

# m:Ciudad: An Infrastructure for Creation and Sharing of End User Generated Microservices

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**Abstract.** We present an infrastructure for the creation and sharing of end-user generated microservices. Main elements of the conceived semantic microservice model, the microservice lifecycle and a high-level architectural view of the m:Ciudad infrastructure are discussed.

## 1 Introduction

m:Ciudad<sup>1</sup> is a service architecture, a set of mobile tools and a platform to allow users to create focused, knowledge-based mobile microservices, also referred to as m:Ciudad U+ Services. U+ services will be small, sharply focused applications with their own graphical user interface, which allow users to obtain and provide information – like opinions, recommendation, location or speed – to fellow users. U+ services will be created and consumed by end users using only their own mobile terminals, encouraging spontaneous and inspired on-the-go creation. U+ services will be shareable and downloadable in order to allow every end user – with a potential for SMEs to act as such – to become a U+ service generator and provider. Therefore, flexible business models will be implemented to reward U+ service generators and users who provide valuable information using U+ services.

This paper presents the basics of the m:Ciudad’s infrastructure for microservices and is structured as follows: In Section 2, we describe the higher levels of the microservice model. Section 3 illustrates the typical microservice usage and lifecycle. Finally, an architectural view of the system is shown in Section 4.

## 2 Semantic Microservice Model

The semantic microservice model of m:Ciudad follows the Model-View-Controller (MVC) architectural pattern, thus separating data and logic from the actual representation. Our model foresees fine-grained semantic annotations (metadata and other

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<sup>1</sup> m:Ciudad – A metropolis of ubiquitous mobile services: <http://mciudad-fp7.org>

semantic formalisms) on different service layers to facilitate efficient service composition, re-usability and meaningful, accurate search results.

Figure 1 illustrates the main elements of the microservice model. Within m:Ciudad, content refers to a collection of metadata-enhanced content items (e.g., tagged blog entries, images, etc.). The service logic comprises semantically annotated functional elements and directly controls the content and the presentation layer, which ultimately retrieves and presents the service content. Finally, each microservice contains global metadata that are usually service instance specific.

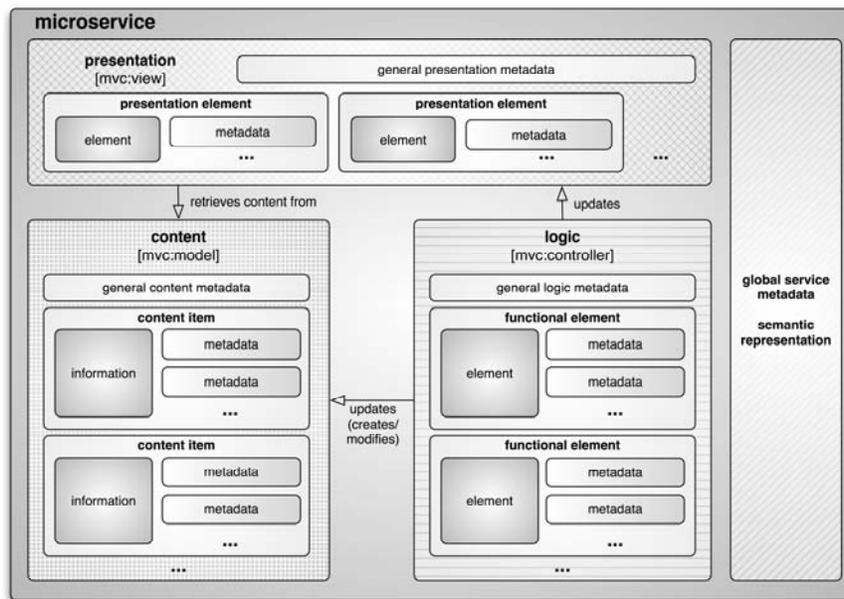


Figure 1: Model of a Microservice

### 3 Microservice Lifecycle

Figure 2 depicts the different stages in the lifecycle of a U+ service, from the different viewpoints of the creator, the provider or the user of a service.

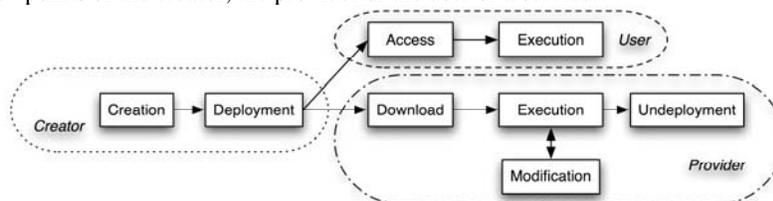
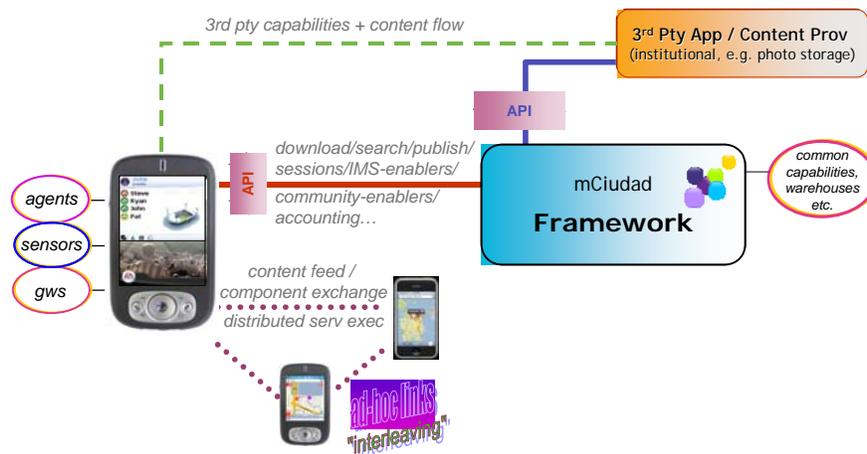


Figure 2: Lifecycle of a Microservice

## 4 Architectural View

Figure 3 depicts a high level overview of the m:Ciudad system. The core of the system consists of a set of mobile devices which exchange volatile micro-services (or their components) and associated knowledge/content. This is a structured interleaving array of devices for spontaneous U+ service creation, execution and consumption (exchange of valuable information). A mobile device can be in a provider or consumer role, or both, for any particular service instance. The user's mobile device could be linked up with particular agents, sensors, gateways or proxies (adjacent or distant), executing specific functionality, such as camera, geo-positioning appliance, speedometer, temperature sensor, NFC (Near Field Communication) module, notification broker, HTTP/SIP gateway, etc.



**Figure 3: A High Level Architectural View of the m:Ciudad Infrastructure**

In order to make U+ services searchable and shareable, so that users can discover and access relevant knowledge sources, certain common capabilities for the m:Ciudad system are needed, such as ontological models of U+ service descriptions, knowledge and service warehouses, a component repository, authentication service, etc. These common capabilities are denoted as the m:Ciudad Framework.

**Acknowledgements** This work has been supported by the European Commission, ICT FP7 Collaborative Project m:Ciudad. The Telecommunications Research Center Vienna (ftw.) is supported by the Austrian government and the City of Vienna within the competence center program COMET.