



**Barcelona
Supercomputing
Center**
Centro Nacional de Supercomputación

A photograph of a server room with three rows of server racks. The racks are filled with server units, and the top of the middle rack is open, showing a dense bundle of blue and red cables. The perspective is from a low angle, looking up at the racks.

BSC-CNS TECHNOLOGIES CATALOGUE

INNOVATING THE FUTURE TOGETHER

Discover groundbreaking technologies developed through research projects led by the Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC-CNS). As a global leader in high-performance computing, BSC-CNS is dedicated to advancing innovation, driving industry competitiveness, and delivering transformative solutions with real-world impact.

This catalogue highlights BSC-CNS' technologies across key sectors, including AI, climate, HPC, health, automotive, and more. From cutting-edge processors and AI-driven applications to climate modeling and digital health solutions, these innovations are designed to meet the evolving needs of industry.

By fostering open, scalable, and future-ready solutions, BSC-CNS is shaping the next generation of digital and industrial transformation.

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**BSC-CNS
Initiatives**

Driving Europe's Digital Edge in HPC and AI Innovation

The DARE project (HPC Digital Autonomy with RISC-V in Europe) aims to leverage cutting-edge technology to create advanced computing and AI systems. By using European-designed chiplets built with the latest silicon technologies, the project seeks to achieve high performance and energy efficiency. Through a collaborative co-design approach, DARE will develop the necessary hardware, software, and infrastructure to support Europe's independence in the fields of high-performance computing (HPC) and artificial intelligence (AI).



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POTENTIAL APPLICATIONS



Artificial Intelligence



Autonomous Cars



High Performance Computing



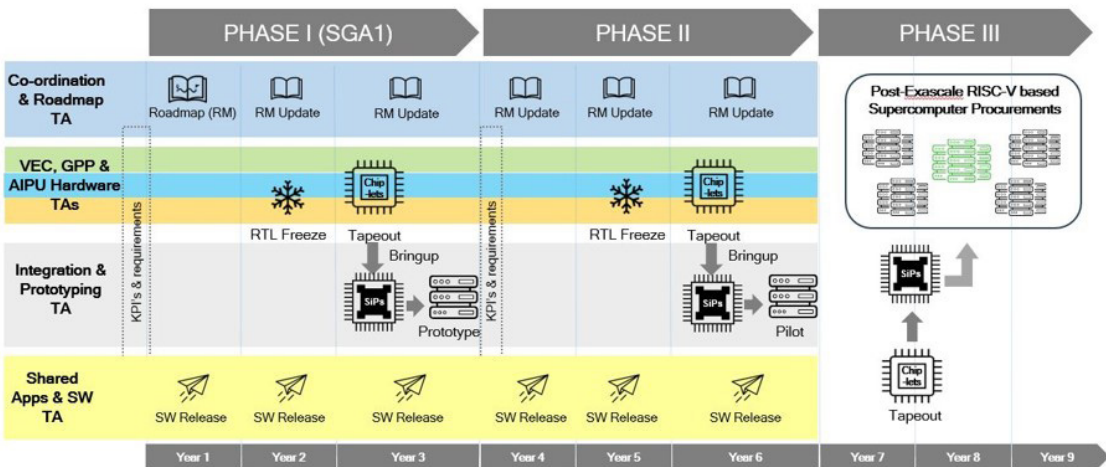
Gaming



Mobile Manufacturers Tech



Software Development



Towards European open-source hardware

Zettascale supercomputers will be 1000 times faster than today's most powerful supercomputers. The Barcelona Zettascale Laboratory aims to develop this new generation of supercomputers.

With the aim to promote European technology, this laboratory will design microprocessors or chips with technology based on open-source RISC-V hardware.

The design of very high performance chips will be used for: supercomputers, autonomous cars and AI devices.



POTENTIAL APPLICATIONS



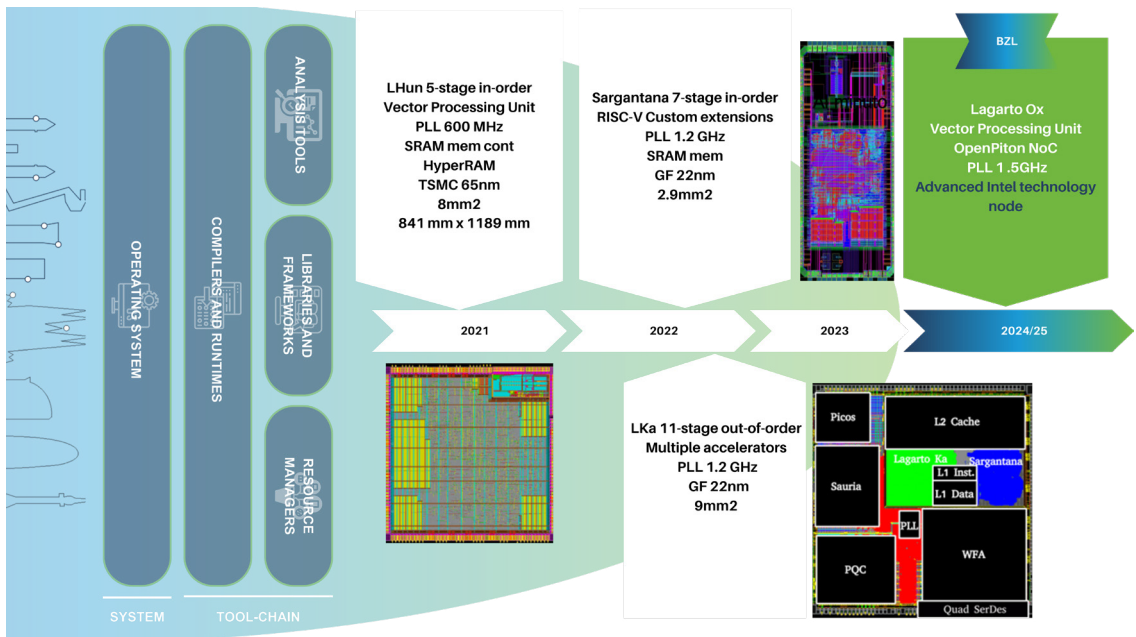
Multicore Chip Design



Mobile Manufacturers Tech



High Performance Computing



European AI/ML and HPC Accelerator System

EUPILOT is an ambitious project aiming to establish a robust European computer system for high performance tasks and artificial intelligence. It's set to design, build, and validate the first EU-based accelerator platform for HPC, covering a wide spectrum of compute-intensive AI applications.

EUPILOT produces accelerator chips in advanced manufacturing technologies based on innovative RISC-V technologies and its associated software stack, achieving high levels of integration and efficiency, aiming to achieve a more independent technology supply chain.



Pilot using Independent Local & Open Technologies



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POTENTIAL APPLICATIONS



Multicore Chip Design



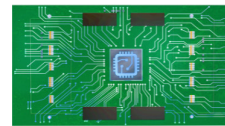
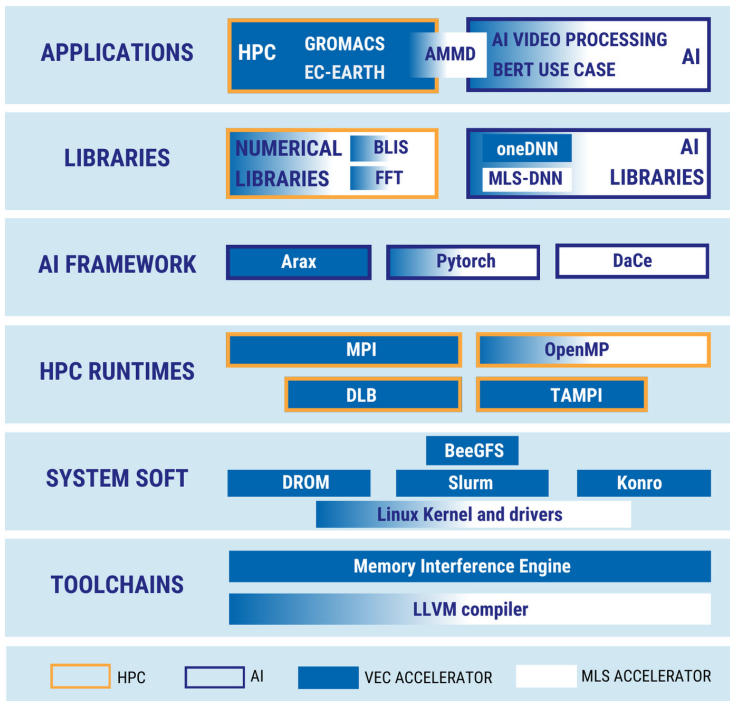
High Performance Computing



