

# Fostering Real Innovation in Cloud Computing

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# Think outside the box...

- Many open research questions:
  - Infrastructureless clouds
  - Very large data (countless data!)
  - Novel applications and services
  - Energy efficiency
  - Pushing the performance to the edge of the network, integrating end user devices
  - Privacy, safety and security
- Maybe redefine reliability, availability and performance for some applications?
- Novel metrics and approaches



# Example: Massively distributed mobile clouds

- End users devices together with other locally available devices (servers, PCs, sensors, smartphones) are connected to each other by means of near-field communication: NFC, Bluetooth, WLAN / Adhoc, etc.
- They build an underutilized infrastructure!
  - Free of charge
  - Zero maintenance
- Leverage this infrastructure to enable a massively distributed mobile cloud
- Various business models are possible: similar to an app



# Where does real innovation come from?

- SMEs, startups, independent developers
- Cooperation with research centers and universities
- Example: Dropbox



# New Objective

## **Objective 3: Distributed and user-centered mobile cloud computing**

### **Aim**

This objective aims to foster the innovation in the cloud computing sector. Activities should include the implementation of novel applications, services, middleware and architecture, which make explicit use of distributed heterogeneous resources (e.g. end-user devices, embedded sensors, internet of things, local computing resources, etc.). New metrics and evaluation techniques will be needed, as well as identification of novel application scenarios and services. The position of innovative SMEs in Europe should be strengthened further through this objective.

### **Why**

The current approach to cloud computing is to centralize resources and available services into large data and computation centers. While this approach is still in development itself and has already achieved great efficiency and user friendliness, it is not the only possible approach to agglomerating resources. Many others remain still under exploited, such as end user devices, locally available servers and PCs, embedded sensor devices and the internet of things.

### **What**

The following challenges need to be addressed in order to fully take advantage of distributed resources:

- Architectures and Middleware for massively distributed local cloud computing
- Communication protocols and algorithms for massively distributed local cloud computing
- Reliability and availability concepts, metrics and evaluation tools
- Application and service scenarios, including real user validation
- Modelling and simulation for highly distributed clouds
- Security and privacy