



PROGRAMME
DE RECHERCHE
NUMÉRIQUE
POUR L'EXASCALE

NumPEX program

ODISSEE Annual Meeting

January, 21st 2026

1. Status of the program

The NumPEX Program

Co-directors: Dr J. Bobin (CEA), Pr M. Krajecki (CNRS), Dr J-Y. Berthou (INRIA)

Project leaders and co-leaders:

Exa-MA - Pr C. Prud'homme, U. de Strasbourg– Hélène Barucq, Inria

Exa-SofT - Pr R. Namyst, Inria/U. de Bordeaux - Alfredo Buttari, IRIT

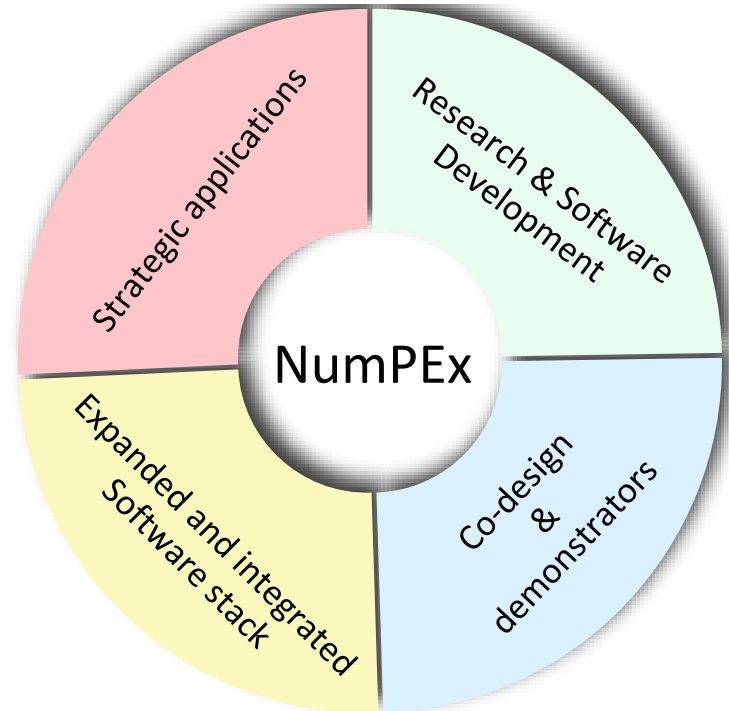
Exa-DoST - Dr G. Antoniu, INRIA - Julien Bigot, CEA

Exa-AtoW - Pr F. Bodin, U. de Rennes - Mark Asch, U. Picardie - Thierry Deutsch, CEA