Artificial Intelligence



Personalized Medicine



MODULES

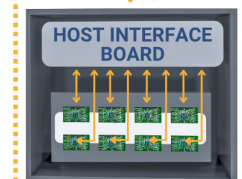


BOARDS



HOST SYSTEM

PCIe



HOST INTERFACE BOARD

EUPILOT Accelerator System



LIQUID IMMERSION RACKS

SYSTEMS





Towards European technological sovereignty

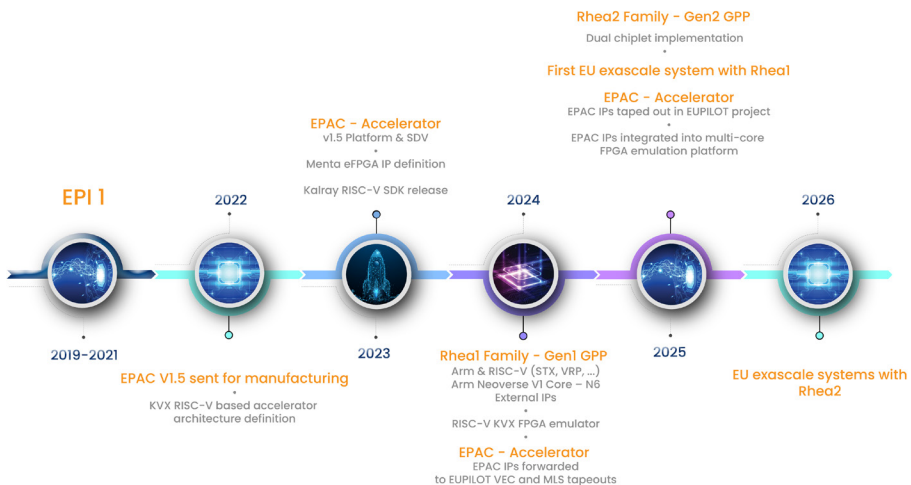
The European Processor Initiative (EPI SGA2) aims to design and build a new family of low-power processors for various applications, including supercomputers and machine learning. This initiative focuses on two main technical areas: one dedicated to developing Arm-based CPUs and the other to RISC-V-based accelerators.

BSC contributes to the development of a RISC-V-based accelerator designed for HPC applications, laying the groundwork for next-generation HPC technologies. This vector accelerator has been integrated into the EPAC test chip, which was taped out in March 2023 and has been operational since October 2023. BSC provides a state-of-the-art infrastructure for testing, prototyping, and validating new architectures, significantly accelerating the transition from research to real-world deployment. Additionally, BSC is advancing the development of system software for RISC-V, including the LLVM compiler with support for vector extensions, as well as libraries for HPC and AI software stacks. In doing so, BSC contributes to a key European objective in today's technological landscape: accessing groundbreaking European HPC technologies, optimizing workloads for future processor architectures, and positioning Europe at the forefront of the rapidly evolving HPC and AI ecosystem.



POTENTIAL APPLICATIONS

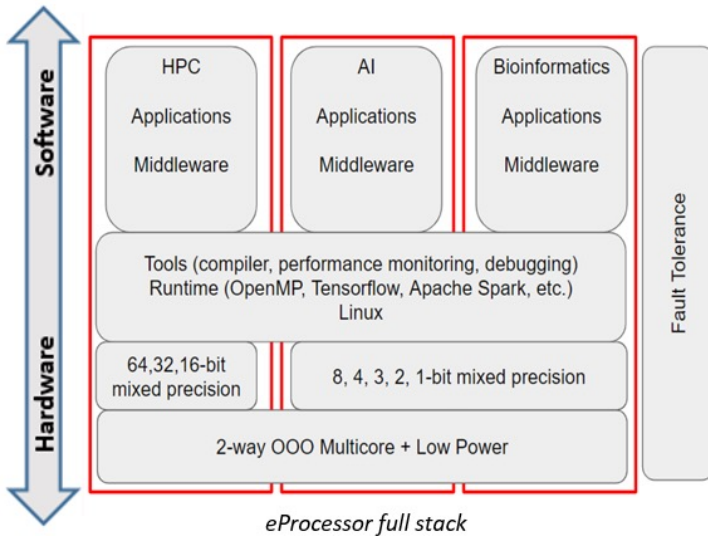
-  Multicore Chip Design
-  Cloud Providers
-  Automotive Engineering
-  High Performance Computing



An open source full stack ecosystem

eProcessor presents an holistic integration of a fully open-source European full-stack ecosystem (hardware and software), featuring a novel RISC-V CPU architecture, paired with diverse and energy efficient accelerators.

The accelerators cater to traditional high-performance computing (HPC) tasks and expand into mixed precision workloads, including high-performance data analytics (HPDA), artificial intelligence (AI), machine learning (ML), deep learning (DL), and bioinformatics.



POTENTIAL APPLICATIONS



Multicore Chip Design



Mobile Manufacturers Tech



Artificial Intelligence



Bioinformatics



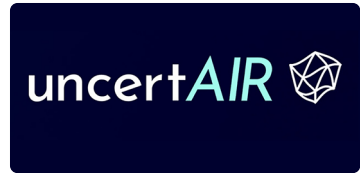
High Performance Computing







Autonomous Cars

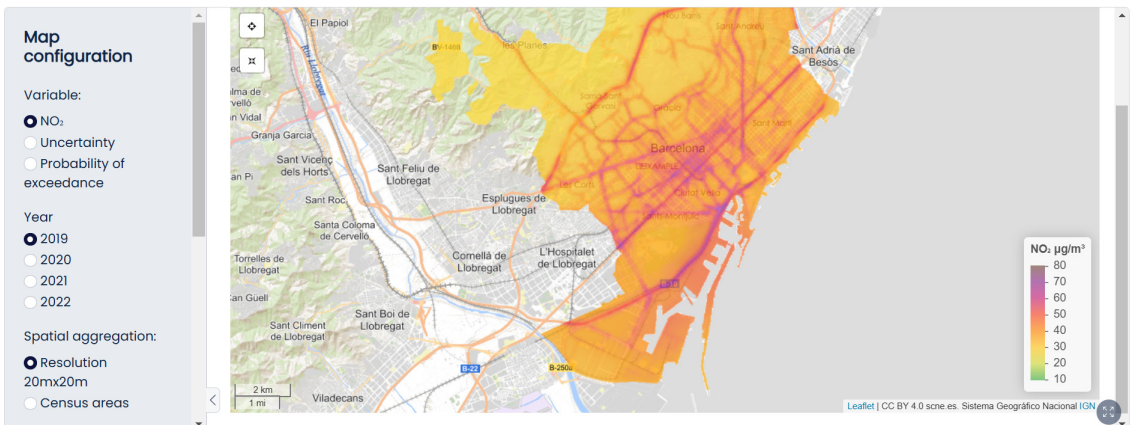
Enhancing Air Quality Decision-Making with Uncertainty Modeling

uncertAIR is an interactive platform designed to address air quality model uncertainty, offering tools to discuss, compute, and communicate air quality issues within specific regions. It provides visualizations and downloadable data that inform policymaking, experimental planning, and public health strategies, such as reducing traffic emissions and promoting sustainable mobility. The platform benefits sectors like urban planning and air quality management, offering probabilistic data to help design future cities. BSC led this project by co-designing and co-developing the platform, uncertAIR is crucial for supporting urban policy planning and management in Barcelona, ensuring evidence-based decisions through the reporting of air quality simulation uncertainties.



POTENTIAL APPLICATIONS

-  Public Health
-  Transport Logistics
-  Public Administration
-  Urban Planning



Hurricane Forecasts to mitigate risks

The Seasonal Hurricane Predictions Platform offers centralized, free access to forecasts for the upcoming hurricane season in the North Atlantic. It aggregates predictions from universities, private sector organizations, and government agencies worldwide, providing forecasters with a unified platform to share their latest seasonal insights. The platform also ensures easy access to these predictions for industry experts and the general public, supporting informed decision-making and preparedness.

BSC hosts and maintains the platform that allows forecasters to make these predictions freely available to the wider public, compare the predictions with real-time hurricane activity, and obtain the best estimate of upcoming hurricane activity.



POTENTIAL APPLICATIONS



Hurricane Predictions



Simulations on Supercomputer Previsions



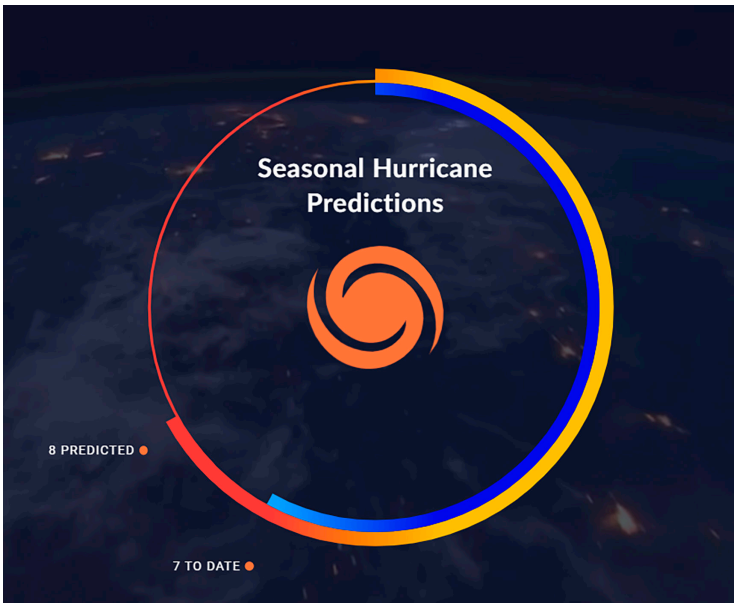
Smart Cities



Public Health



Transport Logistics



Advancing Air Quality and Emission Monitoring in Spain



The RESPIRE project develops a national emission system with high spatial (1 km x 1 km) and temporal (hourly) resolution, tracking air pollutants from anthropogenic, biogenic, and biomass-burning sources, such as nitrogen dioxide and particulate matter. This data enhances the national air quality forecasting system and supports informed decision-making.



