

**NEXT
GENERATION
IoT**

workshop



HiPEAC Vision 2021



<http://hipeac.net/vision>
Available since January 2021

IoT and Edge: Instruments, Priorities and Partnerships workshop

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25 February 2021

RATIONALE FOR A SYNERGISTIC PROGRAM ACROSS DOMAINS

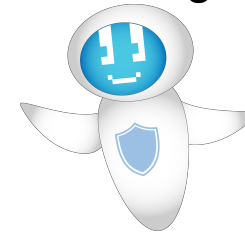
- **Evolution of ICT (Web)**
 - Offering cross-domains services through Apps
- **Continuum of Computing (from IoT to Cloud)**
 - Interoperability, Virtualization, Scalability
 - Build on top of existing technologies/standards
- **“Write once, run anywhere”**
 - (Micro) Containers for legacy and migration of code (and less data)
- **EaaS (Everything as a Service)**
 - Dynamic selection and orchestration of distributed services
- **Link with the physical world (CPS and IoT)**
 - Exposing non-functional properties (time, power, latency, cost...)
 - Contract-based services (e.g. using REST-API)
- **Cybersecurity everywhere**
 - Trusted platform loyal to its owner, not to the provider
 - Correct by construction, use of formal methods and proofs
- **Controlling in-bound and out-bound data (Privacy)**
 - Detecting fake/rogue data
 - Protecting corporate data and privacy
- **Natural interfaces (e.g. voice) and context aware**
 - “Natural programming”
 - More natural interfaces (touchscreen, voice, imitation, ...)
- **Edge processing**
 - Federation of local resources
 - Running on European hardware platforms



Moonshot program “Guardian Angels”

A paradigm unifying technical solutions for these evolutions

Based on existing technologies



Nicknamed **“Guardian Angels”**

It is a **holistic approach** to build a complete European ecosystem & infrastructure

The challenge: Interoperability and Composability (Orchestration)



Federated
Open Personal
Guardian Angels



Too
complex
for users

Creating the *next Web*,
Intertwining
Cyber and Physical worlds
for *industrial* and personal use
Build on top of existing technologies

Overcome the fragmentation of vertically-oriented closed systems

Move towards open platforms and standards

Heterogeneity/Interoperability

Handling the numerous types of devices, protocols, standards, and *non functional requirements*

Scalability

Handling the big number of connections/big data coming from millions of devices

Dynamicity

Plug&play, self-configuration, self-management, self-matchmaking

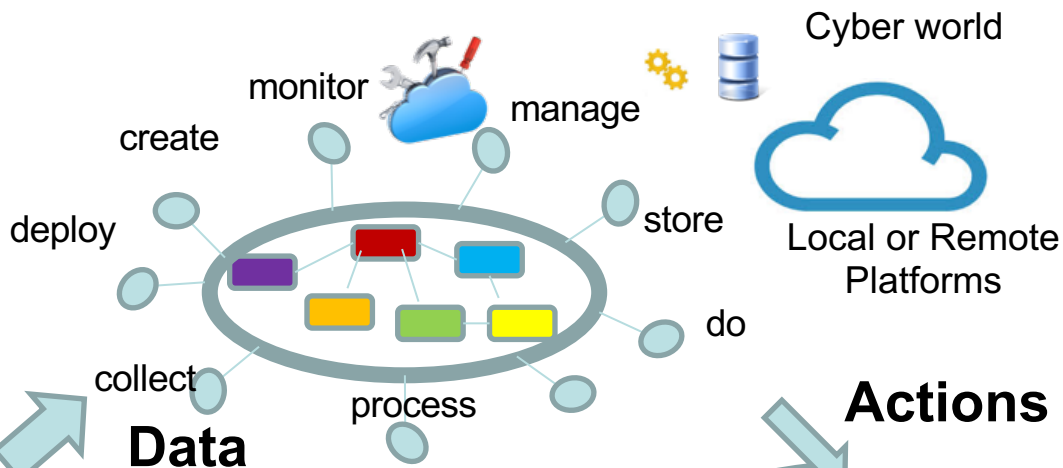
Privacy

Ensuring that the confidential data of the company, the individuals don't leak

Security

Protecting the assets against viruses, hackers, and other unwanted actions

- Dynamic construction of applications from distributed Services (local or remote)
- Taking into account non-functional requirements (locality, energy, privacy, ...)



