Lopez**</u>. "Efficient and scalable topologies, routings, and congestion-control techniques for real-systems high-performance interconnection networks". Invited talk at FORTH, Heraklion, Grecia (2024). (1/1). **(Invited conference).**

6. <u>**G. Gomez-Lopez**</u>. "Resultados intermedios del proyecto RED-SEA". XI Jornadas Doctorales de la Universidad de Castilla-La Mancha, Toledo, España (2023). **(Poster)**

7. <u>**G. Gómez López**</u>. "Monitorización de redes InfiniBand para reaccionar eficazmente a la congestión". XXXII Jornadas de Paralelismo (Jornadas SARTECO 2023), Ciudad Real, España (2023). (1/1). **(Oral presentation).**

8. <u>**G. Gome-Lopez**</u>. "Building a hybrid network topology in an HPC Infiniband-based cluster". Computational and Mathematical Methods in Science and Engineering (CMMSE 2023), Rota, España (2023). **(Oral Presentation)**

9. <u>**G. Gómez López**</u>. "Implementación de una configuración eficiente de una topología híbrida de tipo KNS en un clúster InfiniBand". XXXI Jornadas de Paralelismo (Jornadas SARTECO 2020/2021), Málaga, España (2022). **(Oral Presentation).**

10. **A. Cascajo,** <u>**G. Gomez-Lopez,**</u> **J. Escudero-Sahuquillo, P.J. García, D.E. Singh, F.J. Alfaro-Cortés, F.J. Quiles, J. Carretero.** "Improving Congestion Control through Fine-Grain Monitoring of InfiniBand Networks". IEEE Symposium on High-Performance Interconnects (HOTI 2022), Online (2022). **(Oral Presentation).**

C.3. Research projects

1. **Project:** Cátedra CHIP (UCLM)**. Reference:** 240253CAT / TSI-069100-2023-0014. **Funding:** Ministry for Digital Transformation and the Civil Service (Next Generation EU Funds). **Principal Investigator (PI):** Juan Carlos López López (University of Castilla-La Mancha). **Date:** 10/10/2024 – 31/12/2025. **Grant Amount:** €1,320,049. **Type of Participation:** Contracted Researcher. **Personal Contribution:** Research on advanced architectures for Systems-on-Chip (SoC) and Interconnection Networks.

2. **Project:** Redes de Interconexión de Centros de Datos de Alta Eficiencia Energética / High Energy Efficiency Data Center Interconnection Networks. **Reference:** TED2021-130233B-C31. **Title:** Redes de Interconexión de Centros de Datos de Alta Eficiencia Energética / High Energy Efficiency Data Center Interconnection Networks. **Funding:** MICIU/AEI and European Union NextGenerationEU/PRTR. **Principal Investigators (PIs):** Francisco José Quiles Flor and José Luis Sánchez García. **Date:** 01/12/2022 – 31/08/2025. **Grant Amount:** €238,395. **Type of Participation:** Research Team Member / Researcher. **Personal Contribution:** Research on energy efficiency mechanisms and congestion management for Data Center Networks.

3. **Project:** Técnicas Eficientes para Tecnologías de Red Avanzadas 2 (TETRA-2) / Efficient Techniques for Advanced Network Technologies 2 (TETRA-2). **Reference:** SBPLY/21/180501/000248. **Funding:** Regional Government of Castilla-La Mancha (JCCM) and FEDER. **Principal Investigators (PIs):** Pedro Javier García García and Jesús Escudero Sahuquillo. **Date:** 01/09/2022 – 31/08/2025. **Grant Amount:** €119,972.23. **Type of Participation:** Research Team Member. **Personal Contribution:** Evaluation of network architectures and development of latency reduction techniques in simulated and real environments.

4. **Project:** Desarrollo y mejora de aplicaciones, servicios e infraestructuras en HPC y Centros de Datos / Development and Improvement of Applications, Services, and Infrastructures in HPC and Data Centers**. Reference:** PID2021-123627OB-C52. **Funding:** MCIU/AEI/10.13039/501100011033/ and FEDER, EU. **Principal Investigator (PI):** Pedro Cuenca Castillo (UCLM Subproject). **Date:** 01/09/2022 – 31/08/2025. **Grant Amount:** €363,000.00. **Type of Participation:** Research Team Member. **Personal Contribution:** Improvement of communication infrastructures to support High-Performance Computing (HPC) applications.

5. **Project:** RED-SEA: Network Solution for Exascale Architectures. **Reference:** PCI2021-121976 / EuroHPC JU No. 955776. **Funding Body:** European High-Performance Computing Joint Undertaking (JU) and Ministry of Science, Innovation and Universities. **Principal Investigators (PIs):** Pedro Javier García García and Jesús Escudero Sahuquillo (UCLM). **Date:** 01/04/2021 – 31/03/2024. **Grant Amount:** €349,591.26 (UCLM Subproject). **Type of Participation:** Researcher / Research Team Member. **Personal Contribution:** Modeling of the BXIv3 network in the SAURON simulator, design of hybrid congestion control mechanisms, and validation with European partners (Atos/Eviden, FORTH).

6. **Project:** Optimización del diseño de la nueva red de interconexión del sistema de adquisición de datos del experimento ATLAS del CERN / Optimization of the New Interconnection Network Design for the CERN ATLAS Experiment Data Acquisition System. **Reference:** IN TIC TIC 0042 (Leonardo Grants). **Funding:** BBVA Foundation (Leonardo Grants for Researchers and Cultural Creators 2020). **Principal Investigator (PI):** Jesús Escudero Sahuquillo. **Date:** 17/03/2021 – 30/04/2022. **Grant Amount:** €39,975.79. **Type of Participation:** Contracted Researcher. **Personal Contribution:** Development of simulation models for the CERN Data Acquisition (DAQ) network and evaluation of technologies (InfiniBand, Ethernet) for the experiment upgrade.