BSC and the Spanish State Meteorological Agency (AEMET) have joined forces to improve the representation of atmospheric emissions and complete the air quality prediction and greenhouse gas (GHG) monitoring systems in Spain. It will include carbon dioxide (CO₂) and methane (CH₄) and will combine data from emission inventories with observations derived from ground-based instruments.

POTENTIAL APPLICATIONS



Public Health



Smart Cities



Agritech Agriculture



Renewable Energy



Transport Logistics



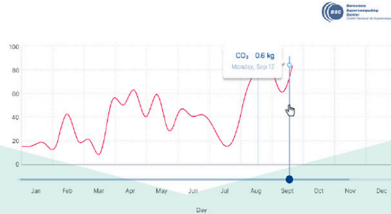
Public Administration

Development of a greenhouse gas (CO₂ and CH₄) emissions monitoring system

Pillar 1: Georeferenced Official GHG Emission Maps



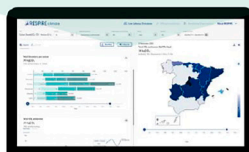
Pillar 2: Low-Latency GHG Emissions Monitoring System



Pillar 3: National GHG Observational Monitoring Network



Pillar 4: Web Application



Fine-grained air quality modeling based on real traffic monitoring

Moving towards the digital transition of the mobility sector by putting in place the necessary sensing and computing infrastructure and intelligence, cities can obtain real-time traffic information which cannot be captured through simulated traffic models. The digitalization of mobility must leverage disruptive ICT technologies, such as Internet of the Things (IoT), big data analytics and Artificial Intelligence (AI).

AIR-URBAN project proposes a **methodology to enhance air quality monitoring and forecasting by incorporating observations from real time traffic data**. This is achieved by implementing the following key steps:

- extract traffic data (i.e., types of vehicles, and their speed and acceleration) and traffic events (e.g., congestion) from video sources,
- include the traffic data into a model for the estimation of vehicular emissions,
- feed the estimated emissions into a model for AQ forecasting, thus obtaining more accurate values,
- develop AI methods for a more fine-grained AQ estimation.



POTENTIAL APPLICATIONS



Air Quality
Forecast



Citizens
Healthcare



Public
Administration



Smart Cities



Transport Logistics

Giving universal access to medical decision support

Aloe Vera, a cutting-edge AI healthcare solution, comprehends medical images and text to provide precise responses. It supports practitioners in diagnosis and treatment planning while offering accessible health insights to individuals, showcasing its versatile capabilities in medical query handling.



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POTENTIAL APPLICATIONS



Medical Universal
Access



Citizens Healthcare

Aloe Vera in action

Is this lung healthy?



No, the lung is not healthy, there is a nodule here...

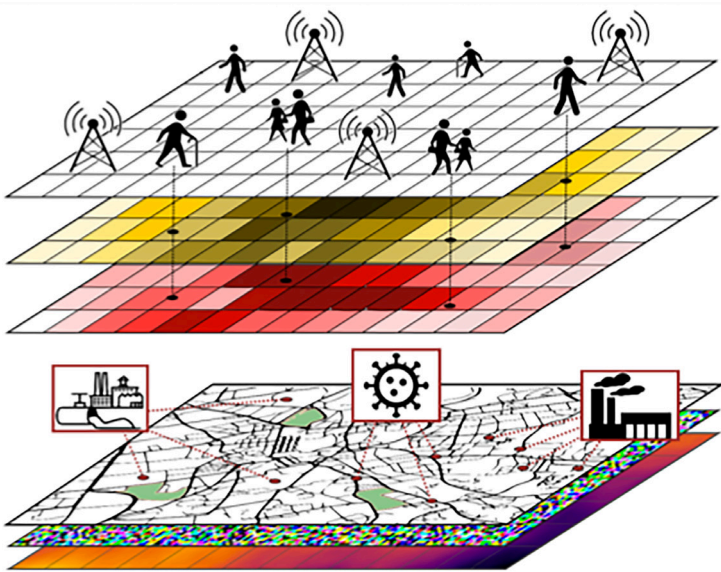


TRY
IT
HERE



Precision medicine for healthy cities

MePreCiSa provides innovative urban health management with a cloud-based platform, a flexible and scalable solution for the integrated analysis and management of Health issues in cities. It integrates epidemic simulation for real-time scenario assessment and decision-making, emphasizing environmental risk factors' impact on well-being. This scalable solution represents a significant leap in proactive public health management for cities.



POTENTIAL APPLICATIONS

-  Sustainable Cities
-  Healthcare Tech
-  Public Administrations
-  Software Platform

Smart City Software Architecture Framework for smart and safe mobility

Smart City Software Architecture Framework is a robust solution for developing and orchestrating AI-enabled cloud-native applications across the edge-to-cloud spectrum. Integrated with 5G network services, it ensures rapid, reliable connectivity for diverse applications, emphasizing real-time components with low response time guarantees. Ideal for complex workflows, it finds applications in domains such as smarter and safer mobility and real-time air quality monitoring, shaping the future of intelligent urban living.



POTENTIAL APPLICATIONS



Smart City



Artificial Intelligence



Software Architecture Framework



Edge Cloud Tech for Air Quality



5G



Smart Mobility






Collecting, combining, and displaying information in a user-friendly way to respond to urgent urban needs

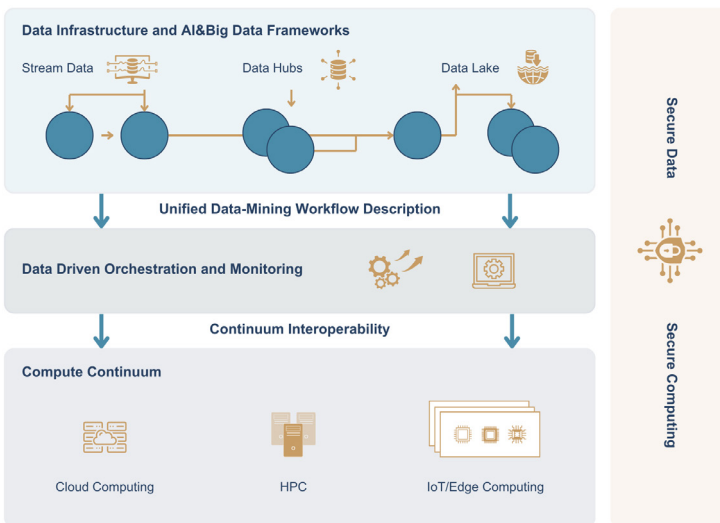
Data has become one of the most valuable assets driving the digital transformation. Current data mining solutions are optimized to deal with specific data requirements but fail to cope as the data characteristics become extreme.

EXTRACT and Ascender projects deliver a **data-driven open-source software** platform which improves the complete lifecycle of extreme data mining workflows. This data-driven **open-source platform integrates cloud, edge and HPC technologies for trustworthy, accurate, fair and green data mining workflows** for high-quality actionable knowledge. It transforms data mining across the compute continuum by **simplifying complex workflows and ensuring efficient, secure data processing.**



POTENTIAL APPLICATIONS

-  Data-mining Software Platform
-  Digital Twins
-  Workflows Across Edge, Cloud and HPC Tech
-  AI Platform
-  5G

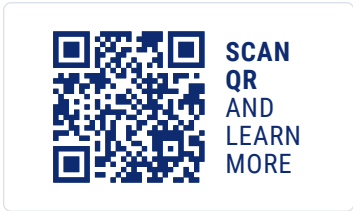


A human-centric platform for urban digital twins

The share of the world's population living in cities is expected to rise to 70% by 2050. The need for innovative solutions that can support this growth, in a fair and sustainable way, has never been greater.

vCity is an adaptable, data-driven platform to help assess the impact of new interventions on all aspects of city life. This is possible thanks to urban digital twins: virtual replicas of real cities, that optimise data to map the invisible connections between factors such as air quality, public services, or energy efficiency. They allow us to simulate the ripple effect of urban policies over time, making big changes simple for everyone to understand.

vCity aims to facilitate informed policy decisions, and help the public understand the reasons behind them.



