PERVASIVE AND EDGE COMPUTING PLATEORNS EOR

NEXT-GEN APPLICATIONS

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CLOUD COMPUTING: ENABLER OF A DIGITAL REVOLUTION

- Cloud computing is the practice of using a network of remote servers, accessed through the Internet, to store, manage, and process data, in place of a local server
 - consumers and companies can use and deploy applications without dealing with the associated complexity
- One of the most impacting paradigm shift of recent years
 - Many widely used applications and platform are now running "in the Cloud"

Storage









NEXT-GEN APPLICATIONS

- However, a large set of applications are currently left behind because are
 - dependent on on-premise infrastructures or specialized end-devices
 - too latency-sensitive or data-dependent to be moved to the PUBLIC CLOUD
- These Next Generation (Next-Gen) applications would benefit from an geographies

Even more

infrastructure with ubiquitous presence, unblocking them from fixed

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Recent studies demonstrate that the concept of EDGE COMPUTING will unlock the challenges of those applications and enable a financially safe *market roll-out*.



Edge Infrastructure

(small distributed data centers in-between devices and cloud 5-10 ms round-trip time)

Edge Devices

(near real-time local data processing, limited capabilities)



Edge Sensors & chips (data sources/collection)





- Innovative high-level application model for **Edge** applications
- Dependable, Secure, Dynamic approaches to the **Cloud-Edge continuum**
- Smart and Efficient solutions for edge resource management





RESEARCH CHALLENGES







Distributed and Decentralized algorithms tailored for the edge computing









CURRENT

- BASMATI Enhanced Application Model (BEAM)
- Genetic Cloud Brokering
- Distributed, **Cognitive**-based approach to workload distribution and orchestration
- Static Optimization Tool for Data Stream Processing Applications



ACTIVITIES

Highly active in Cloud and BigData EU projects



UNDER INVESTIGATION

- Structured Streaming at the Edge
- **Edge** Gaming
- Federated Learning for autonomous vehicles



YOUR (POTENTIAL) ROLE A FEW EXAMPLES

As a Master Student



- Cognitive approaches for edge application placement
- Distributed leader election in federated learning environments
- Smart caching systems at the edge
- Indexing & discovery of resources at the edge

As a PhD Student



- Optimisations for Streaming processing at the Edge
- Edge computing supporting personalised autonomous driving
- Efficient exploitation of GPUs and FPGAs for edge applications
- Efficient solutions for edge gaming
- Intelligent, adaptive resource orchestration at the edge



REFERENCES AND LINKS

Links

- https://kubeedge.io/
- http://unikernel.org/
- https://ai.googleblog.com/2017/04/ federated-learning-collaborative.html
- <u>https://spark.apache.org/docs/latest/</u> <u>structured-streaming-programming-</u> <u>guide.html</u>

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