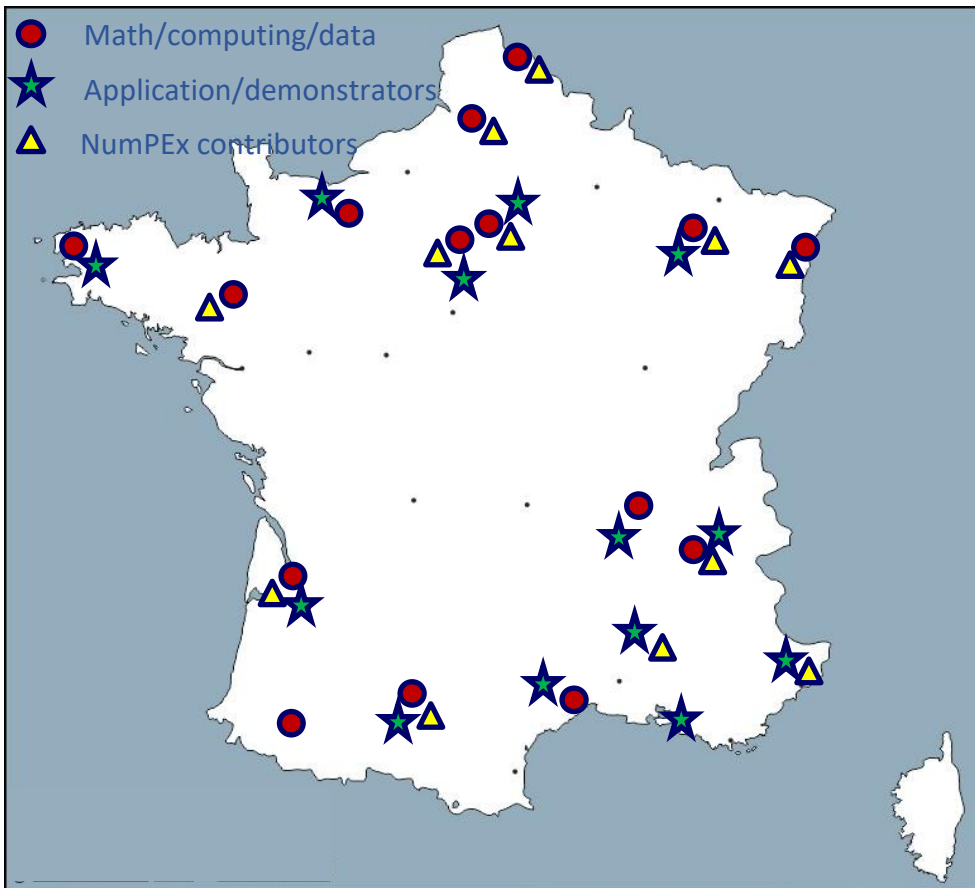
Exa-DI - Dr J-P. Vilotte, DR CNRS - Valérie Brenner, CEA

The French NumPEX Program Objectives

- Contribute and accelerate the emergence of a **European sovereign exascale software stack** and **strategic applications exascale capability** in a **coherent and multi-annual framework**
- Integrate and validate **co-designed** methods, logic collection of libraries, frameworks and software stack with demonstrators of strategic applications.
- Accelerate science-driven and engineering-driven developers **training and software productivity**
- Foster **national and international collaborations** to prepare for the post-Exascale era
- **Help aggregate the French HPC/HPDA/IA community**



NumPEx by numbers



6 Years
41 M€*

2023-2028
* Funding 41M€=500 man.year non permanent staff
+ 170 man.year permanent staff
Total cost : 81 M€

Core national Research Institutions: CNRS, CEA, INRIA, Universities, Engineer schools, Industry

