



High Performance Computing in the EU: Progress on the Implementation of the European HPC Strategy

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Summary of Recent IDC Study

- **Task:** Assess progress against the Action Plan in the EC Communication, *High Performance Computing: Europe's Place in a Global Race* (February 2012).
- **Use:** Study findings will support the EC report to the European Parliament and Council (planned for 2015) on the implementation of the Communication.



Commonly Used Acronyms

cPPP	Contractual Public Private Partnership (between the EU and ETP4HPC)
EESI	European Exascale Software Initiative
EU	European Union (28 Member States)
EU+	European Union plus Norway and Switzerland
HPC	High Performance Computing
PCP	Pre-Commercial Procurement
PPI	Public Procurement of Innovative solutions
PPP	Public-Private Partnership
PRACE	Partnership for Advanced Computing in Europe
SHAPE	SME HPC Adoption Programme in Europe
SME	Small and Medium-size Enterprise

Assessment of Progress, Organized by the Six Actions in the EC Communication (2012)



Action 1

Governance at the EU Level

- Situation:
 - Europe is inherently more challenging to organize and collaboratively advance than its single-nation competitors for leadership: the U.S., China and Japan.
 - The European Commission, PRACE and ETP4HPC have done an admirable job of advancing Europe's position in the few years since the 2012 Communication.
- Assessment
 - Today, there is a European HPC consciousness, a Europe-wide scheme for categorizing HPC centres, a single peer review process for accessing tier-0 supercomputers, more of the world's top 50 supercomputers, and improved access for industry of all sizes (including SMEs).
 - Issues already present that will likely grow unless addressed:
 - PRACE hosting members want relief from growing operating expenses.
 - More than today's typical 10-15% of tier-0 cycles may be needed for Europe.
 - Current participation rules limit EC contributions to 20%.

Action 2

Financial Envelope

- Situation:
 - European HPC investments have advanced substantially since 2012, but not at the doubling rate targeted in the Action Plan.
 - EC investments have grown significantly (e.g., €700 million for the cPPP within ETP4HPC) but contributions to procurements are limited by the 20% rule.
 - PRACE 1.0 attracted €400 million in commitments (mostly in-kind contributions) but not all of this has been spent yet.
 - ETP4HPC has built strong supplier participation, but supplier financial contributions need to grow to match EC investments.
- Assessment
 - No clear funding path exists to acquire/operate exascale systems in competitive time frames.
 - The main actors (EC, Member States, European suppliers) will need to adapt current rules (e.g., 20% limit, resource pooling) to create a path.
 - This will test commitments to the goal of European HPC leadership.

Action 3

Funding Mechanisms

- Situation:
 - PCP and PPI mechanisms are underused in Europe¹, including HPC.
 - The U.S., Japan, China regularly use them to drive innovation for competitive advantage in HPC.
 - Pooling resources among Member States for HPC procurements is rare.
- Assessment
 - Resource pooling among Member States, and among Member States and the Commission, will be needed to enable innovative exascale supercomputers in globally competitive time frames.

¹*Policy-Related Frequently Asked Questions on PCP and PPI.*

<http://cordis.europa.eu/fp7/ict/pcp/docs/faq-v9.pdf>

Action 4

European Supply Chain

■ Situation:

- A large majority of the European HPC stakeholders said European scientists and engineers need access to best-in-class HPC technologies and systems, no matter where in the world they come from.
- It is important to expand/strengthen Europe's HPC supply chain, to increase competition, choice, and to decrease reliance on non-European suppliers.

■ Assessment

- ETP4HPC recognizes that suppliers not based in Europe are involved in R&D collaborations with European suppliers.
- These collaborations will benefit European scientists/engineers/data analysts and will help ensure that Europe-based suppliers are ready to compete globally.

Action 5

Industrial Use of HPC

- Situation:
 - Europe's HPC community has been oriented more toward science than industry.
 - Europe has some world-leading HPC centers for collaborating with industrial users, including SMEs (HLRS, Teratec, SURFsara, CINECA, and LRZ, to name a few).
 - The PRACE, SHAPE and Fortissimo initiatives are expanding industrial use.
- Assessment
 - Industrial HPC problems can be as large and as challenging as scientific problems, but industry can rarely justify buying large supercomputers.
 - Industrial access to European leadership supercomputers has grown but remains limited.
 - In some key domains (e.g., manufacturing), SMEs drive important innovation that is impractical for larger companies to pursue.
 - Many SMEs (and some large firms) are unaware of HPC's benefits and opportunities for access.

