IoT and Edge Computing

Future Directions for Europe

Setting the Scene

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European Commission - DG CONNECT
Deployment of technology that works for people
A fair and competitive digital Economy
An open, democratic and sustainable society

European federation of cloud infrastructure and services
Establishing common European data spaces

Strengthen and connect AI research excellence centres with TEFs
At least one digital innovation hub per Member State specialized in AI
Digital enabling technologies strategies converge: need for holistic approaches
  • Data – Processing – Connectivity – Intelligence

System level approaches enabled by these technologies (very similar):
  • Cognitive Cyber-Physical Systems - Next Generation Smart Internet of Things

Trend / paradigm shift to the edge:
  • Today 80% to 20% processing on the cloud versus the edge – reverse in 5 years?
  • Security- and privacy-critical, time- and safety-critical, environment/energy -critical
  • Computing power to the edge and to the data
  • Intelligence to the edge: smart devices

The closer to the edge – the more application specific customisation needed
  • Cloud computing services: largely general purpose and application agnostic
  • Edge computing must be strongly customised towards the application

Concepts for the future
  • Compute continuum - IoT/Edge (Meta-level) Operating systems - Digital Industrial Platforms
From Edge to Cloud

- Edge / IoT Device
- Edge Cloud
- Cloud / HPC Infrastructure
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<th>Low energy mobile</th>
<th>Real-time safety</th>
<th>Graphics &amp; matrix processing</th>
<th>Speed for AI Inference</th>
<th>Speed for AI Training</th>
<th>High performance, low energy, low cost, real-time/safety AI Inference</th>
<th>Special purpose processor for electric autonomous driving</th>
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**General Purpose**
- Intel x86
- ARM low power
- Infineon Tricore
- NVIDIA GPU

**Special Purpose**
- Tensor processor
- Neuromorphic processor

**Special Purpose**
- High performance, low energy, low cost, real-time/safety AI Inference

**Special Purpose**
- Special purpose processor for electric autonomous driving

**Speed for AI Inference**
- Speed for AI Inference

**Speed for AI Training**
- Speed for AI Training
Europe’s potential

- General purpose Cloud Computing (IaaS) in the hands of US/Chinese digital giants
- Trend “FROM Cloud to Edge” denotes a paradigm shift
- Europe is strong in industrial applications, sensors, CPS ➔ opportunity to regain competences and market shares for EU actors
- An opportunity for Europe to reinforce its place between US and China
- Technological autonomy - Mastering full value chains in key sectors, e.g. automotive
- Broad approach needed – a lot is already on-going:
  - Microelectronics, Photonics, IoT, SW and Systems, data analytics/fusion, 5G and beyond
  - Operating Systems, Platforms
  - Large Scale Piloting and Partnerships
- Speed – speed – speed: competition is not sleeping
Next EU Programming Period: Relevant Areas

Horizon Europe
Cluster 4: Digital, Industry, Space
• JU KDT
• JU SNS
• Work Programmes
  • Destination 3 World leading data and computing technologies
  • ...

Horizon Europe
Cluster 3: Security

Horizon Europe
Cluster 5: Energy and Mobility

Horizon Europe
Cluster 6: Agriculture, ...

Digital Europe
• Artificial Intelligence
  • Data Spaces
  • Cloud to edge federation
  • Testing & Experimentation
• Cybersecurity
This Workshop: Addressing the Smart IoT/edge Vision from Different Perspectives

Enabling technologies and challenges

Session 1

Next Generation Internet of Things

Session 4

Application needs and scenarios

Session 2

X-cutting issues: Architecture, Constituency, Regulation, Standards

Session 3

Technology: HW, SW, Systems
TREND

- **Growth** led by IoT
- **Sovereignty** in key sectors like industry, automotive, aerospace, health, telecom, ..
- **Edge computing** to spur innovation in electronic systems
Along with Artificial Intelligence and Big Data, IoT is at the centre of the digitalisation of the world economy (Economist 2020)

- SW & Services to drive monetization of IoT HW
- More than 70% of IoT revenues are cloud-native (ABI Research)

- The Edge represents a new computing paradigm
- IoT Edge: From Pervasive Infrastructure to Outcome-Driven Solutions
- IoT leverages edge computing
  - to reduce bandwidth costs through processing data locally
  - to improve agility through real-time on-premise decision
  - To allow edge devices/processes to function autonomously
A fresh approach to Internet of Things

- **Concepts on IoT/Edge**
  - Leverage Europe's strength in Key Digital Technologies
  - the (industrial) IoT - edge emerges as an entirely **new ecosystem**
  - A multi-tiered infrastructure → from **Cloud to Edge to Smart Connected Devices**

- **Focus Area Internet of Things / Digitising European Industry**
  - Exploiting our close collaboration across verticals with other DGs under the DEI strategy on platforms and pilots (WP2018-20)
  - A revised R&I agenda under Horizon Europe (Data Strategy and SNS Partnership)
  - **Momentum**: Federated Cloud, AI action plan, European Processor Initiative, Blockchains, ..