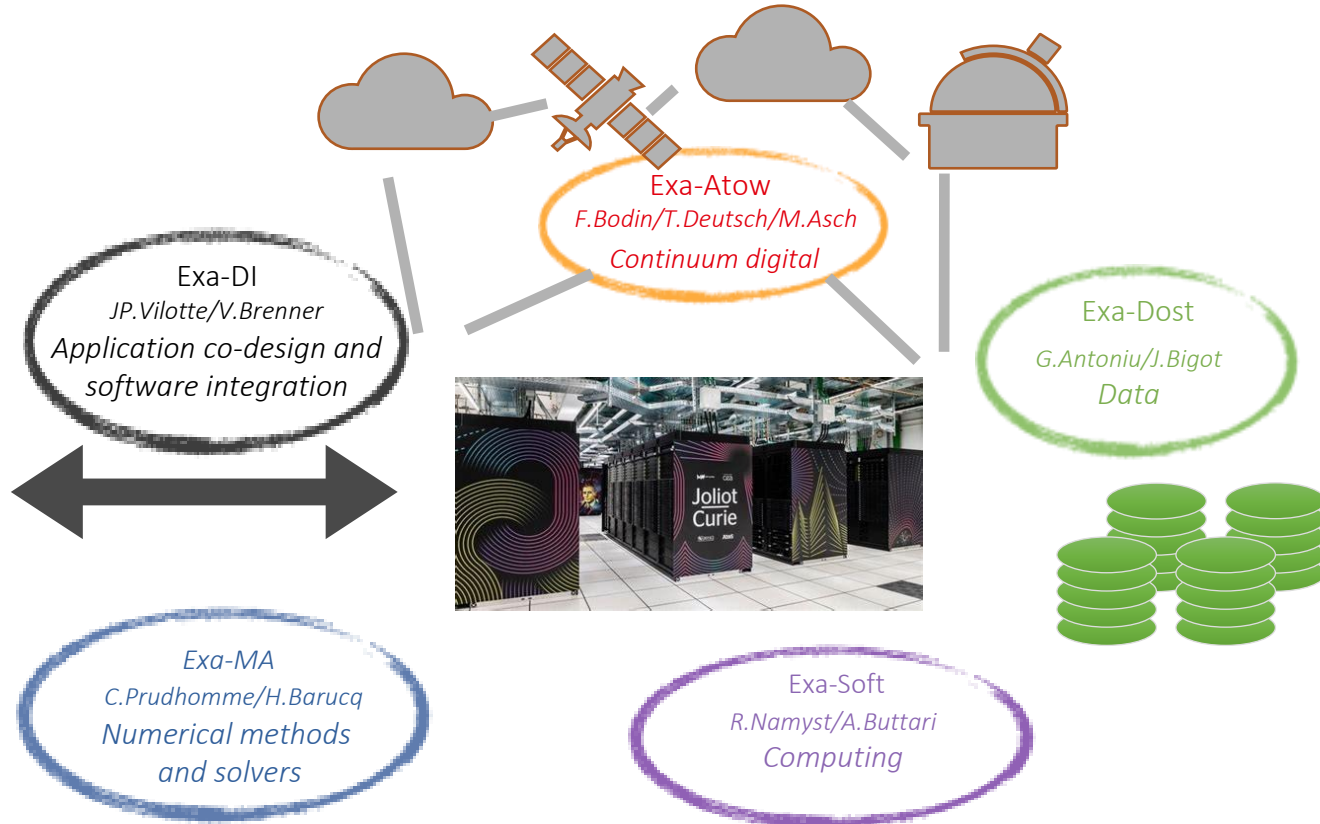
Core Research Institutions

3 Focus Area

Software stack development (PC 1-3)
Wide-area workflows and architecture (PC 4)
Integration and application development (PC 5)

80 R&D teams
500 Researchers

NumPEX in a nutshell



Transverse actions

*Accelerated
architectures and
programming models*
S.Thibault/M.Pérache

AI
T.Moreau/E.Franck/J.Bobin

Computing centers
F.Bodin/N.Lardjanne

*Energy management
and optimization*
A.Guermouche/G Da Costa

Gender/Equity/Diversity
A-L Pelé/V. Grandgirard

Training
M.Krajecki

*Software production
and integration*
B.Raffin/J. Bigot

YoungPEX
PC members

*International
collaborations*
J-Y Berthou

YoungPEX initiative

Leaders: T.Saigre, K. Hoogveld, M. Trochon, M. Certenais, R. Garbage

Community of about 75 people in NumPEX

- **Create a network of young people recruited within NumPEX** (interns, PhD students, postdocs, junior researchers).
- Develop a transversal community across the PCs to enlarge and enrich exchanges and foster collaborations.
- The goal is to propose original actions to be implemented within NumPEX: *Actions during NumPEX events, seminars, onboarding actions, communication, training, careers, etc.*
- Organize the actions selected by the NumPEX leaders and animate the community.
- A working group was set up with representatives from each of the targeted programs.
- Provide out-of-box ideas to build long-term vision for HPC and AI

Board of Industry

Chair: Catherine Lambert (CERFACS)

Missions:

- Guiding strategic directions for the project
- Foster close relations and collaboration with industry
- Organisation of a NumPEX/industry event in 2026.

