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Abstract	This document provides an overview of the planned R&D achievements focusing on the first 9 months of activity
Keywords	Technical Roadmap, Agile, Epics, FIWARE

Document Revision History

Version	Date	Description of change	List of contributor(s)
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V0.2	13/11/2016	Version ready for comments and integration by partners.	Federico M. Facca (MARTEL)
V0.3	23/11/2016	Integration of contributions from partners plus minor adjustments.	Tomas Aliaga (MARTEL)
V0.4	28/11/2016	Add clarification on releases and sprints.	Tomas Aliaga (MARTEL), Silvio Cretti (CREATE-NET)

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* R: Document, report (excluding the periodic and final reports)

DEM: Demonstrator, pilot, prototype, plan designs

DEC: Websites, patents filing, press & media actions, videos, etc.

OTHER: Software, technical diagram, etc.

EXECUTIVE SUMMARY

SmartSDK is the FIWARE's "cookbook" for developing smart applications in the Smart City, Smart Healthcare, and Smart Security domains. Concretely this means that SmartSDK refines, combines and develops new FIWARE GEs and FIWARE Data Models into a set of well-codified and ready to use solutions. This is very important to facilitate the take up of FIWARE by new developers and its transition from proof of concepts environment to productions ones.

This document presents the initial roadmap of R&D activities defined in the first design sprint held between September and October 2016. It also highlights which of those will be prioritised to be developed for the first and second releases of SmartSDK (expected around February and May 2017 respectively). Full documentation of stories and features is left in the Agile management tool (JIRA) for the interested readers.

Work for the first two releases will focus on assembling a minimal set of working functionalities for the three scenarios and applications prioritised in the following three domains:

- Smart City Mobility
- Smart Security in parking and buildings
- Smart Health care through mobile sensing

Also, activities for the SmartSDK platform and its contributions to the FIWARE Community will be focused on:

- Providing a first integrated release of the SmartSDK Platform Manager
- Developing a set of basic recipes for the deployment of FIWARE Data and IoT management architecture into production (based on key cloud patterns)
- Providing additional functionalities to the Data Management stack allowing for easy development of NGSI mobile application and usage of time series
- Integrating Cloudino¹ in the FIWARE-ready programme and enhancing its capabilities, including edge storage and connectivity beyond WIFI

The next release of this document (May 2017) will refine the Epics and priorities according to the evolution on the project and requirements in the application scenarios.

¹ <http://cloudino.io>

1. INTRODUCTION

This document presents the current status of the SmartSDK R&D roadmap with the aim to highlight the planned contributions to the FIWARE Open Source Community.

The roadmap is not set in stone and it will evolve throughout the lifespan of the project according to the different technical and non-technical aspects that influence the project: e.g. needs of the application scenarios, community relevance of the outcomes, available resources, and so on.

This first release of the SmartSDK Roadmap presented in this document is based on the initial activities defined through the Agile R&D methodology². The document is not meant to be a detailed discussion of the identified epics, features and user stories. Those are detailed in JIRA following FIWARE Community best practises³ and will evolve at each sprint (particularly user stories).

This deliverable focuses instead on providing a high-level picture of R&D plans of SmartSDK, including priorities for the upcoming months, in order to:

- Guide the SmartSDK developers in the R&D activities by keeping in mind main outcomes expected by May 2017.
- Provide hints to the wider FIWARE Community of SmartSDK plans, so as to favour the establishment of collaborations.

1.1. Concept

SmartSDK is the FIWARE's "cookbook" for developing smart applications in the Smart City, Smart Healthcare, and Smart Security domains. SmartSDK is looking into applications developed so far within Europe and Mexico (using FIWARE or alternative Open Source technologies), analysing them and making a cookbook for developing applications in the Smart City, Smart Healthcare, and Smart Security domains.

The "cookbook" is based on: a set of architecture patterns (i.e. the basic cooking processes), a set of Generic Enablers (i.e. the basic ingredients) and a set of data models (i.e. the spices and flavours binding the ingredients through the cooking process).

