# European Industrial Technology Roadmap for Next-Generation Cloud-Edge Services

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**Location**: Brussels, Belgium

## Executive Summary

The European Industrial Technology Roadmap for the Next-Generation Cloud-Edge outlines a strategic vision for enhancing Europe’s cloud and edge computing capabilities by 2025. It emphasizes the need for Europe to leverage its technological strengths to create competitive, secure, and climate-neutral cloud services. The report identifies key investment priorities across various domains, including climate neutrality, cybersecurity, interoperability, and infrastructure development. It highlights the importance of establishing a federated European cloud ecosystem that meets user demands for openness, security, and efficiency while addressing environmental concerns. The roadmap calls for significant public-private collaboration and investment to foster innovation, enhance data sovereignty, and ensure that Europe remains competitive in the global digital economy. By focusing on these priorities, Europe aims to transform its cloud-edge landscape and achieve its digital and sustainability goals by 2030.

## Characteristics

* **Strategic Investment Focus**: The roadmap emphasizes strategic investments in climate neutrality, cybersecurity, interoperability, and next-generation data center infrastructure to enhance Europe’s cloud-edge capabilities by 2025.
* **Technological Leadership**: Aims for Europe to lead in energy-efficient, secure, and interoperable cloud services, fostering a competitive environment against global hyperscalers.
* **Infrastructure Development**: Calls for increased density of cloud and edge facilities, supported by advanced network management and ubiquitous connectivity, to meet growing demand.
* **Sovereign Data Services**: Advocates for the development of sovereign, sector-specific services that align with European values, ensuring data privacy and security.
* **Collaborative Ecosystem**: Encourages public-private partnerships and synergies with existing initiatives like GAIA-X to create a cohesive European cloud ecosystem.
* **Regulatory Support**: Highlights the need for a supportive regulatory framework to facilitate investment, innovation, and the growth of the European cloud and edge industry.

## Actors

| Category | Actor |
| --- | --- |
| Political Actors | European Commission; European Union; EU Member States |
| Research and Innovation Actors | European Institute of Innovation and Technology; Digital Innovation Hubs; Universities |
| Economic Actors | Private Sector Representatives; Telecommunication Companies; Digital Companies |

## Main Themes

| Category | Subcategory |
| --- | --- |
| Digital Transformation & Strategy | Digital Infrastructure; Digital Platforms |
| Technology & Innovation | Cloud Computing; Artificial Intelligence |
| Data & Governance | Data Governance; Data Protection |

## Practical Applications

* Established the European Industrial Technology Roadmap for the Next-Generation Cloud-Edge, outlining strategic investments and technology priorities for 2021-2025.
* Leveraging the GAIA-X initiative to align the development of the EU Cloud federation, including a cloud rulebook and marketplace.
* Implementing the Climate Neutral Data Centre Pact to achieve climate neutrality for data centers by 2030.
* Developing low carbon digital infrastructures, including AI, cooling technologies, and blockchain-certified recycling.
* Supporting the creation of cross-industry decarbonization data platforms to optimize resource utilization and energy efficiency.
* Investing in zero trust identity management solutions powered by AI to enhance cybersecurity.
* Promoting the development of innovative data encryption technologies, including quantum-safe encryption.
* Establishing automated Security Operation Centres (SOC) for faster detection and response to cyberattacks.
* Creating a federated European cloud marketplace to facilitate access to compliant cloud and edge services.
* Developing a Multi-Provider and Cloud-Edge Control-Plane (MPCP) and API Framework to simplify management of multi-cloud environments.
* Launching pan-European data sharing platforms to enhance data-driven business cases and ensure data sovereignty.
* Implementing advanced data center infrastructure management tools to improve operational efficiency and energy savings.
* Investing in the development of open standard/open source cloud software stacks to reduce dependency on non-EU providers.
* Initiating the first deployments of advanced IaaS/PaaS services to create a competitive European cloud offering.
* Establishing a European “Telecom Cloud” reference implementation to support the deployment of 5G and cloud-native technologies.
* Promoting the development of edge-compatible supply chain management platforms and AI-based analytics for various sectors.
* Supporting the creation of a central vessel resource optimization platform for the shipping industry to improve performance and reduce emissions.

## Commitments

* Achieve a reduction of greenhouse gas emissions by 55% by 2030.
* Deploy 10,000 climate-neutral and secure edge nodes across the EU by 2030.
* Increase the density of edge and cloud facilities to support the adoption of innovative technologies by 2025.
* Invest €200 million by 2025 in low carbon digital infrastructures.
* Invest €100 million by 2025 in cross-industry decarbonization data platforms.
* Invest €500 million by 2025 in zero trust identity management solutions powered by AI.
* Invest €500 million by 2025 in innovative data encryption technologies including quantum safe encryption.
* Invest €250 million by 2025 in automated Security Operation Centres (SOC) for faster detection and response to cyberattacks.
* Invest €270 million by 2025 in edge cybersecurity solutions.
* Invest €50 million by 2025 in the development of European cloud services standards.
* Invest €150 million by 2025 in the Multi-Provider and Cloud-Edge Control-Plane (MPCP) and API Framework.
* Invest €100 million by 2025 in the development of a federated European cloud marketplace.
* Invest €500 million by 2025 in a reference implementation for cloud and edge deployment.
* Invest €2.9 billion by 2025 in cloud data centre infrastructure.
* Invest €2.1 billion by 2025 in near edge data centre infrastructure.
* Invest €1.4 billion by 2025 in far edge data centre infrastructure.
* Invest €600 million by 2025 in retrofitting data centre facilities for improved energy efficiency and performance.
* Invest €100 million by 2025 in advanced data centre infrastructure management.
* Invest €130 million by 2025 in end-to-end data pipelines and platforms.
* Invest €120 million by 2025 in middleware and runtime capabilities.
* Invest €50 million by 2025 in managed databases and custom operating systems.
* Invest €150 million by 2025 in application services enabling development of edge use cases.