POTENTIAL APPLICATIONS



Digital Twins



Smart Cities



Public Administration

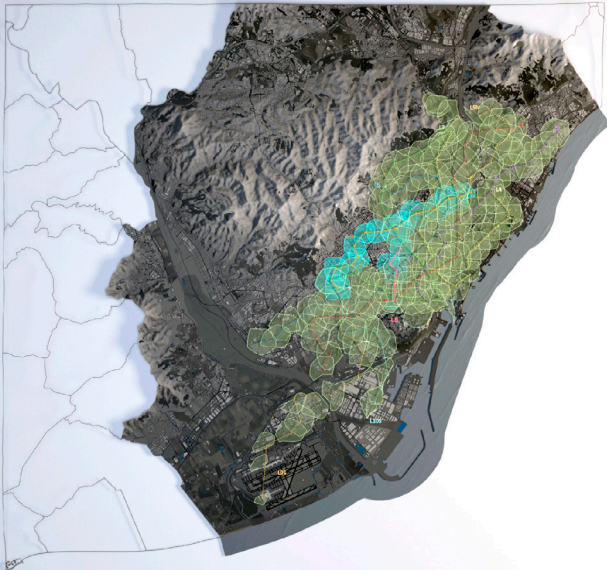


Urban Planning



Sustainability

Metro network coverage (L8, L9)



Proximity | Barcelona

A platform for Programming, Orchestration and execution of real-time data analytics for smart and clean mobility

The radical transformation of transport systems so they provide **sustainable, clean, safe and integrated mobility** is a major policy goal at national and European level. Furthermore, the **transport sector has a significant environmental footprint**, accounting for 23% of CO2 emissions in the EU and more than a fifth of greenhouse gases, ultimately affecting air quality with a direct impact on our health.

The PROXIMITY project will provide a **software framework for the development, deployment and execution of innovative data analytics applications** over a unified, integrated and multi-tenant computation and **5G-enabled communication ecosystem**.

PROXIMITY considers a **smart city application for intelligent and safe mobility**.



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POTENTIAL APPLICATIONS



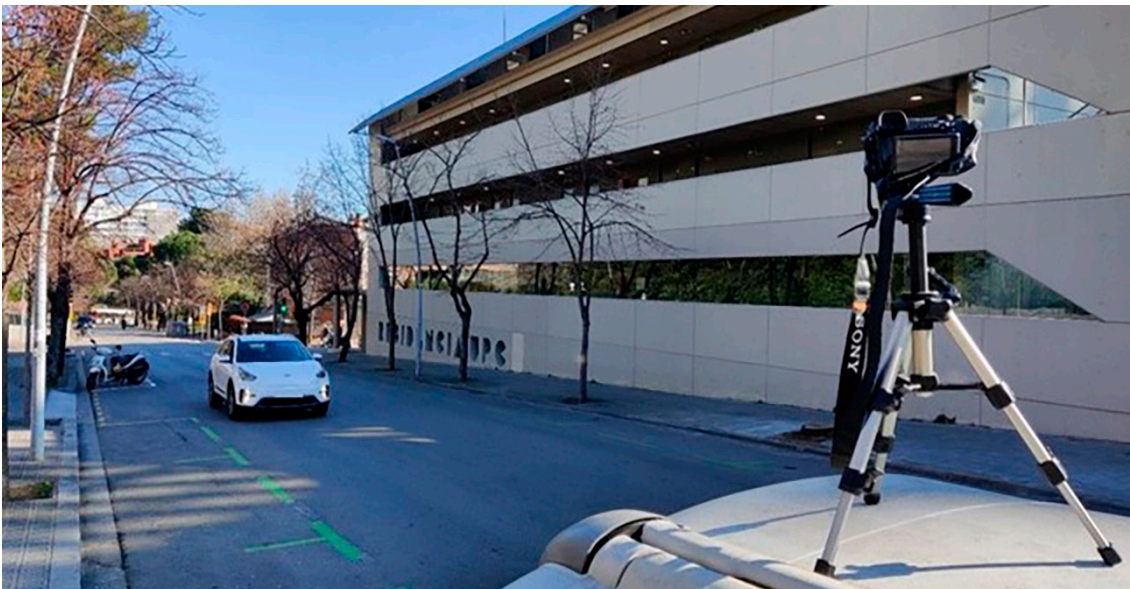
Software Development



5G



Workflows Across
Edge, Cloud and
HPC Tech



Designing large simulation workflows with integrated analysis and visualization

Horus, an innovative multi-platform GUI, empowers scientists in molecular modeling. With cutting-edge technology, it serves as a local app or centralized server, enhancing collaborative teamwork. Featuring an integrated 2D infinite canvas, Horus excels as a modular workflow designer across environments. Autonomous blocks allow seamless linking, enabling customizable workflows via an accessible API. As a desktop app, it facilitates workflow design, result visualization, and offers an extensive API for custom flows, blocks, and visualizations. Targeting pharmaceutical, biotechnology, and AI industries, Horus heralds a new era of efficiency and adaptability in scientific pursuits.



POTENTIAL APPLICATIONS



Large Simulation Workflows



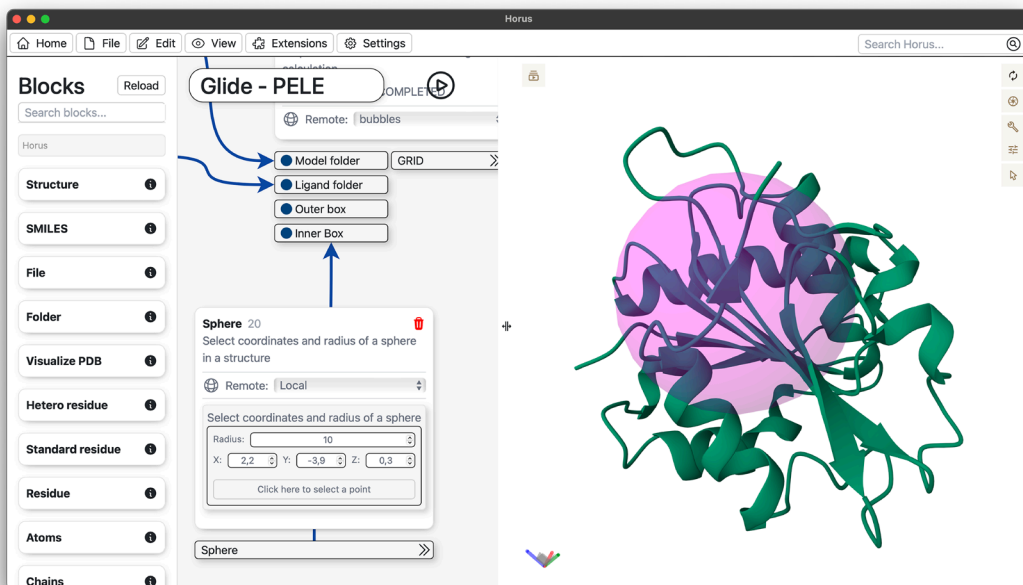
Pharmaceutical and Biotechnology Research



Research Centers

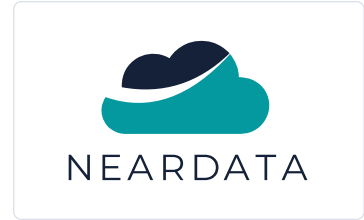


AI Platform



AI-Optimized Serverless Deployment Environment

ASDE provides a framework for optimizing omics workload deployment in serverless environments. Enhanced by an AI engine, it continuously monitors deployment telemetry, refining future deployments. This technology streamlines automated, flexible foundational infrastructure deployment through AI and real-time telemetry, ensuring optimal performance for similar workloads.



POTENTIAL APPLICATIONS



Artificial Intelligence



Cloud Providers



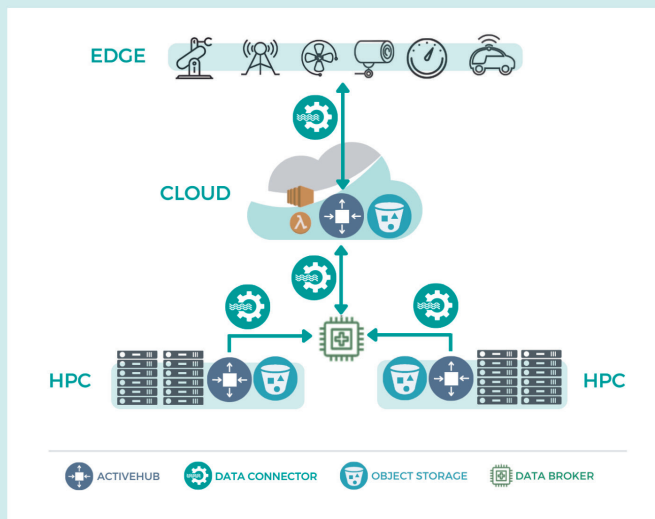
5G



Data connector



AI Platform



Pioneering Europe’s All-RISC-V Cloud Server Infrastructure

RISER is set to revolutionize Europe’s cloud ecosystem by developing the first fully European RISC-V cloud server infrastructure. This initiative focuses on validating cloud-centric platforms built on open standards—particularly RISC-V—and open-source system software, ensuring seamless integration with standardized management and monitoring frameworks.