**First meeting on January, 06th
2026**

NumPEX Board of Industry	Organisation	Gender
Catherine Lambert	CERFACS	F
Bruno Lecointe	Eviden/ATOS	M
Stéphane Tanguy	EDF	M
Isabelle Terrasse	Airbus	F
Patrick Fabiani	Dassault	M
Philippe Noton	SiPearl	M
Frédéric Feyel	SAFRAN	M
Natacha Bernier	MétéoFrance	F
Florent Ventimiglia	CNES	M
Denis Gueyffier	ONERA	M
Florence Delprat-Jannaud/Julian Kashdan	IFPEN	F/M
Thierry Collette	Thalès	M
Diego Klahr	Total Energies	M

3. International collab. and EU calls

The International Post-Exascale (InPEX) Project

InPEX expected outcomes

- Identify future trends/disruptions, missing software components
- Contribute to the share/development of software components: @deployable, @maintenable, @robust, @sustainable => **partnership factory**
- Landmark documents largely exploited, worldwide, for supporting future post-exascale science
- Develop an international network of exascale computing experts and leaders

Actions

- Dedicated international **working groups**
- International Post-Exascale (InPEX) workshop series

Participants

Researchers, engineers, industry, funding bodies

Pre-workshop InPEX, October 2023, Reims, Fr



InPEX Japan - Kanagawa, April 15-17, 2025

Inpex 2025(Japan): Working Groups

WG1: AI and HPC: sharing AI-centric benchmarks of hybrid workflows

Coordination:

Thomas MOREAU, Franck CAPELLO, Mohamed WAHIB

WG2: AI and HPC: generative AI for Science

Coordination:

Mickaël KRAJECKI, Jean-Yves BERTHOU, Sergi GIRONA, Franck CAPELLO

WG3: Software Integration

Coordination:

Julien BIGOT, Bruno RAFFIN, Todd GAMBLIN

WG4: Digital continuum and data management

Coordination:

Gabriel ANTONIU, Tommaso BOCCALI, Maria GIRONE

InPEX Japan - Kanagawa, April 15-17, 2025

International Post-Exascale Initiative

AI and HPC: sharing AI-centric benchmarks of hybrid workflows

Action points:

- First benchmark team set-up:
R. Badia(BSC), S. Jha (BNL), N. Ferrier (ANL), **Th. Moreau** (Inria), J.-P. Vilotte (CNRS), D. Gratadour (CNRS), A. Bardakoff (RCCS), M. Wahib (RCCS), J. Bobin (CEA), F. Capello (Argonne)
- Create InPEX Slack channel and collaborative working tools
- Regular remote meetings
 - ▶ analyse first AI-coupled HPC/HPDA workflow candidates to extract execution motifs and set of metrics
 - ▶ gather and prepare shared AI-ready data corpus
 - ▶ set-up a first benchmark framework prototype and methodologies
- Team supported by a program manager: Corentin Lefevre (NumPEX, Neovia)

REMINDER – Outcomes of the
2025 conference

InPEx Japan - Kanagawa, April 15-17, 2025

International Post-Exascale Initiative

AI and HPC: generative AI for Science

Action points:

- Organise a new (EU) edition of Scientist AI Jam inspired/based on the 1000 Scientists AI Jam organised in the US

REMINDER – Outcomes of the
2025 conference

Software Integration

Actions point: (Bigot + Raffin / Todd Gamblin / JP ?)

