SHAPING EUROPE'S DIGITAL FUTURE
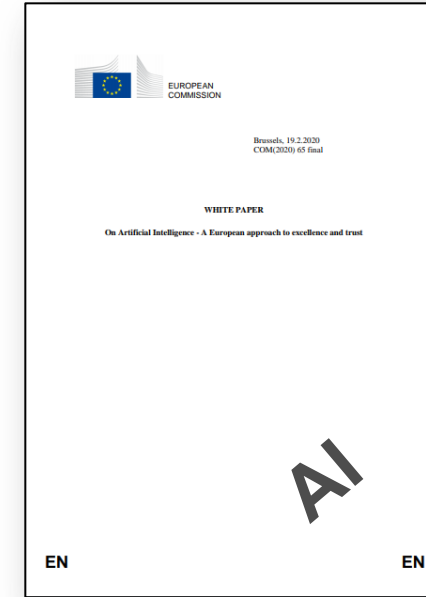
Deployment of technology that works for people

A fair and competitive digital Economy

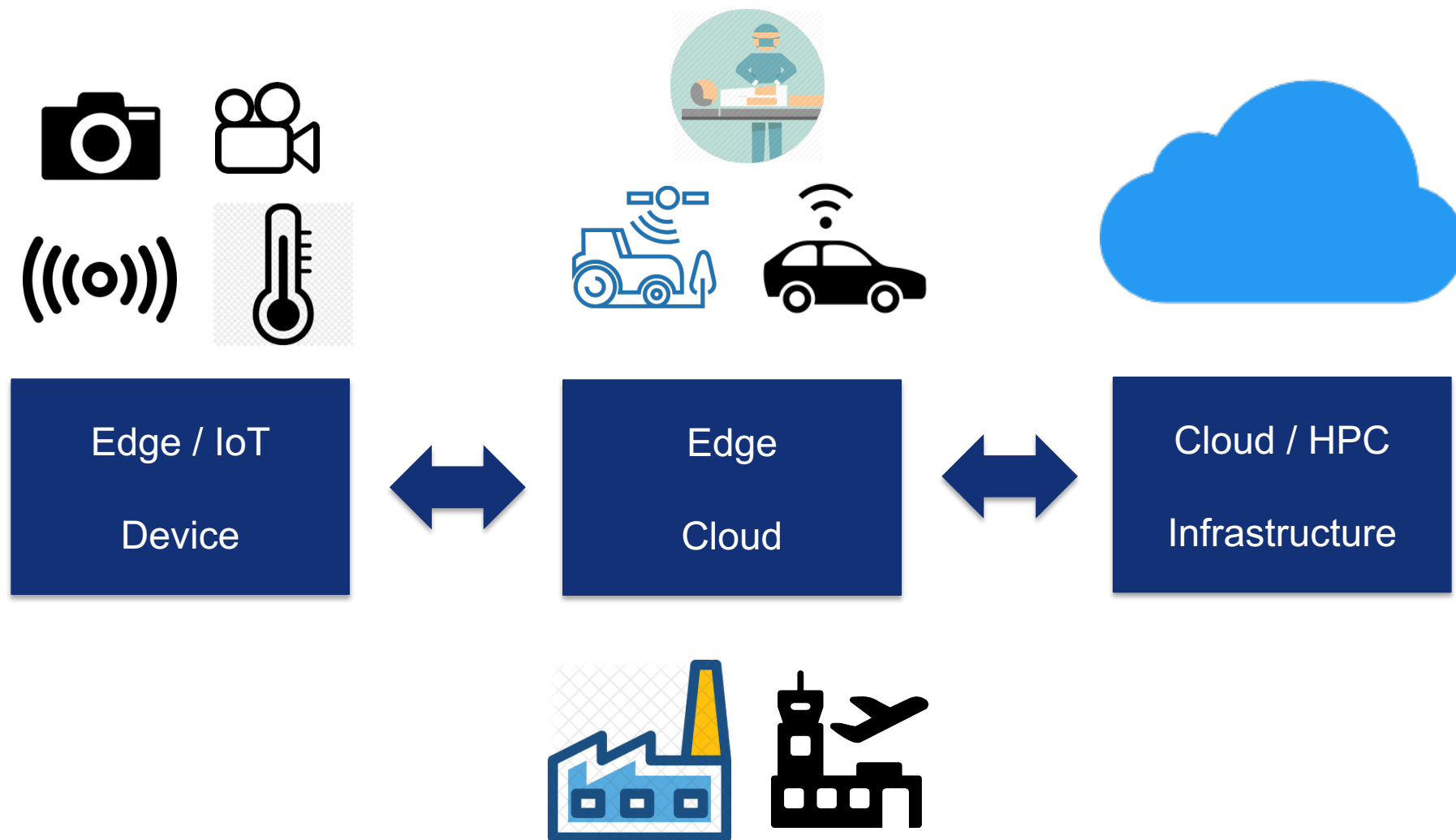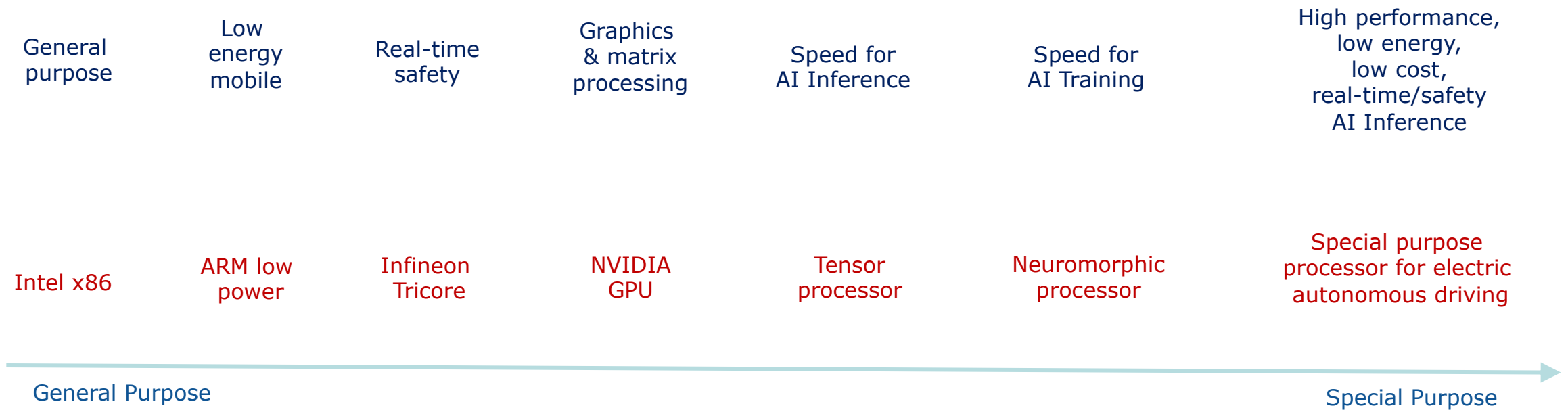An open, democratic and sustainable society
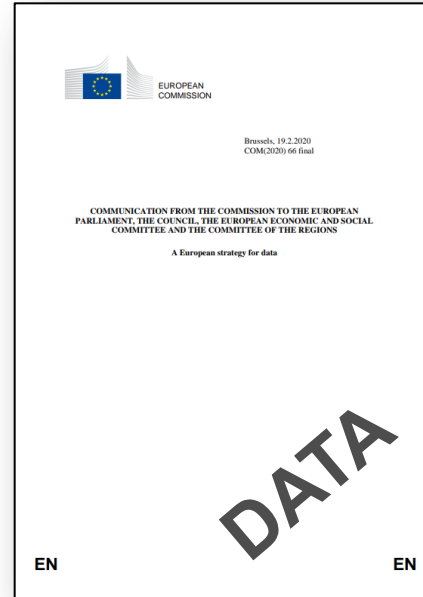
European federation of cloud infrastructure and services

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

Edge / IoT

Device

Edge

Cloud

Cloud / HPC

Infrastructure

European Commission

| General purpose | Low energy mobile | Real-time safety | Graphics & matrix processing | Speed for AI Inference | Speed for AI Training | High performance, low energy, low cost, real-time/safety AI Inference |
|---|---|---|---|---|---|---|
| Intel x86 | ARM low power | Infineon Tricore | NVIDIA GPU | Tensor processor | Neuromorphic processor | Special purpose processor for electric autonomous driving |