BSC plays a key role in deploying RISER technology, spearheading use case development and performance evaluation across three critical domains:

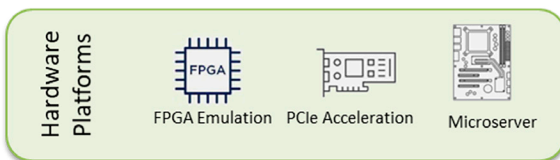
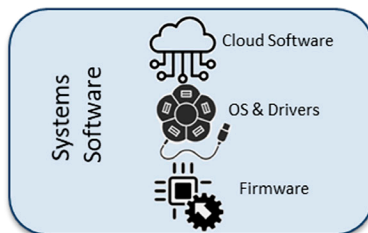
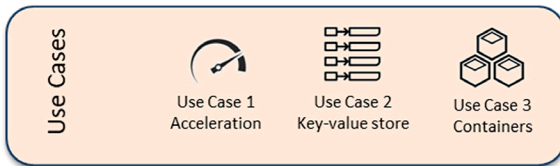
- Accelerating memory-intensive cloud workloads
- Optimizing networked object storage
- Enhancing containerized execution environments

Evaluation strategies include micro-benchmarks and industry-standard cloud benchmarking suites to ensure real-world applicability. In particular, BSC leads the accelerator use case, leveraging advanced offloading techniques to optimize memory-intensive tasks such as data compression, media processing, analytics, and AI model training/inference. By utilizing OpenMP 5.0’s hierarchical parallelism and multi-device accelerator support, RISER efficiently distributes workloads across multiple PCIe cards, unlocking new levels of performance and efficiency for European cloud infrastructure.



POTENTIAL APPLICATIONS

- Cloud Computing
- Cloud Providers
- Multicore Chip Design
- High Performance Computing



Neuromorphic energy-efficient secure accelerators

NEUROPULS aims to revolutionize the processing of massive data streams in self-driving vehicles, IoT devices, and Industry 4.0 applications. NEUROPULS aims to build low-power, secure edge computing systems by developing novel photonic computing architectures and security layers based on photonic physical unclonable functions in augmented silicon photonics platforms compatible with CMOS technology.

By developing novel technological, hardware and simulation platforms, NEUROPULS aims to create next-generation neuromorphic accelerators featuring RISC-V compliant interfaces for easier system compatibility.



POTENTIAL APPLICATIONS



Multicore Chip Design



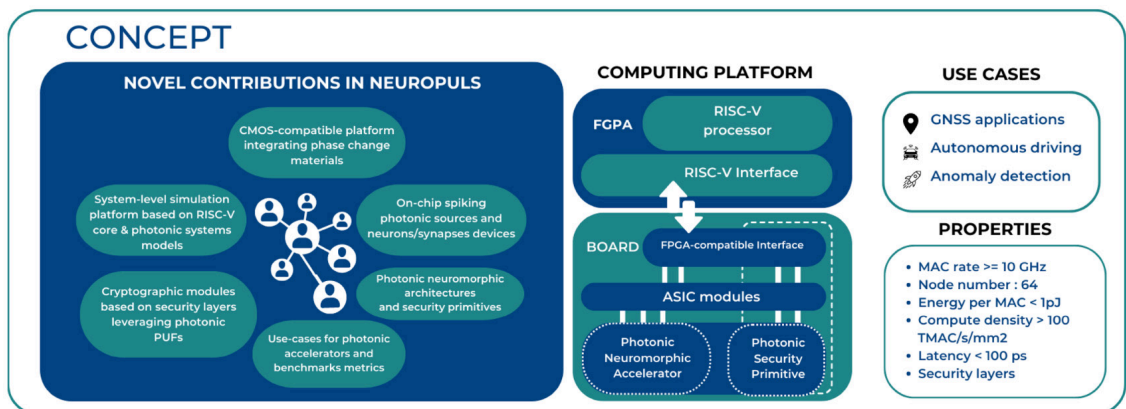
Internet of Things



Industry 4.0



Autonomous Cars



Technology applicable to industry

SMARTY project is supported by large European industry players and well as by 10 SMEs. SMARTY's major suppliers and Original Equipment Manufacturers (OEMs) and reputable academic partners provide a great opportunity for these 10 SMEs to mature their technologies in a challenging but safe environment.

Its technology will be matured within the lifetime of the project and tested through five use cases: automotive, financial technologies, telecom and industrial settings.

SMARTY's results are applicable to different vertical sectors and can be transported to different use cases. Strong synergies with existing efforts in the area of edge computing, European processors and trustworthy AI are envisioned and planned within this initiative.



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POTENTIAL APPLICATIONS



Cloud Software
Services



Autonomous Cars



Financial Technologies



Telecom



Industry 4.0



Artificial Intelligence

RISC-V hardware-software stack for cloud services

Vitamin-V will deploy a complete RISC-V hardware-software stack for cloud services based on cutting-edge cloud open-source technologies for RISC-V cores.

Vitamin-V incorporates an innovative RISC-V virtual execution environment providing hardware emulation, simulation, and FPGA prototyping to enable software development, verification, and validation before actual hardware is released.

Current RISC-V hardware is energy-efficient. Vitamin-V will enable a RISC-V edge ecosystem and bring technological sovereignty to the cloud-edge continuum while reducing total cost ownership.



POTENTIAL APPLICATIONS



Multicore Chip Design



Cloud Environment



Big Data Users



AI Users



Supply Chain Management



A swarm computing platform for programming hyper-distributed applications

COLMENA project advances next-generation computing and data technologies by offering a framework that simplifies the programming, deployment, and maintenance of hyper-distributed applications across the Compute Continuum (device-Edge-Cloud). The project provides a role-based programming model that leverages the cooperation of autonomous agents to ensure the system's Quality of Service (QoS). COLMENA offers a middle-ware that establishes a platform over the Compute Continuum, where devices function as autonomous agents.



POTENTIAL APPLICATIONS



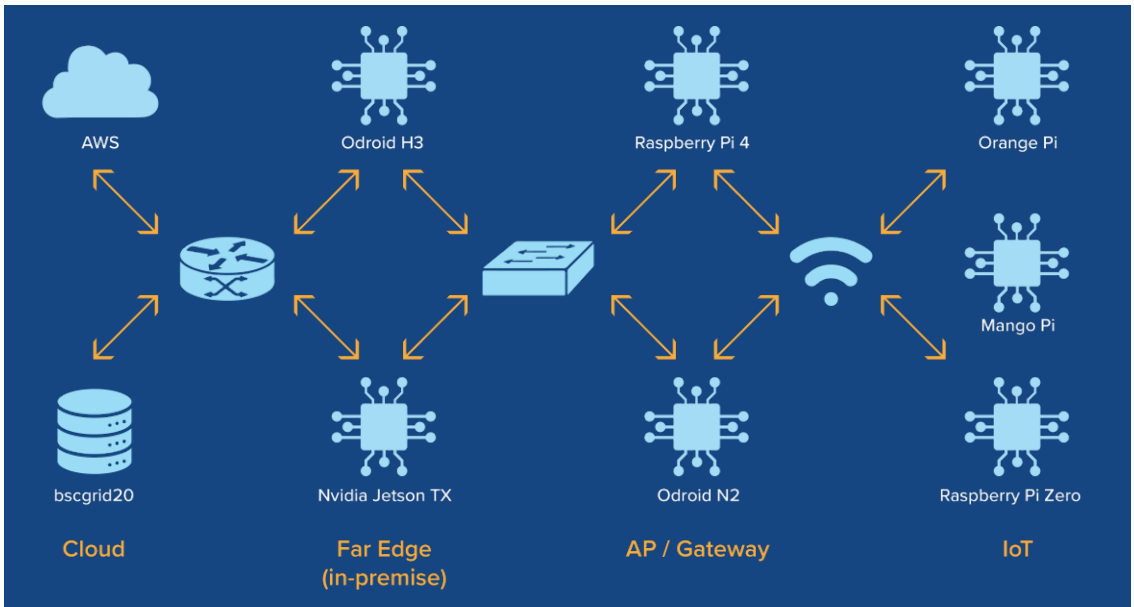
Edge Computing



High Performance Computing



Internet of Things



A new smart changing the whole ecosystem of automotive industry

ISOLDE will have high performance RISC-V processing systems and platforms for the vast majority of building blocks, demonstrated for key European application domains such as automotive, space and IoT with the expectation that two years after completion ISOLDE's high performance components will be used in industrial quality products.

