

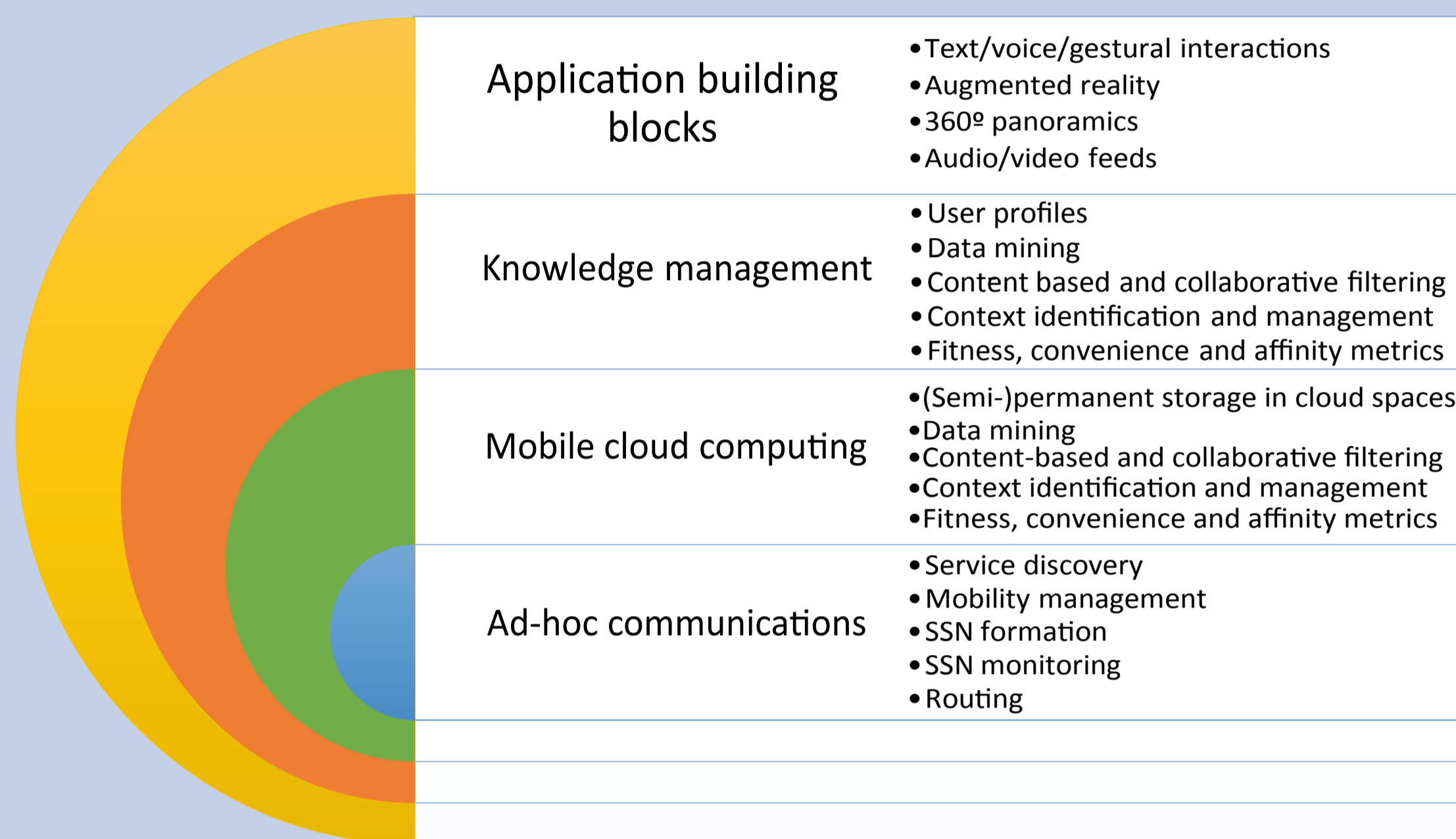
# MOBILE CLOUD COMPUTING MECHANISMS TO SUPPORT THE CREATION AND OPERATION OF INFORMATION SERVICES IN SPORADIC SOCIAL NETWORKS GROUNDED ON AD HOC COMMUNICATIONS

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## WORK MOTIVATION

- ▶ The interactions enabled by classical social networks (Facebook, Twitter, Instagram, ...) are largely confined to the virtual world of the Internet.
  - They fail to engage people in relevant interactions with other people and resources in their physical environment.
- ▶ People are getting trapped into a bubble of communication with online contacts, always with someone accessible at any time.
  - A growing phenomenon of *de-socialisation*.
- ▶ The recently-approved SPORANGIUM project (**Spanish R&D plan, ref. TIN2013-42774-R**) aims at enabling new forms of social interaction outside the bubble.