General Purpose →→→→→ Special Purpose

- 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

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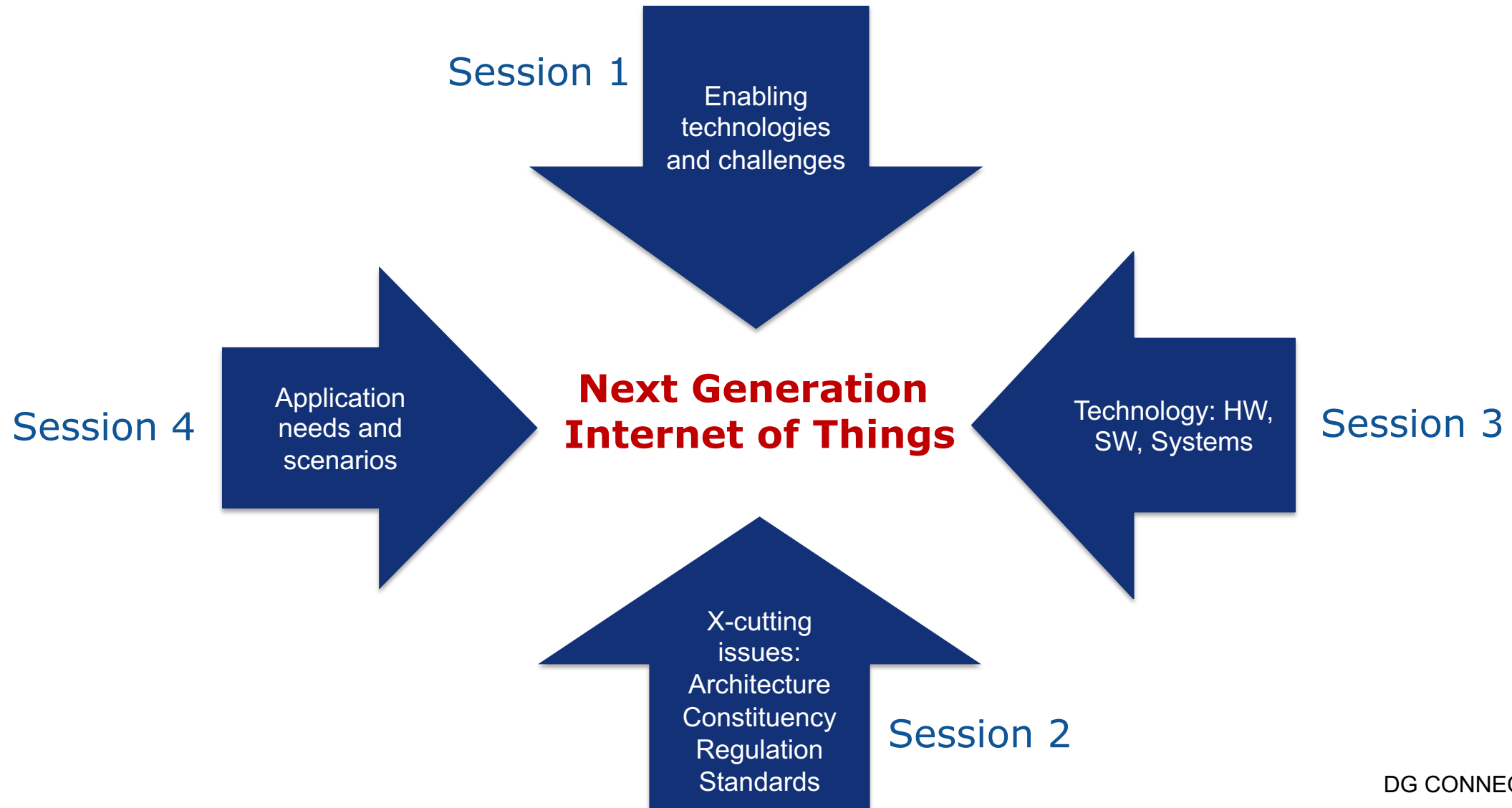- …

**Digital Europe**
- Artificial Intelligence
  - Data Spaces
  - Cloud to edge federation
  - Testing & Experimentation
- Cybersecurity

**Horizon Europe
Cluster 3: Security**

**Horizon Europe
Cluster 5: Energy and Mobility**

**Horizon Europe
Cluster 6:
Agriculture, …**

. . .

European Commission

**Session 1**

Enabling technologies and challenges

**Session 4**

Application needs and scenarios

**Next Generation Internet of Things**

Technology: HW, SW, Systems

**Session 3**

X-cutting issues: Architecture Constituency Regulation Standards

**Session 2**

DG CONNECT page 8

## TREND

- **Growth let by IoT**

- **Sovereignty** in key sectors like industry, automotive, aerospace, health, telecom, ..