BSC enhances, integrates and matures two components providing observability and controllability capabilities, as needed for verification, validation and safety measure realization. In particular, BSC contributes with the SafeSU statistics unit and the SafeTI traffic injector. Both are being extended with additional capabilities to monitor components and inject traffic even in a different System-on-Chip (SoC). They will be integrated as part of a Safety Island to interact with high-performance chips, and will undergo a strict validation process including appropriate safety manuals. Both BSC components, the SafeSU and SafeTI, are specifically integrated in RISC-V SoCs and will be released with open source permissive licenses to ease their adoption and the development of European safety-relevant RISC-V SoCs with high-performance capabilities.



POTENTIAL APPLICATIONS



Autonomous Cars



Space



Internet of Things



and



A NEW SMART CHANGING THE WHOLE ECOSYSTEM OF THE AUTOMOTIVE INDUSTRY



Perceiving a 3D world from a 3D silicon architecture

NimbleAI will design a 3D integrated sensing-processing neuromorphic chip to deliver performance and efficiency gains compared to CPU/GPUs processing frame-based video, and unlock more advanced AI and computer vision algorithms and applications.

The neuromorphic chip will mimics the efficient way our eyes and brains capture and process visual information. NimbleAI also advances towards new vision modalities not present in humans, such as insect-inspired light-field vision, for instantaneous 3D perception.

BSC is in charge of integrating and tailoring a multicore interference-aware statistics unit (SafeSU) to provide observability and controllability means for real-time performance, as well as developing and integrating a tiny controller (TinyCo) orchestrating data delivery and optimizing the processing in the NimbleAI 3D SoC.



POTENTIAL APPLICATIONS



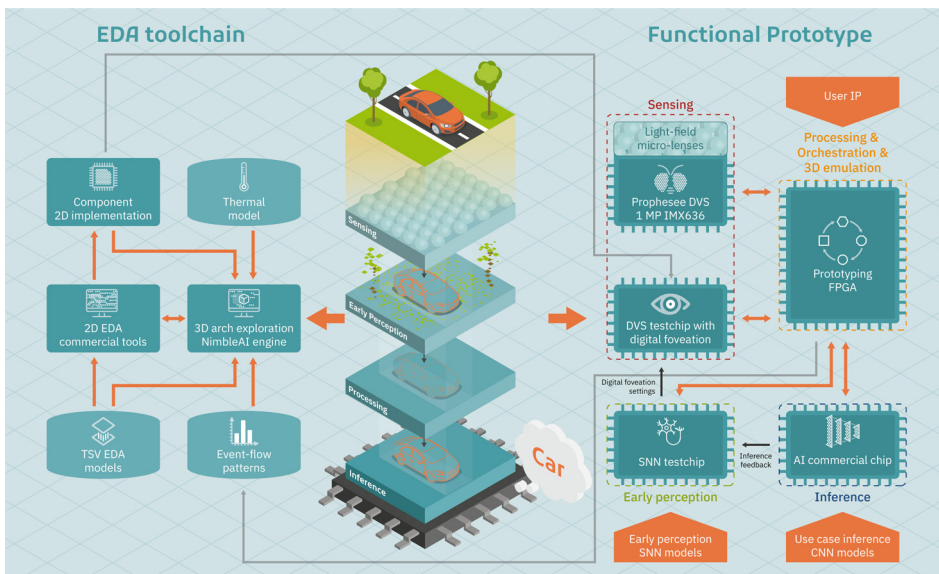
Software Providers



Multicore Chip Design



Industry 4.0



Towards fully autonomous driving

RADLER research will be performed gradually focusing first on the implementation of a functional, hardware demonstrator of the platform on an FPGA, as well as its baseline software stack.

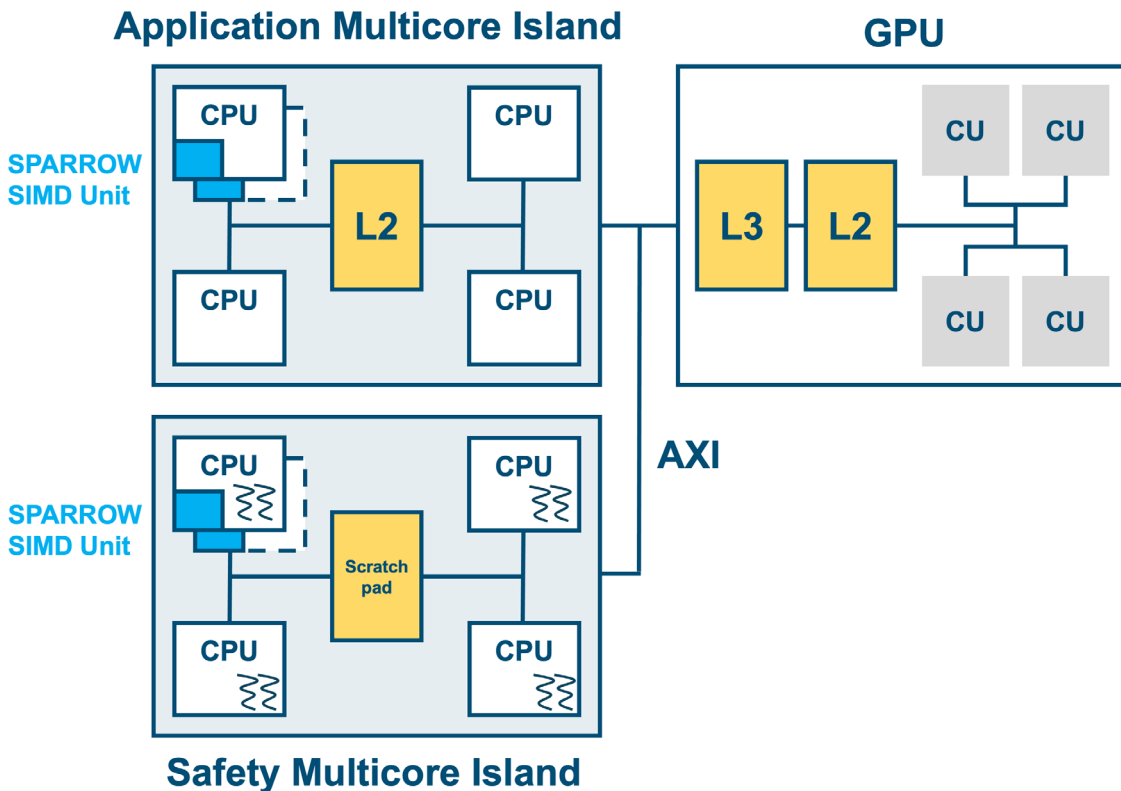
Once the best configuration of the hardware platform is found, the software stack will be optimized and an autonomous driving use case will be showcased. Finally, the tape out of the designed autonomous driving architecture will be performed.



POTENTIAL APPLICATIONS



Autonomous Cars





02

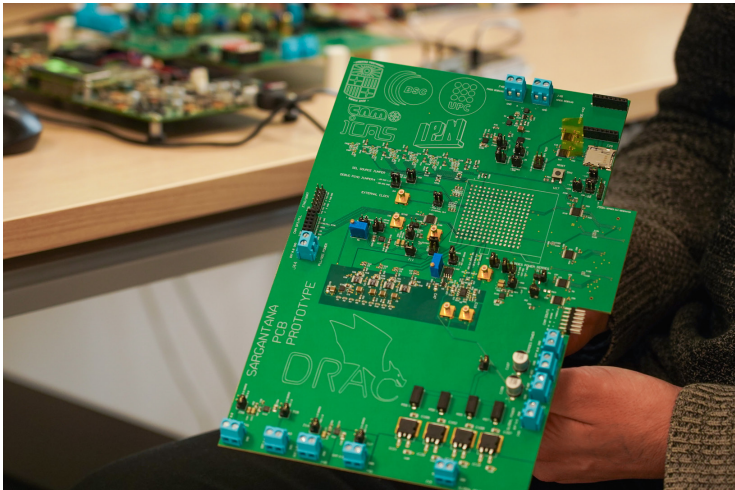
**BSC-CNS
Technologies**

Sargantana, the new generation of the first open-source chips designed in Spain

Sargantana constitutes the third generation of Lagarto processors, the first open-source chips developed in Spain, and is one of the most academically advanced open-source chips in Europe.

The new Sargantana presents better performance than its two predecessors and is the first processor in the Lagarto family to break the gigahertz barrier in working frequency.







This Linux-capable RISC-V core can be of interest for Chip design companies. The Sargantana design is suitable for IoT and edge devices, including microcontrollers for real time applications.



TRL



POTENTIAL APPLICATIONS

-  Autonomous Vehicles
-  Internet of Things
-  Space
-  Computer Architecture
-  Telecom & Mobile Comms
-  High Performance Computing

Software only SmartAI Diverse Redundancy

BSC's Safexplain technology enables the execution of AI models redundantly and with diversity to mitigate the likelihood of a single fault, whether it is a random hardware fault or an AI model misprediction, to cause a failure.

This solution enables the safe use of AI software in the most safety-critical systems by building a library implementing this software feature transparently for the user and specializing the library for different target platforms. This is particularly for autonomous driving and unmanned vehicles.

Safexplain uniquely certifies solutions addressing explainability, supervision, traceability, and real-time compliance, ensuring safe AI integration in automotive, space and railway systems.