Trusted computing base

Build on a trustable distributed meta-level "OS" ***Guardian Angel***



Company/private data



Physical world



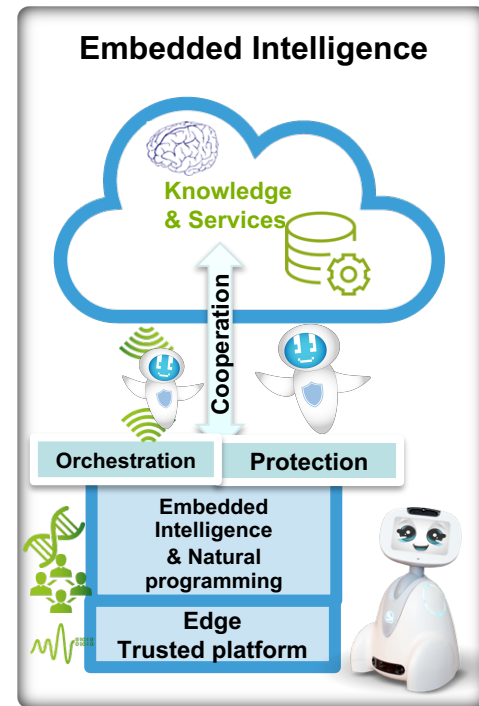
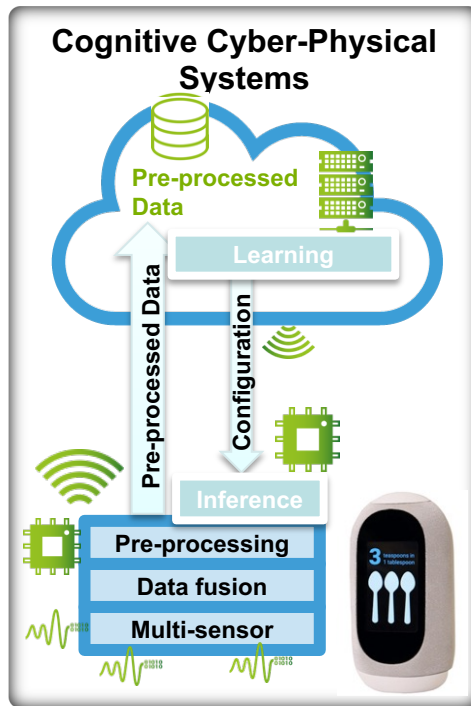
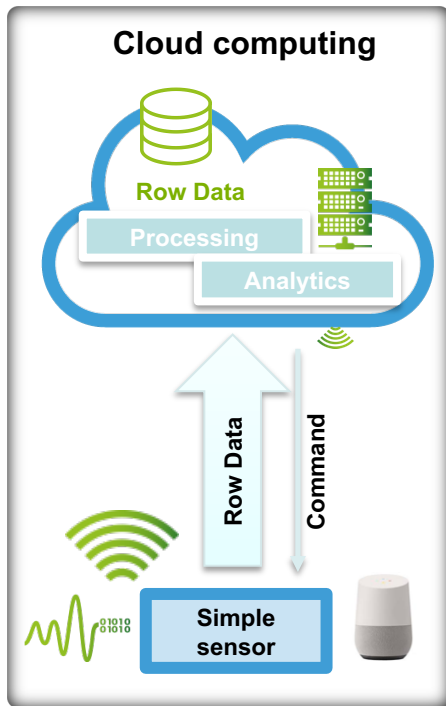
Running on edge hardware

Cross sectors, avoiding "silos"

*OS: Orchestrating System or Operating System



CONCLUSION: EVOLUTION TOWARDS EMBEDDED INTELLIGENCE ORCHESTRATED AND SECURED BY SMART ORCHESTRATORS



2021 model



Federation of Open Trustable "Guardian Angels"

SUMMARY

The evolution to “*next web*” will expose **composable services** getting their information from IoT devices and sensors, associated with **contract-based programming** approaches that will **specify functional and non-functional requirements** such as response time and latency, energy requirements, migration of the service to a local computing resource (IoT device), cost, etc.... Applications will result from the orchestration of these composable services. **Orchestrators will select services according to users’ preferences**, and will orchestrate their execution in a coherent way. The orchestrator, or **trustable distributed meta-level “OS”**, will also be in charge of **managing the in-bound (security, verification of trust) and out-bound (privacy and confidentiality) data**, acting as the “Guardian Angel” of users’ assets. The “**programming**” of this orchestrator will be done **using natural interfaces**, such as voice, drawings and schematics, or even by examples, thanks to the innovation brought about by artificial intelligence techniques.

Europe should **quickly synergize its talents in a cross-domain program** and initiate this “next web” **following European ethics** before it will be imposed on us by non-European initiatives.





Thank you

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