



**Barcelona
Supercomputing
Center**
Centro Nacional de Supercomputación

Beyond Innovation: BSC IoT Technologies

Internet of Things

The connection between Internet of Things (IoT) and High Performance Computing (HPC) represents a dynamic fusion of technologies that will revolutionize numerous industrial sectors.

On the one hand, IoT encompasses the interconnectedness of devices and systems enabling data collection and communication. On the other hand, HPC leverages advanced computing techniques to process large amounts of data with speed, accuracy and efficiency. Together IoT and HPC create synergies that unlocks a new era of innovation, efficiency, and connectivity across various industrial domains.

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Real-time critical situation management platform





Crexdata is a generic platform for real-time critical situation management, flexible action planning and agile decision using extreme scale and complex data.

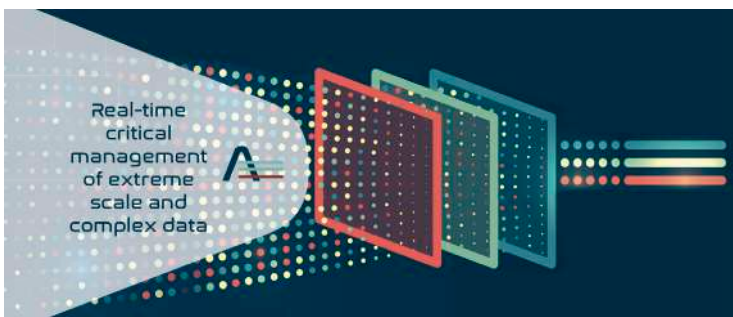
A comprehensive suite of tools designed to enhance crisis management through the use of big data and artificial intelligence. It focuses on the real-time analysis of large-scale data sets to predict crisis scenarios and support decision-making processes.

TARGET INDUSTRIES

- Sector** Key stakeholders in emergency and crisis management, including governmental agencies, public safety organizations, NGOs involved in emergency response, and technology companies specializing in analytics and AI-driven solutions.
- Why** To enhance the efficiency and effectiveness of responses in emergency situations by leveraging advanced computational tools, which set new standards in predictive accuracy and speed, significantly improving decision-making processes during crises.
- Uses** Critical and high-impact areas such as emergency response systems, disaster management, public health surveillance, environmental monitoring and other domains where rapid and accurate data processing is crucial.

TECHNOLOGY

-  Crisis management
-  Artificial Intelligence
-  Machine Learning
-  Public security



Weather emergencies use case	Health crisis use case	Maritime use case
Ingest and fuse extreme data to improve situation awareness that informs decisions in weather emergency scenarios	Integration of epidemiological and multi-scale simulation models with machine learning to support decision-making in health crises	Real-time route forecasting to ensure safer navigational routes

Assisted living solution for elderly people living alone



DOMOBOI provides an assisted living solution for seniors living independently. Through a single measurement point, it observes electrical appliance usage, learns daily routines, and identifies real-time anomalies without active intervention. This advanced technology offers non-intrusive, low-cost monitoring for accident prevention and early detection of chronic diseases, ensuring the well-being of elderly individuals at home.

TARGET INDUSTRIES

Sector Home assistance.

Why Non-intrusive, low cost, low maintenance solution for home monitoring.