Safe and Explainable
Critical Embedded Systems based on AI



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POTENTIAL APPLICATIONS



Railway



Autonomous Cars



Internet of Things



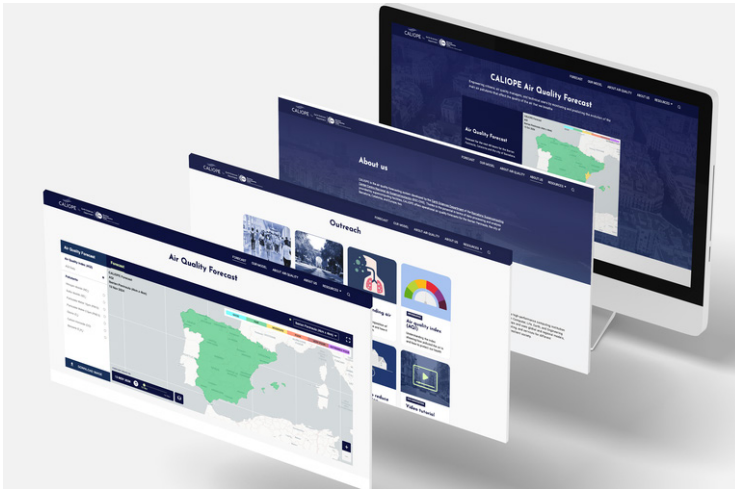
Space



Revolutionizing Real-Time Air Quality Monitoring from Region to Street Level

CALIOPE and CALIOPE-urban projects are tools to monitor and accurately predict in real-time the Air Quality Index (AQI) and various pollutants from a regional to a street-to-street level. Through an intuitive and powerful dashboard, users can effortlessly and friendly navigate, explore and interpret complex and crucial air quality data, track AQI trends, and gain valuable insights into the factors influencing air quality. More experienced and technical users can also access more advanced features to explore emissions, meteorology and evaluation of the model.

CALIOPE and CALIOPE-urban are essential tools for public administration with air quality management responsibilities, which can be used to implement mitigating measures and warn of adverse air quality situations.



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POTENTIAL APPLICATIONS



Air Quality Forecast



Public Administration



Public Health



Smart Cities

Innovating the future of Dust Management

An interactive visualization tool that includes comprehensive and invaluable resources for dust research in Northern Africa, the Middle East, and European regions. It integrates forecasts, observational data, probability maps, warning advisory systems, and evaluation mechanisms. This tool equips researchers, policymakers, and stakeholders with the insights needed to understand, prepare for and respond to dust events effectively. Its versatility and reliability make it a cornerstone in advancing the understanding of regional dust dynamics and their implications.



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Daily Dust Forecast

Forecast for the next 72 hours for Northern Africa, Middle East and Europe

[EXPLORE FORECAST](#)

Updated 08:15 UTC on Thu 19 Dec 2024

Dust Products

The WMO Barcelona Dust Regional Center offers a wide range of dust products that serve the need for detailed dust information on a regional scale.

[EXPLORE ALL](#)

Daily Dust Products

Dust forecasts and dust-related observational products

[EXPLORE PRODUCT](#)

Dust Products Catalogue

Inventory of available dust observational and modelling products

[EXPLORE PRODUCT](#)

Data Download

Access and download the numerical data of dust forecasts

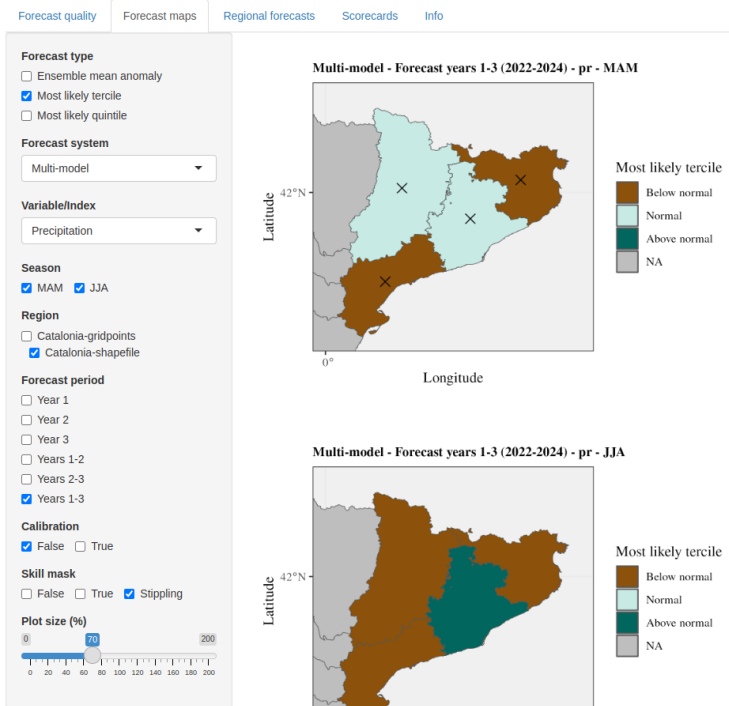
[EXPLORE PRODUCT](#)

POTENTIAL APPLICATIONS

- Air Quality Forecast
- Public Health
- Smart Cities
- Agritech Agriculture
- Renewable Energy
- Transport Logistics

Strategic Forecasting for Sustainable Growth

The Multi-annual climate prediction app is an interactive website that includes annual and multi-annual forecasts of climate variables and drought indicators several years in advance for a concrete region worldwide. It provides maps and time series of regional averages and displays the forecast quality so it can be used to inform stakeholders about the trustworthiness of the forecasts for each specific region, forecast period, and variable or indicator.



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POTENTIAL APPLICATIONS

- Software Engineering
- Agritech Agriculture
- Energy
- Public Health
- Public Administration

Digital Twins transforming Earth and Ocean

The Earth's digital twin is designed to revolutionize the modeling, monitoring, and simulation of natural phenomena, hazards, and associated human activities, achieving unprecedented levels of accuracy, granularity, responsiveness, and interactivity. Similarly, the ocean's digital twin will enable targeted applications and scenario-based simulations, supporting sustainable and informed management of marine environments.



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POTENTIAL APPLICATIONS

-  Air Quality Forecast
-  Public Administration
-  Sustainability
-  Public Health
-  Digital Twins

Simplifying Complex Workflows

Autosubmit is a Python-based workflow management tool designed to simplify the creation, management, and monitoring of complex, multi-step tasks. Its user-friendly web application, built with ReactJS, connects seamlessly to the Autosubmit API, serving as a middleware to facilitate efficient data exchange. With Autosubmit, users can easily visualize, track, and analyze workflows in real time, providing detailed insights that streamline operations and improve decision-making.



POTENTIAL APPLICATIONS

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Manufacturing



Transport Logistics



Fintech



Pharmacology



Audiovisual Sector

The screenshot displays the Autosubmit web application interface. At the top, there is a navigation bar with a logo, 'HOME', and 'ABOUT' links. Below this, the breadcrumb trail shows 'Experiment a748 > Graph View'. The main area features a search bar for filtering jobs, with 'Filter' and 'Clear' buttons. A 'START MONITOR' button and a refresh icon are also present. The workflow graph shows a hierarchical structure of jobs, with the root job 'a748_LOCAL_SETUP' branching into several sub-jobs. The job 'a748_20240418_000_1_SIM' is highlighted in green, indicating it is the current job being viewed. On the right side, a detailed panel for this job is shown, including its name, member ID (000), chunk (1), platform (meluxina), QoS (default), and remote ID (853538). It also displays the number of processors (260), wallclock time (04:00), queue time (00:00:05), and run time (00:27:47). The status is 'RUNNING'. The panel also shows dependencies (CHILDREN: 1, PARENTS: 3) and options for copying output (OUT) and error (ERR) files. The submit and start times are listed as 2024-04-19 15:06:32 and 2024-04-19 15:06:37, respectively. A 'Job History' link and a 'Change status' action button are also visible.

Optimizing Risk Management with Disease Forecasting

El Niño Driven Disease Forecasting (ENDCast) is an advanced web application and framework designed to provide early warnings of infectious disease outbreaks influenced by the El Niño Southern Oscillation. Developed in collaboration with international climate and health organizations, ENDCast communicates the likelihood of disease outbreaks over the next six months, empowering companies and public health stakeholders to make informed decisions at local, national, and regional levels. The initial prototype delivers monthly forecasts for dengue, malaria, and leptospirosis outbreaks in key hotspots during the 2023/24 El Niño event.



POTENTIAL APPLICATIONS



Public Administration



Public Health



Pharmacology

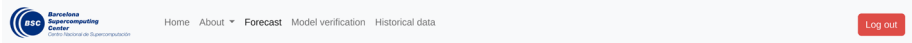


Insurance



Test

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Select disease:

Dengue

Threshold:

75th percentile

95th percentile

Target month:

Jul 2024

Aug 2024

Sep 2024

Oct 2024

Nov 2024

Dec 2024

Select color palette:

Traffic light

Colorblind friendly

Greyscale

Select forecast period:

Jun 2024 (valid for Jul 2024 - Dec 2024)

Display absolute threshold values

National Local

This spatial map shows the outbreak risk level for the forecast month over Colombia.