- Produce a white paper to formalize the various responsibility models over the world
 - Identify the roles involved, clarify how each model map these roles to actual people, design benchmark use-cases for the various software deployment solutions on each model
- Continue the work initiated to develop an interoperable installed software database format
- Work to standardize containers as the one interface with computing centers
 - Work with computing sites could to provide base images with pre-built applications & libraries
 - Identify a set of required variants and push for a standard site description format
- Generalize the virtual Fugaku approach all over the world
 - Work with Riken to extract a virtual-\$site framework
 - Work with computing centers over the world to identify requirements for implementation
 - Push for a worldwide deployment
- Cartography the multiple collaboration forums
 - their participants, their organizational dependencies and failure points, their specificities
 - => Maybe organize a BoF @ SC or ISC to gather this community of communities?
- Evaluate and draft recommendations for HPSF from the point of view of all InPEx participating institutions

REMINDER – Outcomes of the
2025 conference

Work will happen on InPEx slack #wg-software-production

InPEX Japan - Kanagawa, April 15-17, 2025

International Post-Exascale Initiative

Digital continuum and data management

Coord: Gabriel Antoniu, Tommaso Boccali/Maria Girone, J-P Vilotte

Potential goal:

- Co-write a white paper explaining the needs of the science communities that needs to be executed on the computing continuum, listing challenges, priorities and promising approaches to tackle them

Next actions

- Continue the discussions via online meetings
- Continue to contribute to the shared nodes : <https://tinyurl.com/inpex-2025-continuum>
Use case characterization for the additional use cases
Ongoing related R&D projects, strategic actions, impactful technical milestones
- Please add your e-mail in the list at the top of the document to keep being updated for forther actions!

REMINDER – Outcomes of the
2025 conference

The International Post-Exascale (InPEX) Project

Inpex.science

Date	(10/2023)	11/2023	06/2024	04/2025
Location	Preparatory phase EU (France)	SC'23 - BOF	Workshop1 EU/BSC	Workshop2 Japan/Hakone
Date	04/2026	04/2027	04/2028	04/2029
Location	Workshop3 South America	Workshop4 EU	Workshop5 Japan	Workshop6 US

Next InPEX meeting, South America, 20-24 April 2026

Agenda (in progress):

- Strategic: Post-Exascale « Initial vision »
- Technical : WG1 to 4

Alice Recoque, European New Exascale Supercomputer

Installation in 2026, Operational in 2027

- HPL performance: **1+ Eflops HPL (GPUs) & 30 PF CPU < 20 MW**
- A system integrating European hardware / software technologies in terms of computing, storage, network, infrastructure, middleware, applications...
- **Addressing societal and scientific challenges** via AI, large scale numerical simulations and massive data analysis and quantum computing. A system embedded inside the digital continuum.
- **First NDA meeting between AMD / Eviden and NumPEX will be organized in January 2026**



EuroHPC
Joint Undertaking

Alice Recoque in a Nutshell

- **Solution Eviden XH3500**

- 94 compute racks for the unified (accelerated) partition; > 10 classic racks for scalar partition
- 100% liquid cooling (warm water cooling system) ; Power consumption range: 12-15 MW

- **Unified Compute Node**

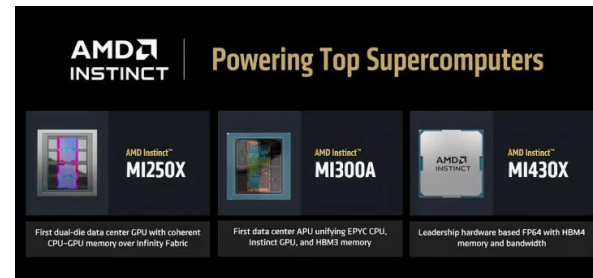
- Address both accelerated and scalar workloads in multi-tenant mode
- 1 AMD Venice CPU (256c) strongly coupled with 4 AMD MI430x GPUs (432 GB HBM4 @ 19.6 To/s)
- 1 TB of MRDIMM memory, 2 x 400 Gbps BULL BXiv3 links / GPU and 1 link per CPU

- **Scalar Compute Node**

- Based on European ARM technology SiPEARL

- **Storage (tender to follow)**

- Target: 30 PB flash, 200 PB disks



ores av



ALICE RECOQUE
BEYOND HPC

2. CSA SPE-EU

CSA SPE-EU

HORIZON-CL4-2025-03-DIGITAL-EMERGING-04: Post-exascale HPC (CSA)

