Decentralized Solutions for Proximity Clouds

Cloud Computing Consultation WP 2018-2020

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Context: Centralized vs Decentralized Models

Centralized

- (Public) Cloud
- Market dominated by big players (outside Europe)
- Even though research is still possible, it is becoming a commodity

Decentralized

- Emergence of intrinsically decentralized technologies (IoT, 5G)
- Involves many actors
- Not yet well established

From Centralized to Decentralized Model

The problem

1. Needs of compute and storage resources near the data.
2. Address intrinsically decentralized systems.
3. Needs of flexibility at the edge.

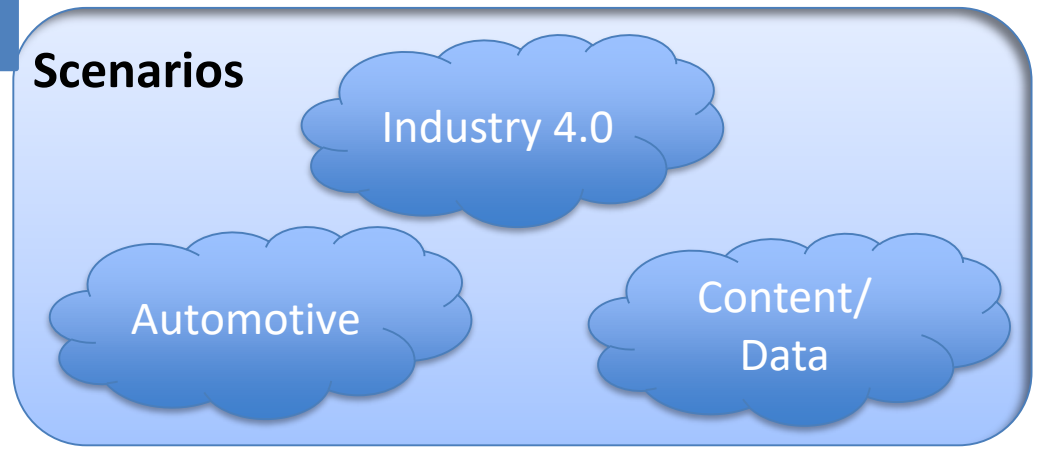
The partial solution

Fog/Edge Computing could address this

The objective

Towards a data-centric, content-centric and future network-centric approach for the Cloud Computing

Scenarios



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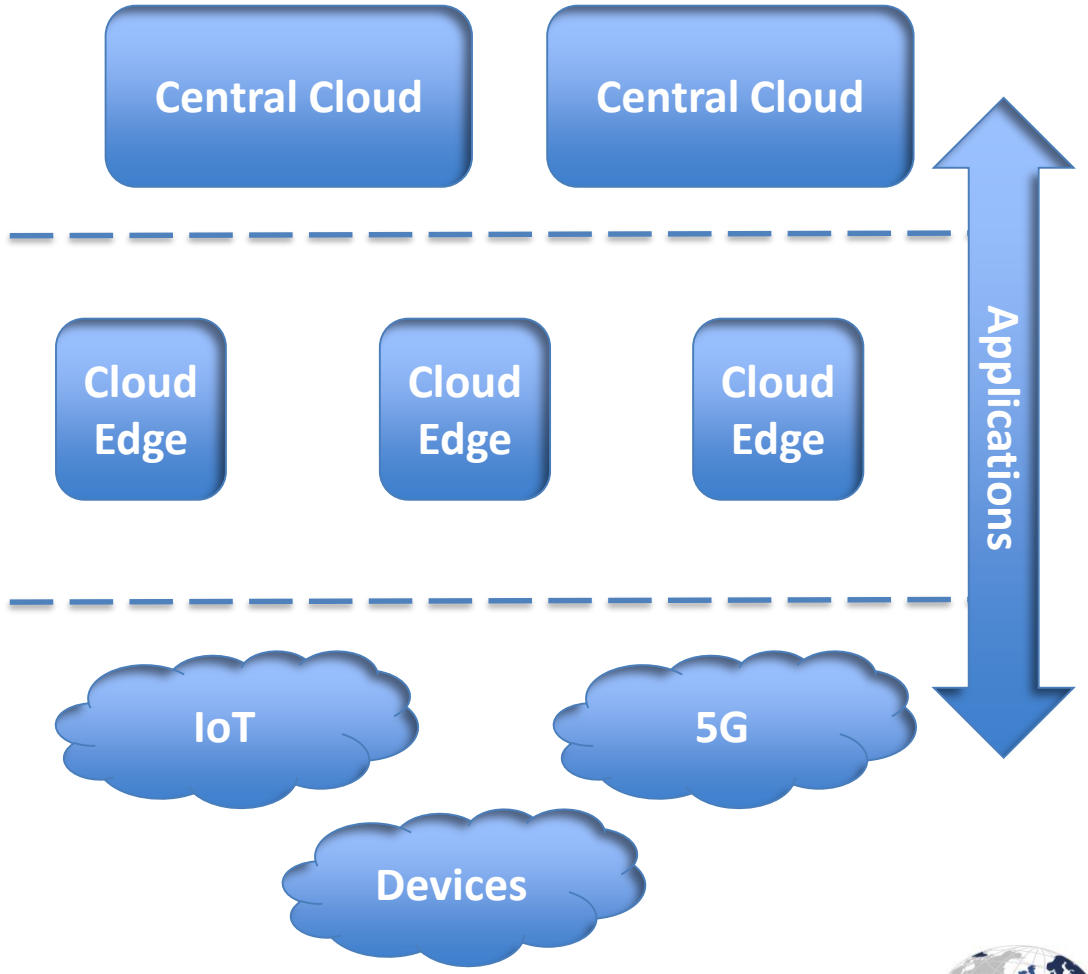
What is still missing or not properly addressed