TECHNOLOGY



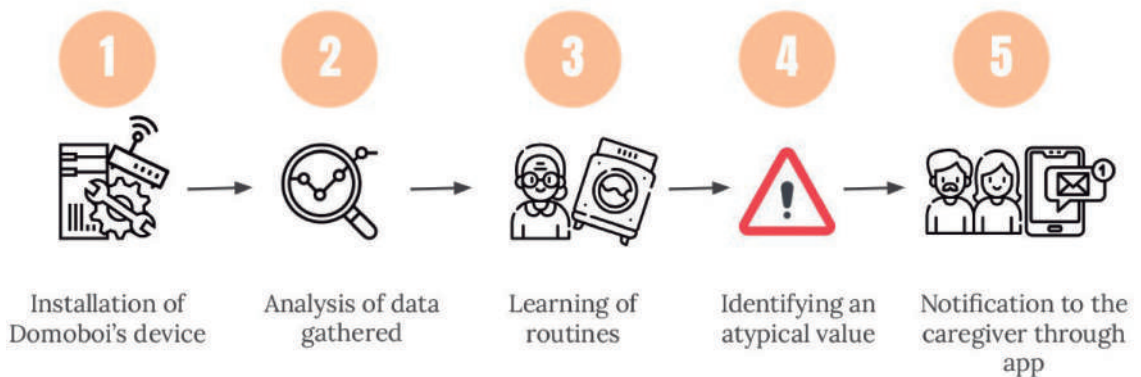
Artificial Intelligence



Medical Assistance



Elderly people



Enhancing Workflow Lifecycle in Distributed Computing Infrastructures

PyCOMPSs and the eFlows4HPC software stack provide tools for developing and managing complex parallel workflows in distributed computing infrastructures. PyCOMPSs simplifies parallel workflow development by annotating Python scripts, auto-converting them into parallel workflows. eFlows4HPC automates deployment on distributed platforms, reducing time-to-market for computing solutions with HPC-ready container images.



TARGET INDUSTRIES

Sector Engineering, bioinformatics, climate forecast, machine learning and software companies.

Why Reduce the development and management time of complex workflows in distributed computing platforms.

Uses Programming parallel complex workflows for distributed computing platforms. Facilitate the development of complex workflows through HPC ready container images.

TECHNOLOGY



Software Stack Provider



Industries Target



Machine Learning



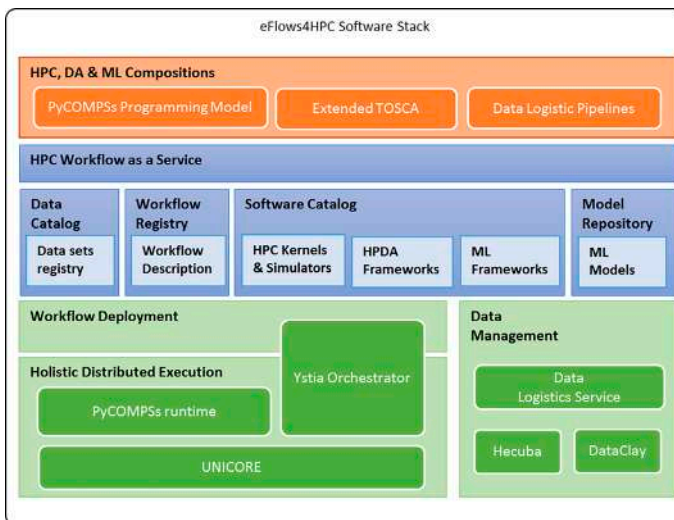
Bioinformatics



Programming



AI Platform



Empowering data-driven decision-making with extreme data mining



A distributed data-mining software platform for extreme data across the compute continuum

The EXTRACT platform delivers seamless data mining workflows across edge, cloud, and high performance computing technologies. It streamlines complex processes, ensuring efficient and secure data processing. Designed for sectors reliant on AI-driven decision-making, such as Industry 4.0 and smart cities, EXTRACT empowers data-driven choices. Real-life testing in Venice will validate its capabilities by providing personalized emergency escape routes, showcasing its practical applications in critical scenarios.

TARGET INDUSTRIES

Sector Industry 4.0, Smart City, Crisis management, Research, Automotive, Healthcare- bioinformatics.

Why The EXTRACT platform offers a scalable, fast, and distributed processing mechanisms capable of efficiently handling massive datasets to accelerate acquisition of actionable knowledge. It reduces costs for developing data mining workflows for extreme data, allows for a 50% faster implementation of data mining workflows, 60% less data transfers, 30% increase in security ML model attack detections and reduces energy use by leveraging edge computing with minimum performance impact.

Uses AI-big data analytics, data mining, Digital twin modelling, Smart mobility, Emergency response - real-time personalized instructions in a crisis, Cybersecurity, Astronomy, High-energy physics, AI-driven decision-making, e.g., bioinformatics.