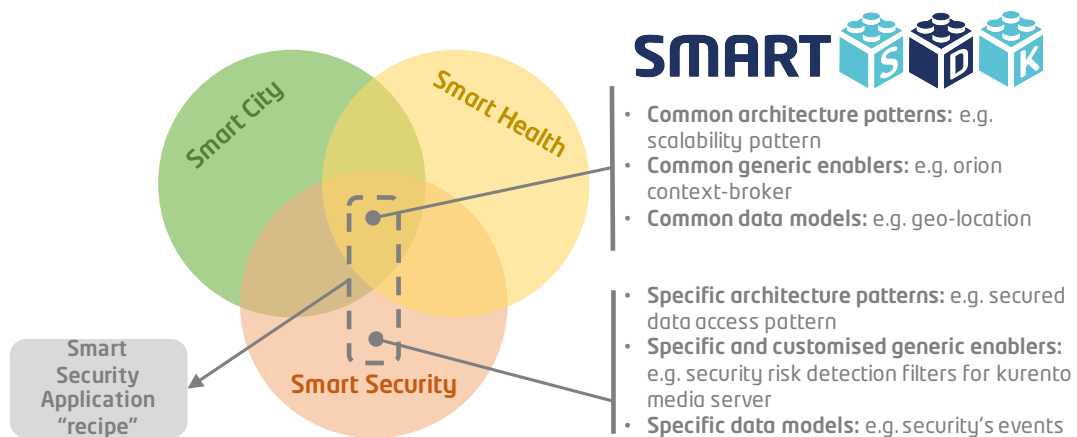


Figure 1. SmartSDK's cookbook concept.

² The methodology and tools are documented in D5.1: Quality Assurance Guidelines [2]. Appendix A of this document includes a summary of the methodology for the sake of the reader, given that D5.1 is a confidential document.

³ <https://jira.fiware.org/projects/SMAR>

Cookbooks often include a set of basic recipes that act as a common basis for different dishes. Similarly, SmartSDK will include as well basic patterns, Enablers and data models that can be used for the development of data-intensive and IoT-based Smart applications and extend and complement them with specific patterns, Enablers and data models that are useful in the context of Smart City, Smart Healthcare, and Smart Security domains.

1.2. Overall architecture

SmartSDK will base its architecture on the FIWARE Reference Architecture and extend it to its wider scope. The core of the system supporting the deployment, management and monitoring of Smart applications is the SmartSDK Platform Manager.