1. Resource allocation, resource optimization and workload management/orchestration for a decentralized, heterogeneous, multi layered Cloud
2. Negotiation of resources between apps and infrastructure (proactive and autonomic not only reactive)
3. Economics and business models for decentralized, multi tenant and multi-stakeholders environments



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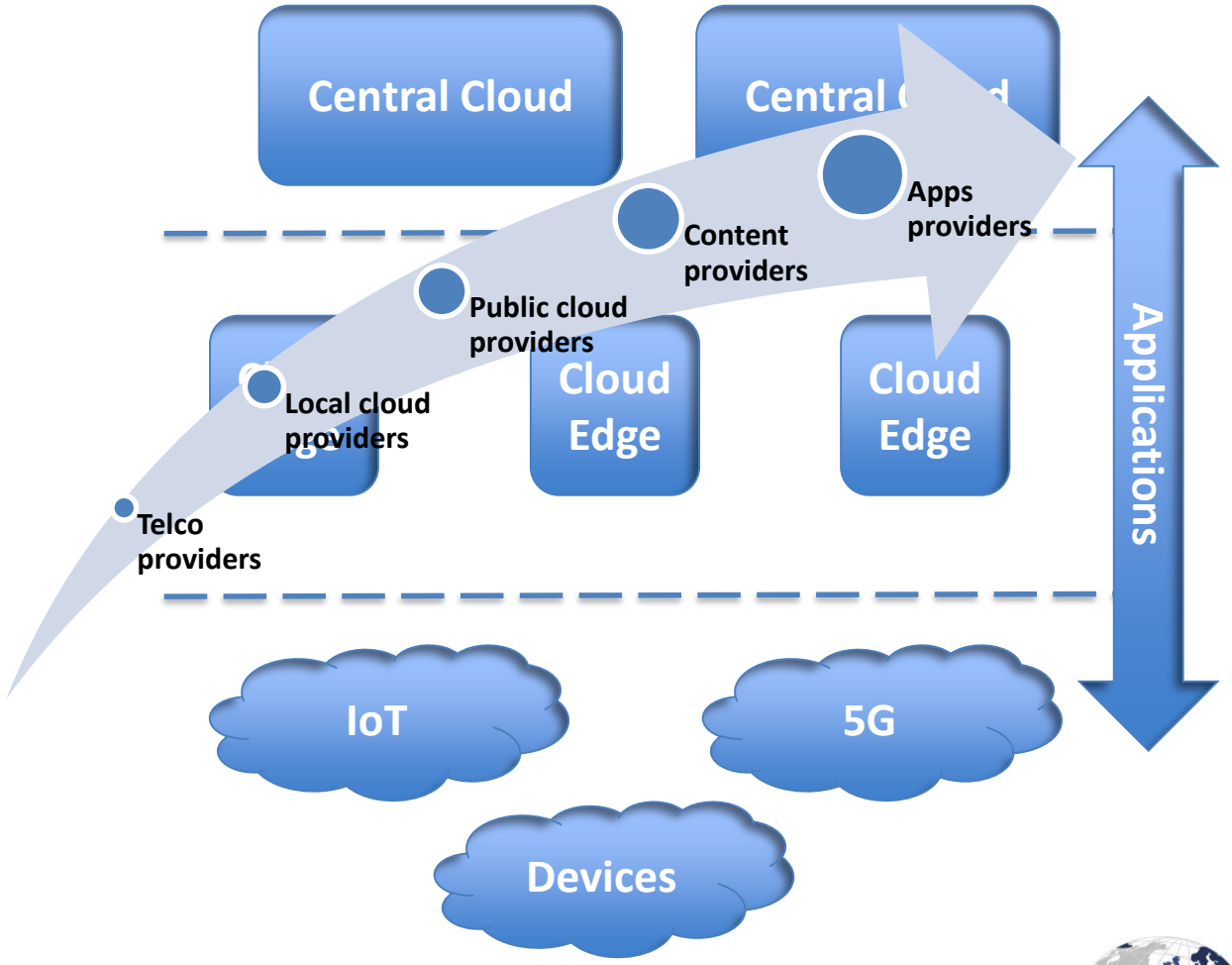

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What is needed from a research point of view

- New/enhanced infrastructural patterns beyond Fog/Edge/Dew, involving remote devices (IoT) and next generation networks (5G), managed as programmable and virtualizable components [NFV like] in a automatic and autonomic way applying concepts proper of centralized Cloud model like Infrastructure as Code
- New/enhanced software architectural patterns beyond cloud-native, microservices, serverless computing towards a world of functions/services negotiating each other resources and cooperating as “good Cloud citizens”
- Models and algorithms for modelling constraints/requirements for resource allocation, resource optimization, workload placement and pricing/billing in a decentralized, multi-tenant and multi-stakeholder environments
- Open Source platform reference implementation (and based on Open Source) supporting the integrated solution in different domains/verticals (automotive, industry 4.0, data/content distribution, tactile internet) => standardization, technology transfer.

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Expected Impact

1. Consolidate a framework for distributed, heterogeneous, decentralized and multi-layered Cloud model that covers IaaS, PaaS and economics and that enables data/content-centric and future network-centric contexts.
2. Pave the way towards new standardizations
3. Uptake of a decentralized Cloud Computing paradigm by the European industry
4. Unlock European Cloud Computing market to new stakeholders
5. Adoption of new business models by different actors




Thanks for your attention

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