The four-layered architecture of the SPORANGIUM platform

- Developing the concept of **sporadic social networks** (SSNs) to allow individuals to make the most of the people and the resources present in their environment at any time.
- Advancing research in **mobile cloud computing** (MCC).
- Areas of application:
  - **Smart venues:** formation of groups and orchestration of activities for people with potentially-related interests.
    - E.g. in museums, concerts or camping sites.
  - **Smart cities:** better planning of personal mobility, emergency coordination, location-based urban games, timebanking, etc.
  - **Vehicular social networks:**
    - Proposed by Gerla and Kleinrock as an important niche of the Future Mobile Internet [1][2][3].
    - Vehicle encounters exhibit inherent social structure and behavior.
    - The temporal and spatial proximity of drivers and passengers may imply sporadic proximity of interests, preferences and needs.

## OBJECTIVES

▶ To develop the mechanisms of the "Mobile cloud computing" layer of the SPORANGIUM platform, allowing to share sensing, storage, computing and communication resources among connected devices in the SSNs.

- (OBJ1) Communication and coordination mechanisms among mobile devices in order to overcome the instabilities due to mobility.
- (OBJ2) Integration of several 3G/4G/Wi-Fi connections into one virtual connection with added-up bandwidth.
  - Smooth transition from ad-hoc only services to Internet-enabled ones.
- (OBJ3) Storage and computing spaces in a cloud supported by the connected devices, linked to specific devices, users or locations.
- (OBJ4) Access to high-level information from user profiles during SSN formation.
- (OBJ5) Synchronization of multiple streams of information from the connected devices.
- (OBJ6) Sensor fusion: gathering information from various sensors on multiple devices for global reading of data.
  - E.g. to achieve greater precision in outdoor/indoor location.
- (OBJ7) Supervision and enforcement of interaction patterns among users.

## RESEARCH PLAN

- ▶ The review of the state-of-the-art in the area of mobile cloud computing has been completed.
- ▶ The Ph.D. thesis has been oriented as a continuation of the doctoral work of Jack Fernando Bravo-Torres.
  - In this context, the candidate has co-authored the following publications:
    - (Related to OBJ1) "Leveraging ad-hoc networking and mobile cloud computing to exploit short-lived relationships among users on the move". In Proceedings of the International Conference on Intelligent Cloud Computing (ICC). Muscat, Oman. February 2014. To appear in Lecture Notes in Computer Science (Springer).
    - (Related to OBJ2) "VaNetLayer: A Virtualization Layer Supporting Access to Web Contents from within Vehicular Networks". In Proceedings of the International Conference on Internet of Vehicles (IOV). Beijing, China. September 2014. To appear in Journal of Computational Science (Elsevier).
  - Another contribution, related to OBJ2 and OBJ3, has just been submitted to the 3rd International Conference on Future Generation Communication Technologies (FGCT), titled "Virtualization in VANETs to Support the Vehicular Cloud - Experiments with the Network as a Service model".
- ▶ The 2014-2015 academic year will be devoted to continuing work on OBJ1, OBJ2 and OBJ3, providing the grounds to develop the remaining objectives from 2015-2016.

## RESULTS AND DISCUSSIONS

### Articles accepted for publication

- ▶ We have identified the goals to be fulfilled by a *virtualization layer to support effective communications in various types of ad-hoc networks*.
- ▶ We have contributed ideas to develop a solution *to enable individualized access to web contents from within vehicular ad-hoc networks using HTTP on top of the TCP transport protocol, AODV routing and the virtualization layer*.
  - Better performance than previous proposals in the literature, *including CarTorrent* [4], *CodeTorrent* [5] and *PassCAR* [6].

### Article submitted pending notification.

- ▶ We have made experiments with the *Network as a Service (NaaS) model*, showing that the virtualization layer can be a cornerstone to support the emerging paradigm of vehicular cloud computing (VCC), with mobile nodes getting data from the Internet not only through (nearby or distant) WiFi access points, but also through shared cellular connections.
  - Better performance than *VehiCloud* [7].

## NEXT YEAR PLANNING

- ▶ During the 2014-2015 academic year, the candidate will seek to further develop the concepts of Mobile Cloud Computing with regard to applications of Sporadic Social Networks.
  - The focus will be put on objectives OBJ1, OBJ2 and OBJ3.
- ▶ The candidate is currently recruiting students from Universidad Politécnica Salesiana (Cuenca, Ecuador) to carry out implementation works aimed at creating a simulator of SSNs in smart venues and smart cities, which should be ready by June 2015.
- ▶ The candidate is also seeking to make a short research stay (up to 2 months) in the University of Vigo, most probably during the first trimester of 2015.
- ▶ At least two conference publications and one SCI journal article will be pursued.

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