- **Edge computing** to spur innovation in electronic systems



Segment % World - 2018 — Average: 4.5%

**Consumer/Stand alone apps under the average**

**Embedded/Professional apps above to average**

Industrial & Robotics
Consumer PCs
Automotive electronics
Phones
Aero/Def/Security
Audio & Video
Telecoms infrastructures
Health & Care — Professional PCs
Home Appliances

Compound Annual Growth Rate (CAGR) 2018-2023
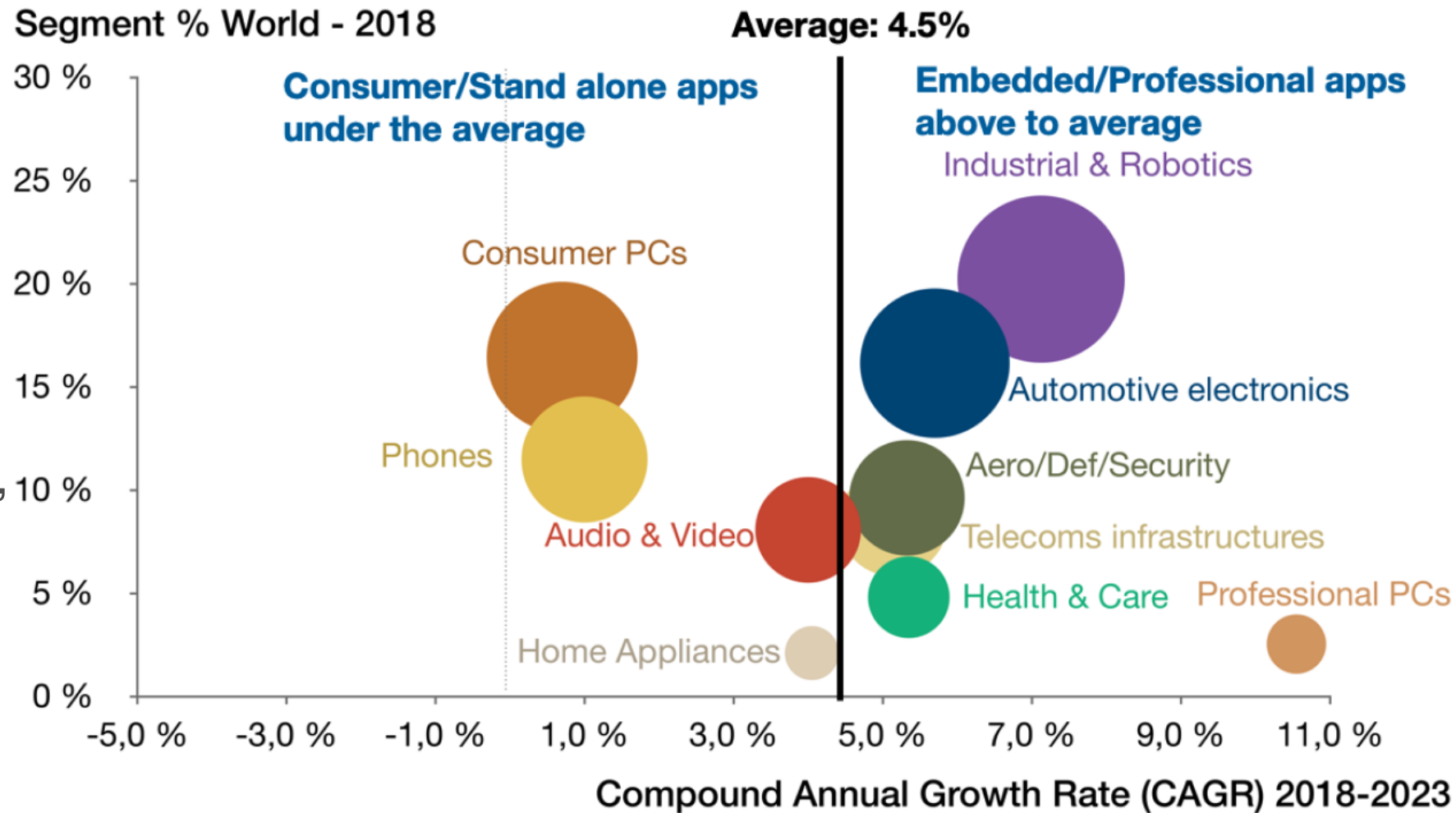
- Along with Artificial Intelligence and Big Data, IoT is at the centre of the digitalisation of the world economy (Economist 2020)

- 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

Connecting

Optimising

Collecting

**Five key characteristics of IoT**

Monetising

Monitoring

Sources: EIU 2020

- **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, ..