TECHNOLOGY



Data-mining Software Platform



Digital Twins



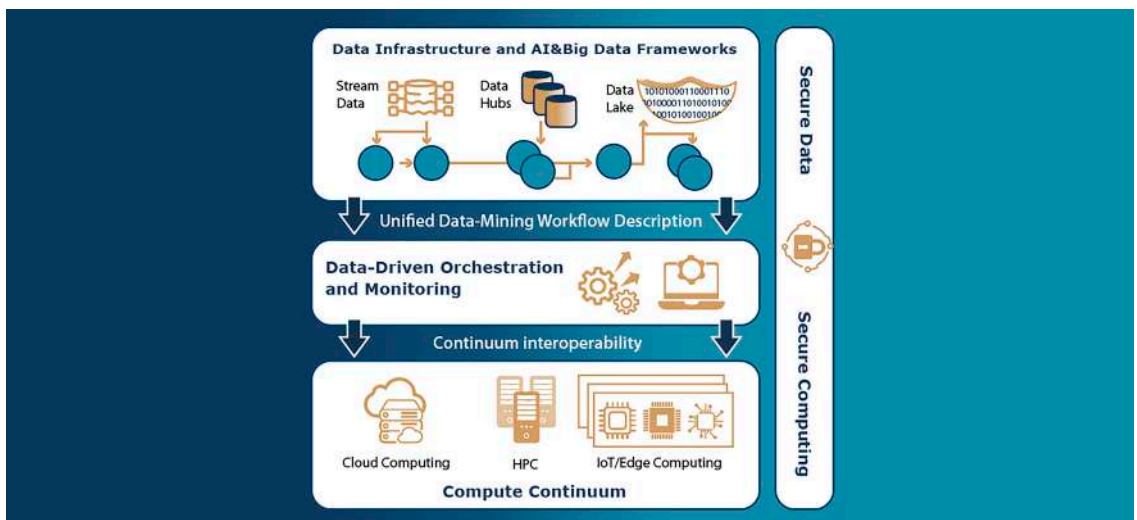
Workflows across edge, cloud and HPC tech



AI Platform



5G



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.

TARGET INDUSTRIES

Sector **Pharmaceutical and Biotechnology Research.**

Why Horus disrupts by revolutionizing drug discovery and biomolecular design processes. It streamlines and enhances collaboration among scientists, expediting research and development.

Uses Hit identification, High throughput virtual screening, Molecular Visualization, Hit to lead optimization, Structure prediction.

Sector **Artificial Intelligence Development.**

Why Horus disrupts AI development by providing a user-friendly GUI and modular workflow design, boosting efficiency in algorithm creation and testing.

Uses Algorithm Prototyping, Model Training, Collaborative AI Development.

Sector **Scientific Research and Collaboration.**

Why Horus disrupts traditional research methods, offering a centralized platform for scientists to collaborate, design workflows, and share insights seamlessly.

Uses Centralized Collaboration, Workflow Customization, Data Integration.

TECHNOLOGY



Large Simulation Workflows



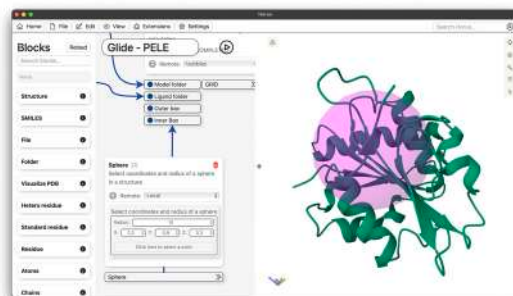
Pharmaceutical and biotechnology research



Scientific Research



Artificial Intelligence Development



Personalized stroke risk assessment using AI and wearables for a healthier society



Stroke, the 2nd leading global cause of death, is often underdiagnosed in women. OneCareAI addresses this by leveraging wearables and AI models developed in HPC environments. Pilot studies with hospitals reveal enhanced predictive accuracy and the discovery of non-trivial data patterns. This breakthrough technology, part of the AI-SPRINT project, utilizes wearables for data collection, making disease prevention accessible to the general population. OneCareAI strives to revolutionize stroke risk prediction, bridging the gap between advanced AI, HPC techniques, and wearable technology for the greater good of public health.