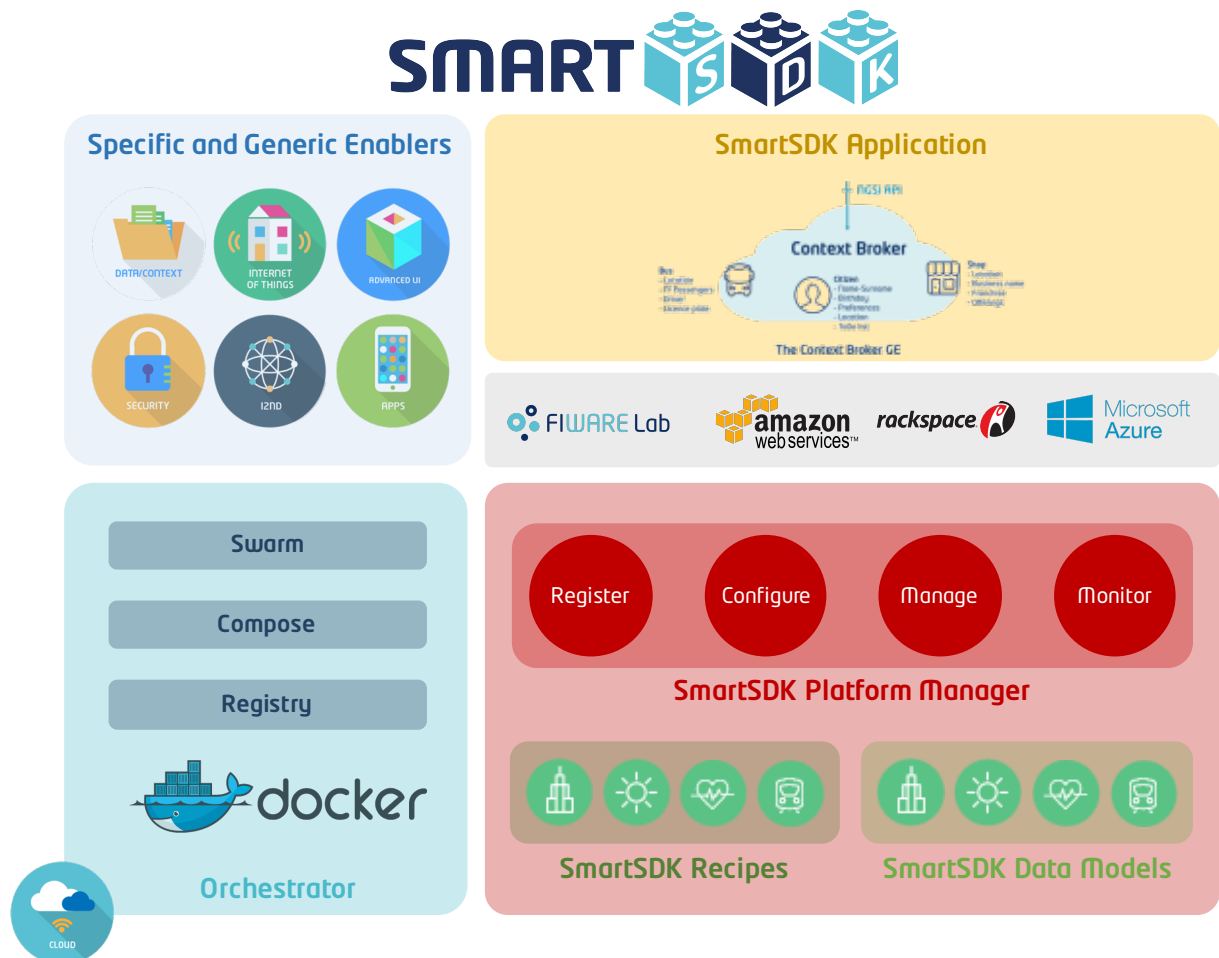


Figure 2. SmartSDK Architecture.

The SmartSDK Platform Manager will allow registering and maintaining the SmartSDK Recipes and SmartSDK Data Models:

- SmartSDK Recipes describe reference architectures for the application domains covered in the project and link them with Data Models. The recipes include relations among the Enablers and leverage on cloud patterns and typical FIWARE patterns for data-intensive and IoT-based applications.
- SmartSDK Data Models are NGSI-based information models defined to support the exchange of data in data-intensive and IoT-based applications in the domains covered in the project.

Recipes will be described using Docker Compose file descriptors or similar solutions (e.g. Kubernetes

PODs descriptions) following the orientation that the FIWARE Cloud Hosting Chapter will take on containers orchestration.

Developers will be able to select a SmartSDK Recipe from a dashboard and provide configuration parameters for the deployment and dynamic self-configuration of their Smart application.

The SmartSDK Platform Manager will deploy and manage configured Smart applications through the FIWARE Cloud Hosting Generic Enablers, for example, leveraging on the Docker GE.

Through the SmartSDK Platform Manager users will be able to control the status of their Smart applications, and re-configure them and eventually re-deploy them (e.g. on different hosting solution from FIWARE Lab, including commercial FIWARE providers or alternative commercial cloud providers).

Beyond the core of the system, SmartSDK Recipes and SmartSDK Data Models, SmartSDK will provide new Enablers and enhanced ones. These contributions will be derived also from the experience developing the trial applications, as presented in the following section.

2. APPLICATIONS

SmartSDK will deliver not only recipes but also trials related to three application domains, namely, Smart City, Smart Security and Smart Healthcare. This section presents the main planned Epics for each of those application domains.

2.1. Smart City

The application developed in the Smart City domain will focus on supporting the citizen mobility in high polluted cities, like Mexico City, with the aim of improving the life quality of citizens and fostering environmental friendly behaviours by citizens. The end-user perspective is shortly summarised below.

Iker is a 35-year-old man living in an overpopulated city. Every day he spends around 45 minutes to go by car from his home to the factory where he works, which requires crossing a central and busy commercial avenue. In rainy days or days with heavy traffic, Iker might spend more than one hour and a half to reach his workplace. Due to his health conditions, he usually suffers severe asthmatic attacks on his path. To avoid such traffic conditions plus the excessive amount of time spent driving, Iker would rather know the best itinerary considering the real-time traffic, before he would have left his house.

2.1.1. Epics

To support the aforementioned scenario, during the first design sprint (Sprint 0, September – October 2016), the owners of the Smart City scenario identified the following Epics. Those in bold will be prioritized up to May 2017.

- **User profile management**
- Vehicle profile management
- **Alerts management**
- **Maps management**
- Route management
- Data context management (rain, high-level pollution, pollen, traffic congestion)
- IoT Management (update information in the sensors & configuration parameters)

The development of features and user stories related to epics identified in the “Sprint 0” foresees the first release including a minimal set of functionalities (end of January 2017) to be enriched by the second release (by May 2017).

2.1.2. Key Used FIWARE Enablers

- Orion Context Broker
- Cosmos Big Data
- IoT Agent

2.1.3. Contributions to the FIWARE Community

The main contributions to the FIWARE Community from this activity will be:

- Enhanced data models and usage example (Alarms, Environment, Vehicle, Weather)⁴
- New data models and usage example based on standards not yet covered in FIWARE (e.g. Open511⁵)
- Example of open application to be replicated easily in different cities.
- DIY instructions for creating a FIWARE-ready environment sensing gateway.

2.2. Smart Security

The application developed in SmartSDK will focus on supporting detection of security risk in parkings and buildings through the combination of cameras and mobile sensors. The end-user perspective is shortly summarised below.

Toño is a security guard who is in charge of the security of the university in which there are many video-surveillance cameras. He can watch all the cameras in the control room; but it is almost impossible to keep track of all of them. Toño would like to have a system that can notify him when something “strange” happens. The system should send an alarm when an event happens and also highlight it in the corresponding screen, indicating the type of event, location and context. Sometimes the events are so complex that the system cannot define them, so Toño also needs that the system stores the relevant information for later retrieval and investigation in a simple and useful manner.

