

Next Generation Computing Roadmap

Over the years computing has evolved to 'nearly always on' web-based mobile computing devices. In the near future we can expect that hardware will become a commodity and the value will be in the software to drive it and the data it generates. The data deluge will require an infrastructure that can transfer and store the data, and computing systems that can analyse and extract value from data in real time.

There are arguments suggesting that the computing sector will become increasingly polarised between small application-specific computing units that connect to provide system services, and larger more powerful units that will be required to analyse large volumes of data in real time.

This report presents a vision of next generation computing for the next 10-15 years. It does this by developing a number of visionary scenarios covering key areas of everyday's life. Starting from these scenarios, we present a series of technology roadmaps, associated research / development / innovation challenges and recommendations for Europe to exploit the opportunities offered by the next generation of computing.

Stakeholders throughout Europe were involved in the study through direct contacts and through two separate workshops providing a validation and refinement of the recommendations arising from this study.

Seven scenarios were carefully developed to address critical aspects of society and economy. Describing how computing will evolve in each of the scenarios has allowed us to describe a series of technology needs that, by considering Europe's current strengths and weaknesses in computing, we could translate into research and innovation challenges for Europe, and into value creation opportunities for the European industry.

Key Messages

Parallel hardware is now mainstream, but parallel software is not.

While all consumer CPUs are now multi-core, software is still designed as mainly sequential. The "parallelisation" of legacy code is very expensive and requires developers with skills in both computer architecture and application domain. European industry needs a new generation of tools for writing software, backed by innovative programming models. New tools should be natively parallel and allow for optimisation of code at run-time across the multiple dimensions of performance, reliability, throughput, latency and energy consumption while presenting the appropriate level of abstraction to developers. Innovative business models may be needed in order to make the development of new generation tools economically viable.

High-performance computing meets cyber-physical systems.

Applications in automation, aerospace, automotive and manufacturing require computing power which was typical of supercomputers a few years ago, but with constraints on size, power consumption and guaranteed response time which are typical of the embedded applications. This is a market opportunity to build upon the existing strength of European industry to develop a family of innovative and scalable technologies, powering computing devices ranging from the embedded micro-server to the large data centre.

Internet of Everything is developing fast.

Computing applications merging automation, real-time processing of big data, autonomous behaviour and very low power consumption are changing the physical world we live in, and creating new areas of application like e.g. smart cities, smart homes, etc... Data locality is becoming an issue, driving the development of multi-level applications which see processing and data shared between local/mobile devices and cloud-based servers. European industry has the know-how and innovation capacity to be a leader in this area, where issues like interoperable interfaces, privacy and data sharing rules will play a very important role in the development of the market.

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Thèmes associés

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