TARGET INDUSTRIES

Sector Digital healthcare.

Why The application of state-of-the-art AI and distributed computing techniques to a widespread technology as wearables devices, thus engaging general population in health monitoring and reducing healthcare system burden.

Uses Telecardiology operators could benefit from an advanced analysis of patient's data to early detect stroke risks.

Hospitals that could integrate it among their portfolio of patients monitoring services.

Wearables manufacturers for the proposition of an added value service on top of the basic fitness functionalities.

Insurance companies that offer the service to the customers and monitor their health to reduce costs.

TECHNOLOGY



Medical Assistance



Stroke Risk Assessment



Citizens Healthcare



Wearable Devices

Enabling the safe use of AI in automotive, space and railway



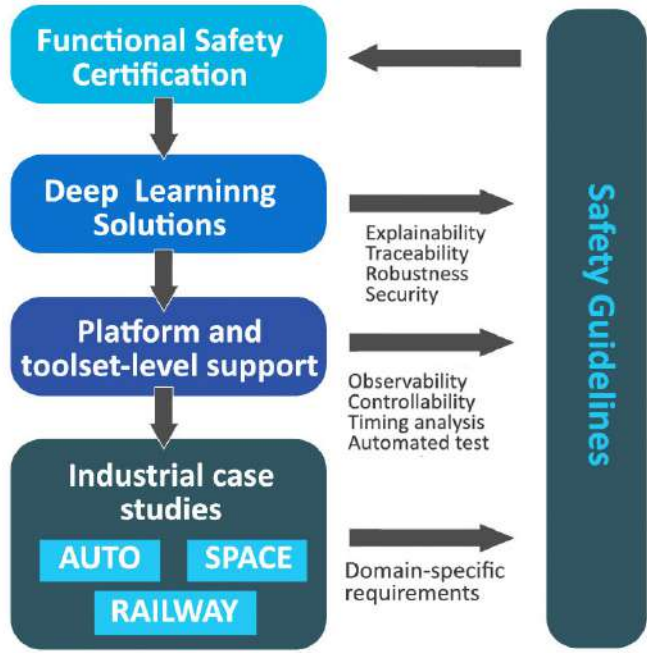
Safexplain ensures safe AI integration in automotive, space, and railway systems. It uniquely certifies solutions, addressing explainability, supervision, traceability, and real-time compliance. Following industrial best practices, it facilitates building safety-critical AI systems for autonomous navigation of cars, space shuttles and trains.

TARGET INDUSTRIES

- Sector** Applications with safety requirements (Automotive, Railway, Space, avionics, Robotics, Industry, health, etc.).
- Why** So far AI-based solutions have only focused on increased quality without ensuring compliance with domain-specific safety standards. SAFEXPLAIN solutions reconcile AI-based solutions with safety-relevant development processes to enable the use of AI in safety-critical applications.
- Uses**
- Autonomous navigation.
 - Safe object detection.
 - Safe classification.

TECHNOLOGY

- Artificial intelligence
- AI integration in automotive
- AI integration in space
- AI integration in railway systems



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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. It also supports porting the complete cross-compiling toolchain, software stack, and essential application libraries for the forthcoming release of the RISC-V processors.



TARGET INDUSTRIES

Sector SME based on hardware and cloud environments, universities, cloud providers, Big Data and AI users.

Why 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 with a special focus on EPI 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. Vitamin-V also contributes to the porting of the complete cross-compiling toolchain, software stack, and essential application libraries for the forthcoming release of the RISC-V EPI processors.

Uses AI and Big Data applications running on RISC-V cloud infrastructure, from traditional cloud to serverless environments. It will as well reinforce European industry leadership across the digital supply chain.

