



ALMANAC

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Welcome to the ALMANAC project



Dear Reader, on behalf of the ALMANAC Consortium, I would like to welcome you to our first newsletter. ALMANAC is a three-year research project started in 2013, co-funded by the European Commission under the Seventh Framework Programme for research, technological development and demonstration, addressing the objective ICT-2013.1.4: A reliable, smart and secure Internet of Things for Smart Cities.

According to the United Nations, in 2008, half of the world's population was living in urban areas. This fact forced the world to take a closer look into the planning and management of cities, and into reevaluating and reformulating already existing city management schemes. In this sense, the ALMANAC project aims to integrate the Internet of Things (IoT) into the development of a Smart City Platform (SCP) that will allow for greener and more sustainable cities.

The City of Turin in northern Italy will be showcased in ALMANAC, which means facing the challenge of finding synergies among the city services, infrastructure and resources to overcome the traditional segmentation of utilities. As a result, ALMANAC will provide integrated and cost-effective smart services to the citizens of Turin through the development of the ALMANAC SCP. The platform will collect, aggregate, and analyse real-time data from heterogeneous sensors and actuators to support Smart City processes, enabling interoperability among heterogeneous devices, resources and services.

The ALMANAC project will contribute with three city domain applications: One for waste management, another for water supply and a third one focusing on citizen engagement. The definition and implementation of all of these applications face challenges both of technical and socio-economical nature which is why, in ALMANAC, technology is developed with a business model-driven approach, by first analysing the needs of all stakeholders involved, then deriving the corresponding requirements, and finally developing the appropriate technological solutions. At last, ALMANAC will deploy a real-life system pilot on the City of Turin to validate both the developed platform and the corresponding business models.

This newsletter describes some findings from the processes that we have gone through during our initial work. We first give some insights into the scenarios for the Smart City applications: Waste, water and citizen engagement, and then present an outlook of the initial work we have made on the ALMANAC architecture and the applications.

We would like to end by inviting you to meet ALMANAC at the IoT Week that will be held in London from 17th to 20th June.

Enjoy the reading!

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Scenarios for Smart City applications

Through a series of scenario workshops, field visits and interviews, ALMANAC has begun the process of deriving use cases and requirements for a Smart City Platform. Focus is on waste management, water supply and citizen engagement in the City of Turin.

Sensors on waste bins communicating when they are full. Citizens reporting abandoned waste via apps on their mobile phone. All this information automatically fed into the collection route of the waste lorry for optimal service and efficiency.

These are some of the scenario descriptions for waste management that ALMANAC is working on in the process of developing a Smart City Platform which can optimize existing city processes by collecting and analyzing real-time data from physical sensors and actuators and make them available to users as web-

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Meet ALMANAC

IoT Week

16-20 June, London, UK

The IoT Week is an annual event which attracts industry and academia from around the world focusing on the opportunities inherent in IoT, connecting global business and research communities for collaboration as well as addressing societal and market issues. ALMANAC will exhibit at the conference and lead a workshop with the title: IoT Technologies for Smart Cities: Enabling business and professional services.

IFIP Trust Management Conference

7-10 July 2014, Singapore

IFIPTM 2014 is the 8th International Conference on Trust Management under the auspices of IFIP - International Federation for Information Processing. The mission of the conference is to share research solutions to problems of Trust and Trust management, and to identify new issues and directions for future research and development work. Partners FIT have submitted a conference paper with the title: *TrustMUSE: A Model-Driven Approach for Trust Management* which has been accepted.

Deliverables released

The following deliverables have been completed:

- D1.1 Project Quality and Risk Management Plan (restricted)
- D1.3 Plan for Managing Knowledge and Intellectual Property (confidential)
- D2.1 Scenarios for Smart City applications (public)
- D3.1.1 System Architecture Analysis & Design Specification 1 (public)
- D7.1 Test And Integration Plan (public)
- D9.1 Project website

services.

Besides scenarios for smart water management, visions for water supply and citizen engagement have been described based on the City of Turin. The emphasis is on the ability to aggregate, analyze and forecast water consumption as well as on engaging citizens both on street level and via collective awareness platforms thereby motivating people to be more environmentally conscious.

Waste, water and citizens

The main focus for waste management is the optimization of waste handling and waste collection in the City of Turin. Sensors placed on the waste bins can communicate to the waste collection planning system when a waste bin is getting full. And pictures from citizens of uncollected or abandoned waste are automatically fed into the collection route.

- The communication between sensors and the planning system enables a more efficient route planning that can save money and resources, while at the same time creating a better, more livable city for the citizens, who can quickly report abandoned waste through a mobile app and follow the state of issues reported as they are being solved, explains anthropologist Mia Kruse Rasmussen from the Alexandra Institute, who leads the work on developing applications and prototypes for the Turin pilot.



