

# CYBER-PHYSICAL SYSTEMS

## CYBER-PHYSICAL SYSTEMS

Cyber-physical systems (CPS) are enabling technologies which bring the virtual and physical worlds together to create a truly networked world in which intelligent objects communicate and interact with each other.

Cyber-physical systems and advanced sensor networks represent the next evolutionary step from existing embedded systems. Together with the internet and the data and services available online, embedded systems join to form cyber-physical systems.

Cyber-physical systems provide the basis the creation of an Internet of Things which makes smart services and products possible. They are "enabling technologies" which make multiple innovative applications and processes a reality as the boundaries between the real and virtual worlds disappear. As such, they promise to revolutionize our interactions with the physical world in much the same way that the internet has transformed personal communication and interaction.

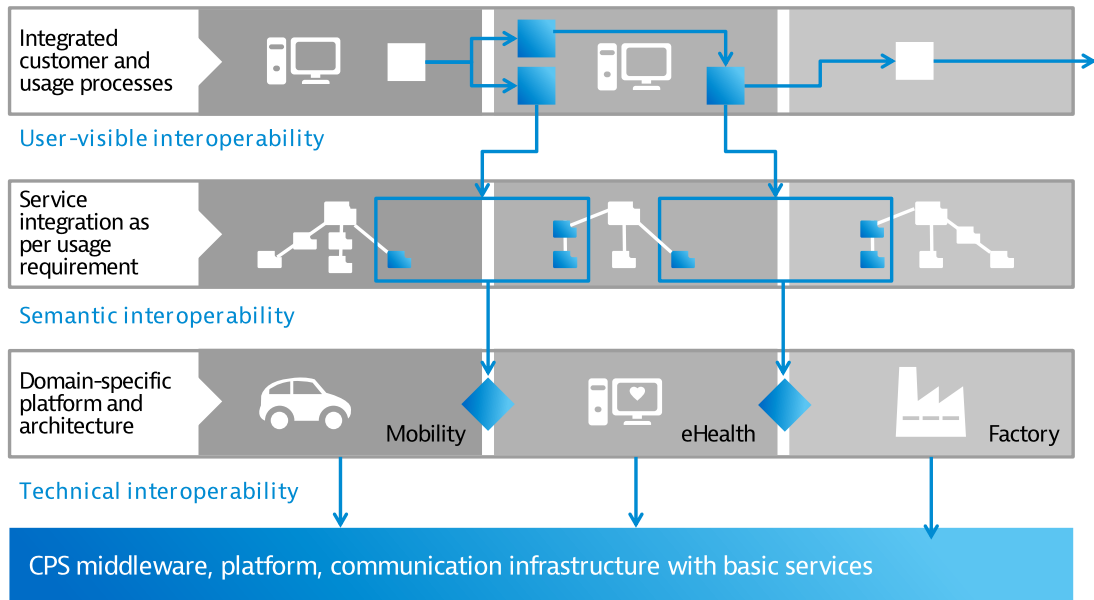
The interplay between high performance software-based embedded systems and dedicated user interfaces integrated into digital networks creates a completely new world of system functionality. Modern mobile telephones are perhaps the most obvious example of this; offering as they do a complete bundle of applications and services which completely outstrip the device's original telephony function.

Sensor technology advances made possible by initiatives like the Federal Ministry for Economic Affairs and Energy's "AUTONOMIK für Industrie 4.0" program are improving information-capture capabilities for improved modeling.

Cyber-physical systems also represent a paradigm break from existing business and market models, as revolutionary new applications, service providers and value chains become possible. Industry sectors including the automotive industry, the energy economy and health care, for example, will in turn be transformed by these new value chain models.

In the future, cyber-physical systems will make contributions to human security, efficiency, comfort and health in ways not previously imaginable. In doing so, they will play a central part in addressing the fundamental challenges posed by demographic change, scarcity of natural resources, sustainable mobility, and energy change.

# Ideal Model of the Layers of a Cyber-Physical System



© Germany Trade & Invest

Ideal Model of the Layers of a Cyber-Physical System | © acatech

## AGENDA CPS

The objective of the Agenda CPS project (2010 to 2012) led by the German National Academy of Science and Engineering (acatech) on behalf of the Federal Ministry of Education and Research (BMBF) was to establish an integrated CPS research agenda allowing Germany to shape this technological revolution as a lead market and provider in competition with other industrial and technological players.