TECHNOLOGY



Hardware



Cloud environment



Big data users

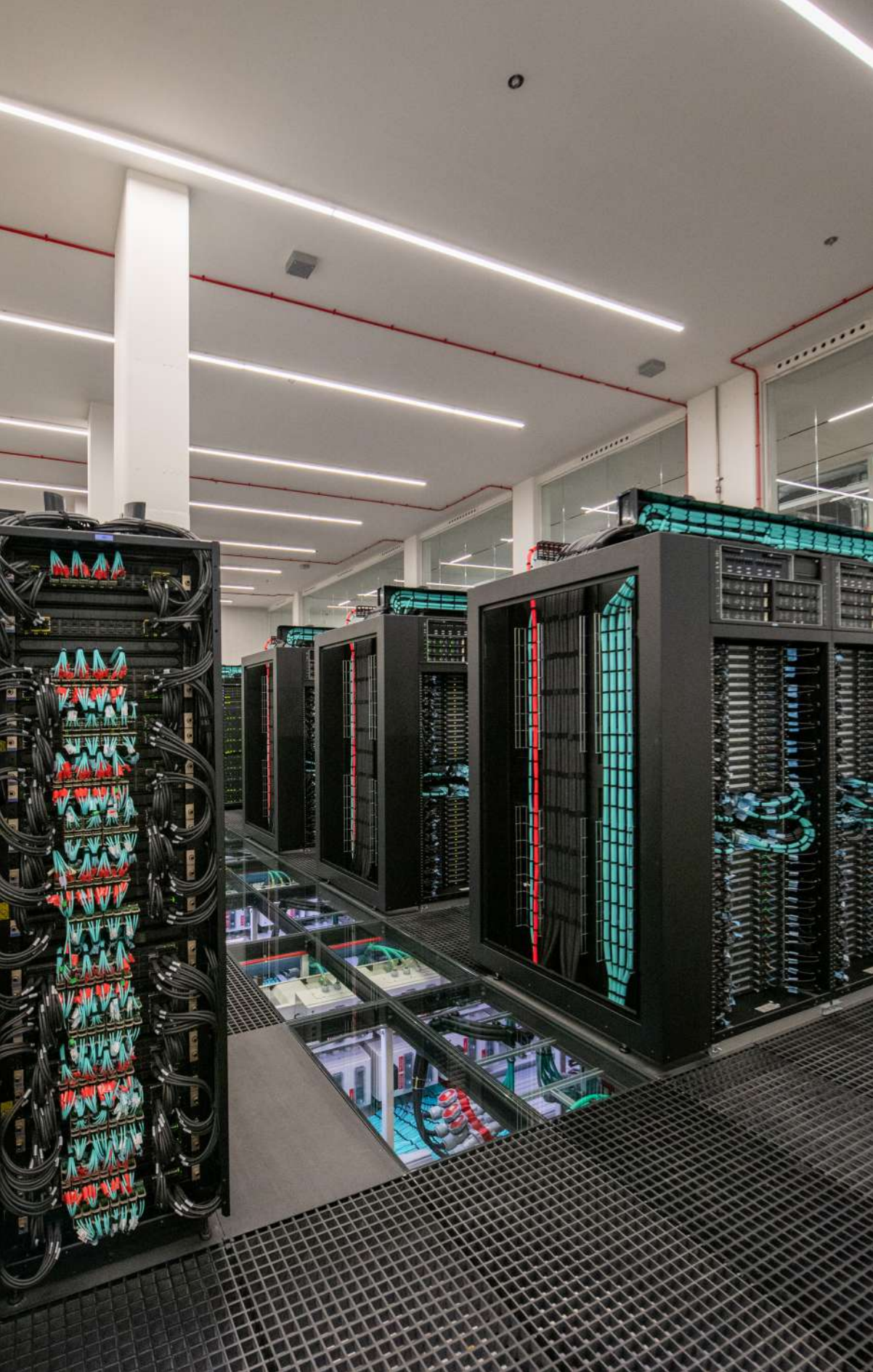


AI users



Supply chain management





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