In terms of water supply, the aim is to optimize the water supply system based again on the collecting of real-time data that can be used to show and forecast consumption and detect problem areas. The availability of data also triggers the possibility of developing new customer services:

- A smart metering solution will enable the water utility to optimize the internal workflow, however, data collected via the ALMANAC platform could also be made available to developers to create new services that provide private consumers with data about their consumption or offer monitoring services such as leakage detection.

Central to the optimization of the city infrastructure is the interaction of citizens where the goal is to inspire and enable citizens to take part in the development of their city both at street level and at home.

Two examples which call for an increased citizen engagement are the poor quality of recyclable waste from street waste bins and waste abandonment which are prominent issues in some city areas of Turin.

- One engagement path could be to create situational awareness of the problem areas based on the data collected and then establish a collective awareness platform gathering all discussions and inviting people into dialogue and possible solutions, Mia Kruse Rasmussen says.

The need for smart city technology

With the increase of urbanization and climate problems, cities are pushed to seek new solutions to well known challenges like citizen engagement, energy, mobility, waste and water. And here, ICT and IoT technologies play central roles.

- Business as usual is no longer viable when it comes to creating smart livable cities of the future. There is a great need for multifunctional solutions that cut across domains and provide new ways to develop and maintain city infrastructure. The ALMANAC Smart City Platform provides a holistic solution which meets the smart city demands for technology to be integrated, Mia Kruse Rasmussen says.

Even though the development and validation of the ALMANAC Smart City Platform is centred on the City of Turin, the technology will be structured so that it can be easily extendable to other cities and domains.

You can read more about the scenarios in the deliverable *D2.1 Scenarios for Smart City applications* which will be available for download after it has been approved by the European Commission in November 2014.

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The ALMANAC architecture - hosting a variety of Smart City applications

The ALMANAC architecture provides a Smart City Platform structure based on services such as interoperability, virtualization, data management and privacy policies.

Public deliverables can be downloaded from the project website after they have been reviewed and approved by the EC:

www.almanac-project.eu

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The ALMANAC project is co-funded by the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 609081, objective ICT-2013.1.4 'A reliable, smart and secure Internet of Things for Smart Cities'. Duration: 1st September 2013 to 31st August 2016.

Read more at:

www.almanac-project.eu

The starting point for ALMANAC is to develop a platform on top of which a number of smart city applications can be deployed. The platform provides services such as management of public and private network access through Telco M2M infrastructure; common abstraction of resources such as devices, systems and services; handling of latest and historical values of heterogeneous information sources, and reuse of data models provided by individual applications. The ALMANAC architecture has been designed to emphasise these services and will be demonstrated through the selected applications: Waste management, water management and citizen engagement.

Defining the architecture

The process of defining the architecture was based on two principles: Existing technologies and generic platform services.

- First, each project partner brought in technologies and software that they developed over a number of outstanding EU projects and which provided sound services to build upon. Secondly, since the aim of the ALMANAC project is to provide an environment that hosts a variety of applications running on top of it, we needed a way to regularly remind us to distinguish between specific application implementations and platform services. The manifestations of these principles are the bottom-up approach that initiated our architecture definition process, while the scenario thinking and use case driven approaches can rather be seen as top-down thinking, explains Mark Vinkovits, M.Sc. from Fraunhofer Institute For Applied Information Technology, who is in charge of leading the development of the architecture.

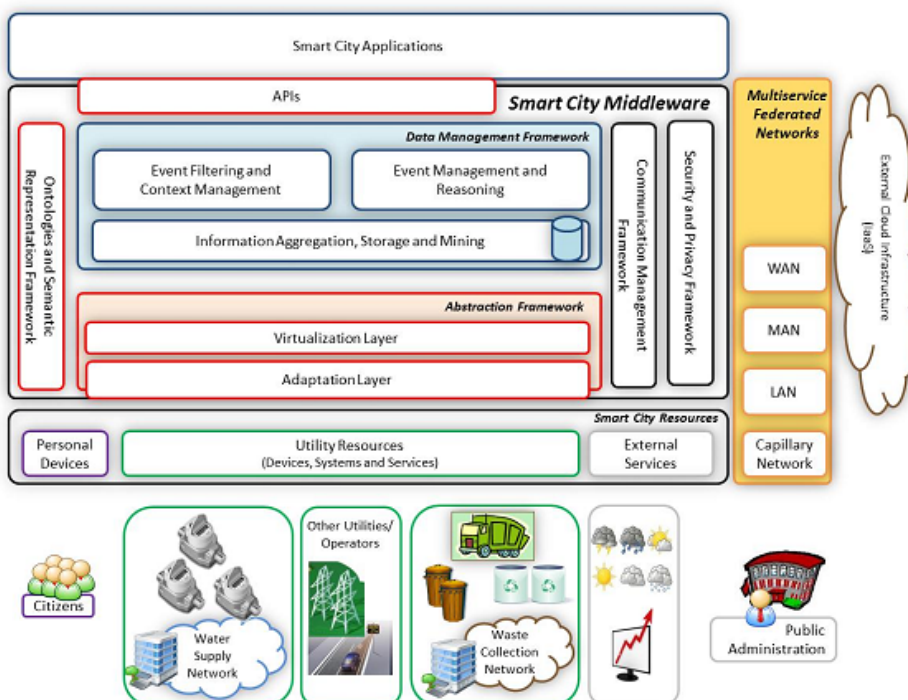
The result of the process was the identification of four main services that the platform should provide. Mark Vinkovits explains:

Interoperability of devices: Enabled by the Smart City Resources Adaptation Layer, applications can access any kind of devices, whichever proprietary protocol they may speak, over a uniform web-service based interface. Additionally to this service, the layer exploits any kind of meta- and semantic information of appearing devices and feeds them into the Virtualization Layer.

Virtual services: Enabled by the Virtualization Layer, the applications relying on the middleware do not have to know where the services or devices they consume are placed, or whether they actually exist. The Virtualization Layer provides service look-up mechanisms that bridge physical network boundaries, or can even wrap arbitrary data-sets – like historic measurements or cached values – as consumable services.

Composition of rules and caching of data: There are multiple scenarios where applications are not interested in current device values but would rather like to be informed if specific thresholds are met, or see trends for particular intervals. This capability is provided by the Data Management entity. The component directly grabs data coming from devices and by parsing and indexing it, enables later complex querying. The rules or mechanisms that the Data Management entity should execute are either specified directly by applications, or indirectly through the Virtualization Layer.

Privacy policies: While mainly required by providers of services and data sets, applications can also greatly benefit from knowing that they cannot run into the threat of invading privacy of the individual services they consume. Service and device providers individually define policies regarding data they provide; these policies are enforced through multiple Policy Enforcement Points throughout the platform, thereby enabling applications to access only the data and functionalities for which they have explicit access rights.



How applications benefit from the platform services

To clarify the operation of the individual components within the architecture, ALMANAC partners identified a number of technical use cases. They are intended to reflect typical applications of the ALMANAC platform, thereby specifying in more detail how users and applications are to interact with the platform. The use cases contain the following as described by Mark Vinkovits:

The first technical use case concerns *data collection and rule based notification*. It is a description of how aggregation of real-time data flows can be configured to derive additional information, and how an end user application may describe the conditions for when it wants to be notified about changes in this information. It also describes the way that the system does rule-based notification events to clients, smart city applications or semantic IoT resources.

A second use case involves *historic data aggregation and reasoning*. When data is reported from IoT devices or generated by semantic IoT resources, the data may be stored locally to allow rules to be able to process historical data. However, local cache is typically for short time periods. This scenario describes how data for sensors is stored and accessed in the system in a scalable way and how historical data is accessed for querying and reasoning.

Another use case is about *smart city resource registration*. It shows how a new physical resource joins the network and how it is discovered and registered by the Adaption Layer. The layer uses designated drivers for individual device types, exposes them as Representational state transfer (REST) service, and informs the Virtualization Layer and Data Management of the capabilities of the new resource.

End-user data access is a fourth use case describing the authentication of users accessing a personal profile or data. In this use case, ALMANAC matches the user identity with his or hers personal consumption monitoring devices (e.g. the water meter provided by the water utility). Thanks to this mapping, the user can retrieve own consumption and benchmark it against the average consumption of the city.

The first year applications will mainly concentrate on the data gathering aspects of the ALMANAC platform. Therefore, waste and water management applications mainly benefit from the easy integration of data sources into the platform without significant changes to previous hardware and software applied in these domains. Additionally, citizens will be able to use their mobile devices to provide additional input on these domains, and also, by means of the Virtualization Layer, access measurements through the cloud and review them in a formatted way.

More on the initial ALMANAC architecture and the methodologies can be found in the deliverable *D3.1.1 System Architecture Analysis and Design Specification 1* which will become available on the project website once it has been approved by the EC in November 2014.

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ALMANAC at the IoT Week 17-20 June

Visit the ALMANAC stand and join us for a session on IoT Technologies for Smart Cities.

The IoT Week is an annual event which attracts industry and academia from around the world focusing on the opportunities inherent in IoT, connecting global business and research communities for collaboration as well as addressing societal and market issues.

ALMANAC will exhibit at the conference where you can see our initial work being demonstrated. In the ALMANAC workshop on 18th June, it is possible to engage in the discussions on IoT technologies for Smart Cities focusing on the change from technological novelty to prominent business takeover in IoT solutions for Smart Cities and the opportunities as well as pitfalls in this future uptake.

The IoT Week will be held at the Grange Tower Bridge Hotel in London. You can find more information as well as registration details on the [IoT Week website](#).

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You're receiving this new newsletter because you have been in contact with one or more of the ALMANAC partners.

We thought you might be interested in following the progress of the project.

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