Expected Outcome:

- Delivery of a high-quality **roadmap** addressing the post-exascale HPC/AI research challenges for applications, algorithms, software, hardware and systems, including a strong emphasis on AI
- Contribution to the development of a competitive European converged HPC/Quantum/AI **ecosystem**, including AI Factories and future AI Gigafactories
- Interaction and collaboration with similar **international** efforts, ensuring alignment with AI-driven computing paradigms worldwide

CSA SPE-EU

Scope:

- Guide and prepare European HPC for the post-exascale era of converging supercomputing, quantum computing and artificial intelligence worlds.
- Bring together the key scientific and industrial players in Europe, and should liaise with the relevant international post-exascale efforts (e.g. the International Exascale Project (**InPEX**), the EuroHPC Joint Undertaking advisory bodies (**RIAG, INFRAG**), the EuroHPC JU private partners (i.e. **ETP4HPC, BDVA, QuIC**) relevant EuroHPC main initiatives (e.g. the **DARE** Framework Programme Agreement on RISC-V processors, HPC Centres of Excellence, AI Factories, etc), the hosting entities of European **AI Factories** and **future AI Gigafactories**, and other relevant European projects and initiatives.
- The action should analyse the research challenges of all relevant technologies in the post-exascale/AI era and produce and maintain a high-quality research roadmap with recommendations for research actions at the European level.
- Issues like hardware-supported mixed-precision, AI-driven HPC as a service, real-time HPC, next generation AI model training and inference, digital continuum, convergence of HPC/AI/Quantum/Cloud/Edge, should be part of the analysis.

CSA SPE-EU

DG CNECT Expectations

Next Framework Program 2028-2034, 7 years

- budget of few Billions euros for converge HPC, IA, Quantum, Cloud
- Need a vision and an implementation strategy for software and hardware

Key points:

- Not classical thinking
- Flexibility and reactivity → small, practical and usable documents (policy paper) as well as a reference doc
- Out of the box (not classical wording)
- Efficiency of the process => time to grant
- Identify disruption, game changers

CSA SPE-EU

DG CNECT Expectations

Timing:

- Call in June, submission in September
- Start January 2026, 1st
- Time possibly 30 months instead or 36 months

Expected contribution:

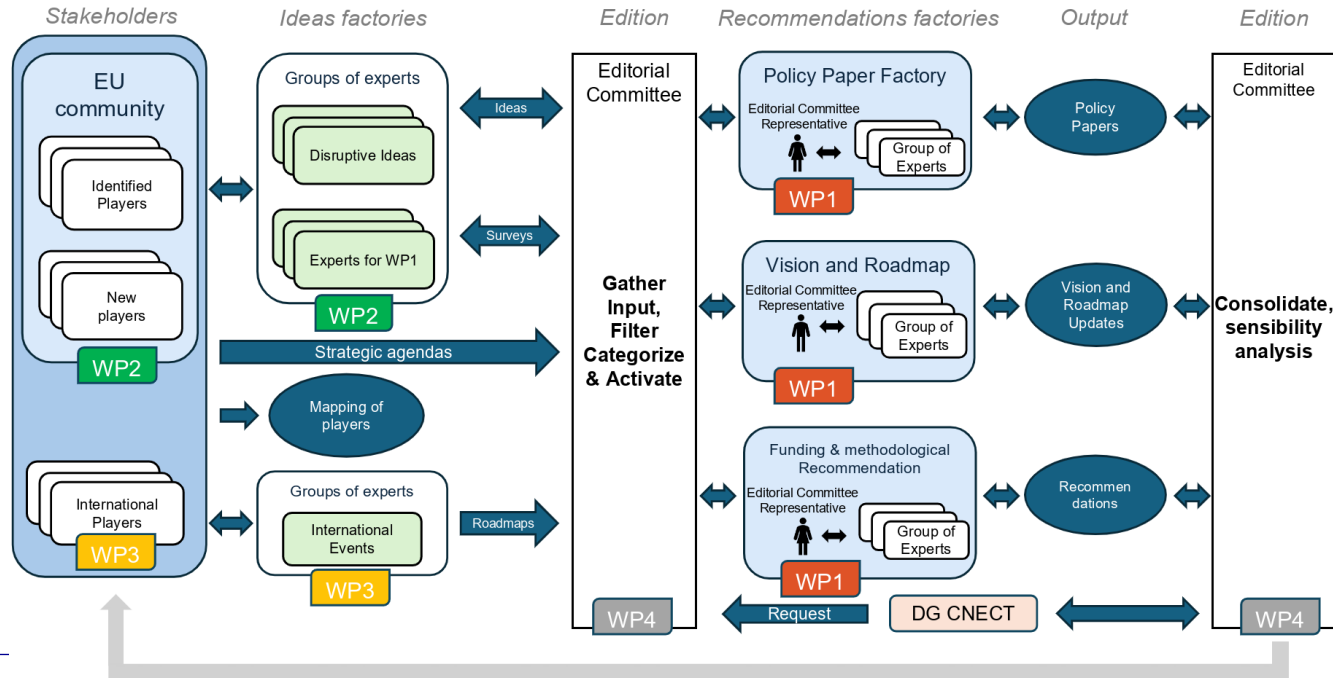
- Must include financial funding modalities of programs and calls
- First CSA deliverable: spring 2026, short perspective document with regular updates
- Final deliverable: vision, why, strategy, roadmap, actionable

CSA SPE-EU

No.	Participant organisation name	Short name	Type
1	INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE	INRIA (Coordinator)	RO ¹
2	UNIVERSITE DE BORDEAUX	UBx (AE²)	RO
3	GRAND EQUIPEMENT NATIONAL DE CALCUL INTENSIF	GENCI (AE)	Non-profit
4	DATA AI AND ROBOTICS DAIRO	BDVA	Non-profit
5	BARCELONA SUPERCOMPUTING CENTER CENTRO NACIONAL DE SUPERCOMPUTACION	BSC CNS	RO
6	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	CEA	RO
7	ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE	CERN	RO
8	CSC-IT CENTER FOR SCIENCE LTD	CSC	Non-profit
9	EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING	ETP4HPC	Non-profit
10	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	Fraunhofer (AE)	RO
11	PARTEC	PARTEC (AE)	SME
12	SIPEARL	SiPEARL (AE)	SME
13	FORSCHUNGSZENTRUM JULICH GMBH	FZJ	RO
14	NATIONAL INFRASTRUCTURES FOR RESEARCH AND TECHNOLOGY	GRNET	Non-profit
15	CENTRO NAZIONALE DI RICERCA IN HIGH PERFORMANCE COMPUTING, BIG DATA E QUANTUM COMPUTING	ICSC	RO
16	CINECA CONSORZIO INTERUNIVERSITARIO	CINECA (AE)	RO
17	ISTITUTO NAZIONALE DI FISICA NUCLEARE	INFN (AE)	RO
18	UNIVERSITA DEGLI STUDI DI TORINO	UNITO (AE)	RO
19	NEOVIA INNOVATION	NEOVIA	SME
20	INSTYTUT CHEMII BIOORGANICZNEJ POLSKIEJ AKADEMII NAUK	PCSS	RO
21	EUROPEAN QUANTUM INDUSTRY CONSORTIUM EV	QuIC	Non-profit
22	TECHNISCHE UNIVERSITAET MUENCHEN	TUM	RO
23	THE UNIVERSITY OF EDINBURGH	UEDIN	RO

CSA SPE-EU

SPE-EU: overall structure of the Work Plan





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 NumPEX