Action 6

Level Playing Field

■ Situation:

- Europe is the world's most open major HPC market.
 - U.S. and Japanese supercomputers have dominated Europe.
 - Europe has had no large supercomputer vendor (Atos will help Bull).
 - A few Europe-based software vendors have done well in Europe
- The U.S., Japan, China all present barriers to non-domestic HPC suppliers.
 - Especially true of government markets
 - Some Europe-based software vendors have succeeded beyond Europe.

■ Assessment

- To thrive, Europe-based HPC suppliers need fair access to global markets.
 - Europe represents only one-quarter of global HPC spending.
- ETP4HPC will help advance Europe-based suppliers to compete globally.
- Experience in live customer environments via procurements is the best preparation.
- Market asymmetries are best pursued on a government (EC)-to-government level.

Recommendations For Going Forward

Items for consideration for the EC report to the European Parliament and Council on the implementation of the Communication

Expand Funding for HPC



- PRACE members and the EC should agree to provide significant funding support to acquire two pre-exascale supercomputers in 2019-2020 and two additional exascale supercomputers in 2022.
 - Recommended cumulative increase is **just over €1 billion**.
 - One path (lower risk) should stress proven technologies from throughout the world.
 - The other path (higher risk) should stress technologies from European suppliers.
- This will require the funders to adapt their current rules and practices.
 - Member States need to pool resources with each other.
 - The EC needs to pool resources with Member States (through PRACE).

Extend the Planning Time Horizon

- Extend the end date of the Action Plan from 2020 to 2022, to match the expected exascale time frames of the U.S., China and Japan and make it easier to amass the funding levels recommended in this study.



Improve Governance/Coordination



- European Commission:
 - Try to relax the rules to permit pooling funding resources with Member States (through PRACE) and contributions to PRACE tier-0 operating expenses.
 - Determine how much tier-0 capacity will be needed for European (as opposed to national) use.
- Member States (through PRACE):
 - Develop a way to pool resources to amass funding for pre-exascale and exascale supercomputers in globally competitive time frames.
 - Build on success with a more aggressive strategy for industry use.
- ETP4HPC and Member States (through PRACE): ensure tight coordination between technology roadmaps & user requirements.

Improve Understanding and Communication of the Strategy



- As IDC knows from conducting this study, the strategy is difficult to grasp in its entirety.
- The European Commission should create a single website portal enabling access to comprehensive information on the European HPC strategy.
 - Aimed at general public as well as the HPC community.
 - With links to Member States' websites showing basic information about their participation in the strategy.
 - A visible (contact information) person/evangelist in charge, well versed in the strategy and able to respond to inquiries quickly and represent the strategy.

Develop the HPC Ecosystem



- ETP4HPC should continue including European suppliers and non-European suppliers performing R&D in Europe.
 - Rewards suppliers for doing R&D in Europe and supports existing collaborations between Europe-based & non Europe-based suppliers.
 - Collaborating closely with (often much larger) U.S./Japanese/Chinese suppliers will benefit European suppliers.
- ETP4HPC's technology development must remain closely linked to leading supercomputer procurements.
- ETP4HPC (or other organization) should form a clearinghouse (online storefront) focused on disseminating/commercializing Europe's highly parallel software.
- ETP4HPC: exploit centers-of-excellence for advancing software and other important capabilities.

Develop the European Ecosystem

High Performance Data Analysis



- Big Data needing HPC (M&S, analytics)
 - Why? Complexity, time-criticality
 - HPDA server, storage market growing 3x faster than overall HPC market.
- No dramatic architecture change is needed
- Devote one center-of-excellence to HPDA.
 - HPDA will affect nearly all scientific and engineers domains (e.g., biology is fast becoming a digital science).
- Initiatives dealing with industry (PRACE, SHAPE, Fortissimo) should welcome commercial (e.g., advanced fraud detection, business intelligence, affinity marketing) as well as industrial firms.

Develop the European Ecosystem Cloud Computing



- HPC cloud use—public or private—has steadily grown from 13.8% of sites in 2011, to 23.5% in 2013, to 34.1% in 2015.
 - Some notable successes for cloud-friendly workloads.
- No dramatic architecture change is needed here, either.
 - Data security, data loss remain major concerns for HPC cloud users.
- The EC should repeat its cloud computing studies every 2-3 years.
 - HPC cloud use is evolving quickly.

Questions?



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