You can manually change the forecast month of interest in the options on the left. This enables users to track how the outbreak risk level changes over time and space.

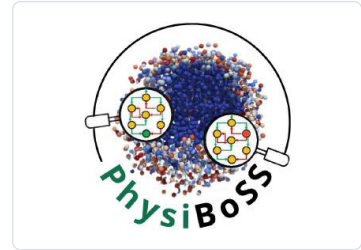
The risk levels are assigned as followed:

Color	Category	Outbreak probability
Green	Low	[0, 23)%
Yellow	Medium	[23, 40)%
Orange	High	[40, 70)%
Red	Very High	[70, 100)%

Physics-Based Simulations for Biological Systems and Soft Matter

PhySiBoSS is a physics-based simulation framework developed for the study of biological systems and soft matter. Leveraging high-performance computing resources, it enables the detailed simulation of molecular interactions, protein folding, and material behavior across multiple scales. With PhySiBoSS, users can efficiently model and analyze complex systems, gaining valuable insights into biological processes and material properties.

The platform provides a robust computational environment for researchers, facilitating rapid experimentation and discovery in fields such as drug design and biotechnology.



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POTENTIAL APPLICATIONS



Pharmacology



Biotech



Material Science

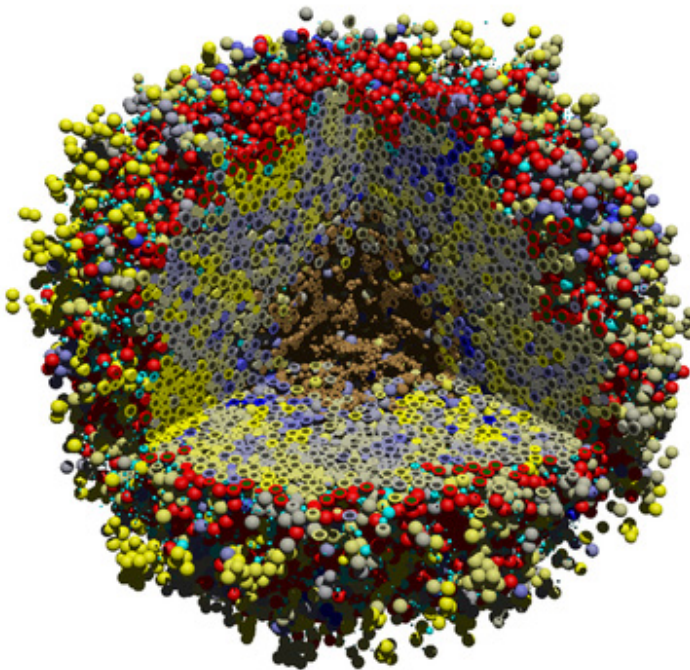


Chemistry

Advanced Simulation Platform for Multicellular Systems and Tissue Dynamics

Many multicellular systems problems can only be understood by studying how cells move, grow, divide, interact, and die. Tissue-scale dynamics emerge from systems of many interacting cells as they respond to and influence their microenvironment. The ideal “virtual laboratory” for such multicellular systems simulates both the biochemical microenvironment (the “stage”) and many mechanically and biochemically interacting cells (the “players” upon the stage). PhysiCell was developed to fill this role as a virtual laboratory.

Over time, PhysiCell has grown from a C++ framework to a software ecosystem and scientific community.



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POTENTIAL APPLICATIONS



Pharmacology



Regenerative Medicine



Tissue Engineering



Biomedical/Scientific Research

AI for Stroke Risk Prediction

Stroke is a leading global cause of death and disability, with treatment costs expected to reach €86 billion by 2040. Early detection is critical but often overlooked. This AI-driven monitoring service, powered by High-Performance Computing, enhances risk assessment by integrating genomics, physiological, and clinical data. It enables real-time health monitoring for improved prediction and patient follow-up.



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POTENTIAL APPLICATIONS



Public Health



Wearable Devices



Insurance



Artificial Intelligence

Empowering Public AI: Open-Source Text Models for Language Sovereignty and Innovation

BSC-CNS generates open-source text models pre-trained in 35 European languages, boosting technology sovereignty and promoting AI adoption by developers, businesses and public administrations.




We have developed reliable and transparent models such as ALIA-40B or Salamandra (7B, 2B), which are crucial to build a public AI infrastructure that promotes the use of Spanish and the national co-official languages - Catalan and Valencian, Basque and Galician - in the development and deployment of AI worldwide.



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POTENTIAL APPLICATIONS

-  Artificial Inteligence
-  Public Administration
-  Chatbot

Ethical, Inclusive, and Privacy-Focused Speech Models

BSC-CNS works on the development of Speech Technologies to count with voice recognisers, encoders and text-to-speech models in order to make easier the adoption of those technologies.

The speech technologies are developed following accurately the ethical and legal framework, and the training process is based on data protection and privacy principles. BSC-CNS has developed text-to-speech models such as Matxa-TTS which integrates the Catalan dialect diversity, and new speech recognition models based on Whisper architecture that cover different needs of the community.



POTENTIAL APPLICATIONS

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Artificial Intelligence



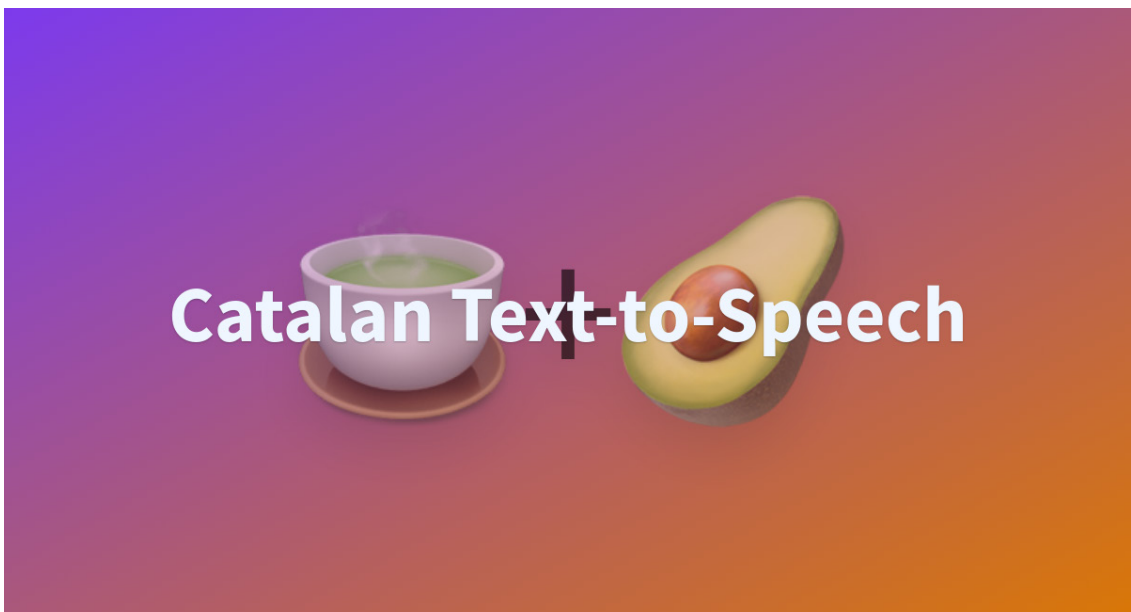
Public Administration



Audio-guide



Audiovisual Sector



High-Quality Machine Translation Across 30 Languages

BSC develops SalamandraTA, a machine translation model that has been continually pre-trained on Salamandra 2B on 70 billion tokens of parallel data in 30 different languages: Catalan, Italian, Portuguese, German, English, Spanish, Euskera, Galician, French, Bulgarian, Czech, Lithuanian, Croatian, Dutch, Romanian, Danish, Greek, Finnish, Hungarian, Slovak, Slovenian, Estonian, Polish, Latvian, Swedish, Maltese, Irish, Aranese, Aragonese, Asturian.

This model is able to perform high quality translations between almost 900 translation directions.



POTENTIAL APPLICATIONS



Artificial Intelligence



Public Administration



Translation Tech



Chatbot

Language Pairs									
Catalan					Spanish				
ca_de	ca_fr	ca_nl	ca-ro		es-de	es-it	es-da		es-el
			ca_da				es-ro		es-bg
ca-pt		ca-es	ca-el	ca_bg	es-pt		es-pl	es-fi	
ca-it	ca-gl		ca-fi	ca-pl	ca-hr	ca-sv	es-hu	es-hr	es-it
		ca-en		ca_cs		es-sk	es-sl		es-et
ca-eu	ca-gi	ca-hu	ca-sk	ca-it	ca-et	es-fr	es-nl	es-sv	es-et
								ca-lv	ca-c



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