

AI FOR SCIENCE: SOVEREIGNTY

INPEX MEETING

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SOVEREIGNTY IN HPC-AI CONVERGENCE

Strategic autonomy in HPC-AI

- Control: compute + data + software + models + operations
- Collaborate globally

Dependencies

- Cloud
- Chips
- Software
- Data

Key point

- Not isolation
- Freedom to choose (no lock-in)

FIVE LAYERS OF SOVEREIGNTY

- **Compute sovereignty:** control over accelerators, storage, interconnect
- **Data sovereignty:** control over where data lives and flows
- **Software sovereignty:** portability and auditability of stacks
- **Model sovereignty:** ability to train, adapt, deploy independently
- **Operational sovereignty:** control over infrastructure and expertise

WHY SOVEREIGNTY IS NOW A RESEARCH ISSUE

- **Frontier AI:**
 - depends on large-scale compute and infrastructure
 - => sovereignty = access to AI-capable systems
- **Europe's response:** AI Factories (EuroHPC) + AI Continent strategy
- **Implication:** sovereignty is a technical HPC issue, not only geopolitical

EUROPE'S CURRENT POLICY ANSWER: AI FACTORY

- **AI Continent Plan:** ≥ 19 AI Factories across Europe
- **EuroHPC (Mar 2025):** 13 sites selected (7 + 6)
- **Purpose:** support startups, industry, researchers with AI-optimised infrastructure and services



WHY AI FACTORIES MATTER FOR SOVEREIGNTY

- **AI Factories:** structured access to compute, expertise, and support
- **Benefit:** reduce reliance on external cloud/private infrastructure
- **Role:** enable sovereign for AI experimentation, fine-tuning, evaluation, deployment in Europe

SOVEREIGNTY IS CONSTRAINED BY MARKET CONCENTRATION

- **OECD:** Amazon + Microsoft \approx up to 80% cloud share in some markets
- **Implication:** access but not strong negotiating power or autonomy
- **Key point:** open models \neq sovereignty if compute/ops are externally controlled

GLOBAL ASYMMETRY ACROSS REGIONS

- **US:** AI infrastructure as strategic priority (incl. federal action, 2025)
- **Europe:** public, coordinated approach (EuroHPC, AI Factories)
- **Contrast:** market-driven scale vs coordinated strategic capacity

WHERE SOVEREIGNTY TOUCHES HPC-AI RESEARCH

- **Training at scale:** can large models run on constrained/federated infrastructure?
- **Distributed learning:** key when data is local (simulation, instruments, regulated datasets)
- **Inference & updates:** must handle locality, governance, portability constraints

THREE TENSIONS FOR DISCUSSION

- **Build vs buy:** own stack or diversified external access?
- **Open models vs weights:** data may remain local/restricted
- **Global science vs autonomy:** collaborate without one-sided dependencies

PROPOSED CONCLUSION FOR THE SESSION

- **Sovereignty (HPC–AI):** global collaboration + local control of key layers
- **Output:** bottleneck matrix (compute, data, software, models, operations)
- **Key question:** which layer is most fragile today?

OTHER TOPICS OF DISCUSSIONS

- **Priority:** which layer must remain sovereign (compute, data, software, models, ops)?
- **Scope:** what to build globally vs regionally?
- **Interoperability:** can regions build compatible ecosystems without duplication?
- **Collaboration:** where are the strongest cross-region opportunities?
- **Strategy:** train local foundation models or adapt existing ones?
- **Distributed learning:** how to train when data cannot be centralized?
- **Portability:** what enables cross-country/institution model stacks?
- **Hardware independence:** which algorithms/tools reduce reliance on proprietary HW?
- **Use cases:** best demonstrators for sovereign HPC-AI?
- **Next steps:** realistic short-term roadmap?