Agenda CPS identified four major fields of application up to the year 2025. These are:

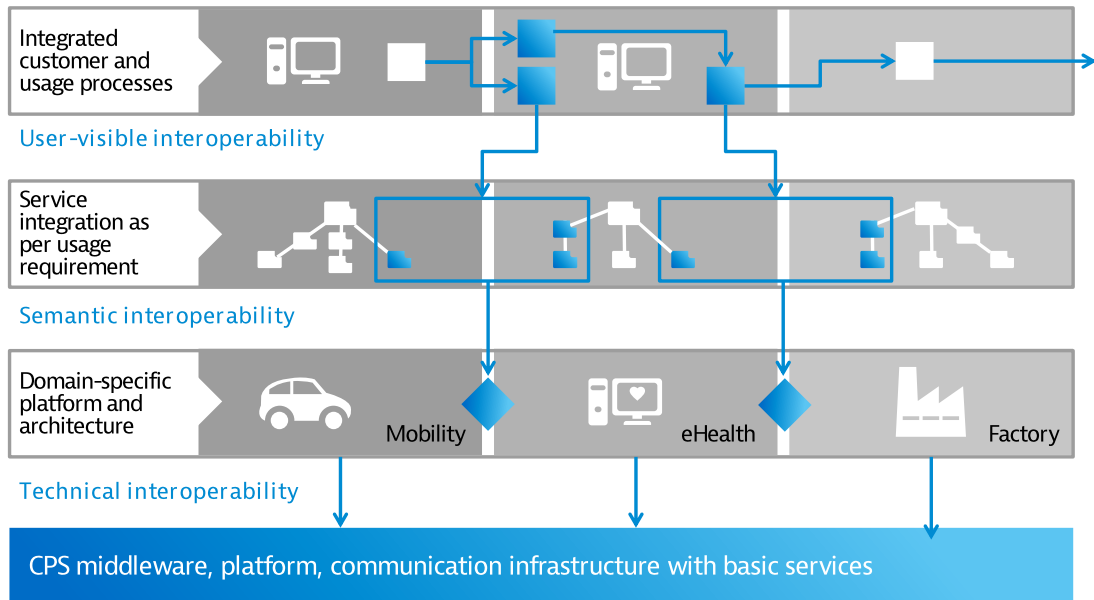
Energy: Cyber-physical systems for the smart grid

Mobility: Cyber-physical systems for networked mobility

Health: Cyber-physical systems for telemedicine and remote diagnosis

Industry ("Smart Factory"): Cyber-physical systems for industry and automated production.

# Ideal Model of the Layers of a Cyber-Physical System



© Germany Trade & Invest

Ideal Model of the Layers of a Cyber-Physical System | © acatech

## CYBER-PHYSICAL SYSTEMS AND THE INTERNET OF THINGS, DATA AND SERVICES

"The Evolution of Embedded Systems into the Internet of Things, Data and Services" below depicts the vision of a global "Internet of Things, Data and Services" through the evolutionary development of embedded system as a result of their being networked over the internet. Closed embedded systems represent the starting point. Recommendations for the next step to locally networked embedded systems were already made in the National Roadmap Embedded Systems 2009.

The National Academy of Science and Engineering's (acatech) "Agenda CPS" study extended the spectrum to global networking (one example being the intelligent networked road junction that makes use of traffic jam information). Cyber-physical systems represent the next stage on the road to the creation of smart cities through the creation of an Internet of Things, Data and Services.

## LEAD MARKET FOR CYBER-PHYSICAL SYSTEMS 2020

As part of the country's INDUSTRIE 4.0 project, Germany aims to be the lead provider of cyber-physical systems (CPS) by 2020. In marked contrast to many other industrialized nations, Germany has maintained a stable manufacturing labor force while integrating new technological developments into industrial products and processes at an early stage.

A bridge between the real and virtual worlds is being created with the digital refining of everything from production facilities and industrial products to everyday products with integrated storage and communication capabilities, radio sensors and intelligent software systems.

Germany's superior embedded system and cyber-physical systems know-how represents a major opportunity for industry in Germany to help shape the fourth industrial revolution.



Asha-Maria Sharma | © GTAI

### CONTACT US

Asha-Maria Sharma

☎ +49 30 200 099 312

✉ [Submit your question](#)




Henri Troillet | © GTAI

### CONTACT US

Henri Troillet

☎ +49 30 200 099 390

 [Submit your question](#)

---

All rights reserved. Any reproduction in whole or part only with express written permission. All efforts are made to ensure integrity of the content, however we are not liable for any mistakes that may occur.

© 2019 Germany Trade & Invest

Promoted by Federal Ministry for Economic Affairs and Energy in accordance with a German Parliament resolution.