2.2.1. Epics

To support the former scenario, in the first design sprint (Sprint 0, September – October 2016), the owners of the Smart Security scenario identified the following Epics. Those in bold will be prioritized up to May 2017.

- **Surveillance Data Management:** Retrieve and manage information coming from the video-surveillance cameras and other sensors (cell phones). This includes storage (at different levels), pre-processing and labeling relevant data for further analysis and retrieval.
- Pattern Recognition: Recognize different elements inside video streaming such as people, cars and objects
- Building surveillance: Detect anomaly behavior in buildings (interior and exterior) focusing on people and some objects (i.e. left unattended) based on video cameras. Parking lot surveillance (detect anomaly behaviour in parking lots)
- Notification management: Notify the operator of relevant events based on the anomaly detection, and inference using the ontology. This includes the development of a user interface for different devices (computers, smart phones)

The development of features and user stories related to epics identified in the “Sprint 0” foresees the first release including a minimal set of functionalities (end of January 2017) to be enriched by the second release (by May 2017).

⁴ <https://www.fiware.org/data-models/>

⁵ <http://www.open511.org>

2.2.2. Key Used FIWARE Enablers

- Kurento
- IoT Agent
- Orion Context Broker
- CEP
- Cosmos

2.2.3. Contributions to the FIWARE Community

The main contributions to the FIWARE Community from this activity will be:

- Enhanced data models and usage example (Alarms, Parking, Vehicle)⁶
- New data models and usage example related to Security
- New filters for Kurento to detect objects and vehicles in the context of parking and buildings.
- Example of open application to be replicated easily in different security trials.

2.3. Smart Health

The Smart Health application will focus on collecting and analysing data about people behaviour through mobile sensors. The goal is to understand people activities and how their behaviour influence health so as to promote appropriate changes in their lifestyle and improve their health.

Alejandra is 60 years, she is retired and lives with her daughter Mary of 25 years. Mary is very concerned about the health of her mother after her last surgery but she cannot monitor her mother daily progresses and health while she is at work. She normally relies on the neighbours to check after her mother. But she heard that nowadays many sensors are available on the market to monitor health conditions and activity of people, so she wonders if with such sensors it would be possible to check after her mother without the help of neighbours.

2.3.1. Epics

To support the above scenario, in the first design sprint (Sprint 0, September – October 2016), the owners of the Smart Health scenario identified the following Epics. Those in bold will be prioritized up to May 2017.

- **As a user interested in monitoring my health I want to upload information gathered from several sensors I wear in my environment, so I can monitor my well being.**
- **As a healthcare specialist, I would like to use a dashboard to monitor activities and behavioral patterns of my patients in different time spans, either individually or as a group.**
- As a healthcare researcher I want to analyze longitudinal behavioral data stored in a mobile sensing repository. For this I create a dataset harmonizing information from several studies, so that the results I obtain are generalizable to different populations.

⁶ <https://www.fiware.org/data-models/>

- As the responsible for the mobile sensing study I monitor the information uploaded by the participants to make sure it is complete, and if required I communicate with them to make sure he has the software properly installed and it is being used correctly.

The development of features and user stories related to epics identified in the “Sprint 0” foresees the first release including a minimal set of functionalities (end of January 2017) to be enriched by the second release (by May 2017).

2.3.2. Key Used FIWARE Enablers

- Cosmos
- Context Broker
- IoT Agent
- Keyrock Identity Manager

2.3.3. Contributions to the FIWARE Community

The main contributions to the FIWARE Community from this activity will be:

- New data models and usage example related to eHealth care starting from the work in FI-STAR
- Data curation support for NGSI: an interface to easily add quality meta-data to NGSIv2 data sets.
- Example of open application to be replicated easily in different health care trials.

3. PLATFORM

With the aim of contributing to FIWARE OS Community and supporting the development of the scenarios depicted in the previous section, SmartSDK will work on the development of new functionalities for existing GEs and novel ones. The functionalities are grouped around three main groups:

- The platform: the glue that help the provisioning and automation of smart applications.
- The data management: the enhanced set of functionalities that increase the capacity of FIWARE Data Management platform.
- The IoT management: the enhanced set of functionalities that increase the capacity of FIWARE IoT platform.

3.1. Platform

The aim of the SmartSDK Platform is to contribute FIWARE OS Community by:

- Providing architecture pattern for the development of data and IoT intensive applications at scale (i.e. ready for a production environment).
- Defining basic data models in support of smart applications.
- Developing a provisioning environment, based on cloud best practises, that combine the two items above (architecture patterns and data models).

3.1.1. Epics

The Epics identified for the development of the platform during the first design sprint (Sprint 0, September – October 2016) are:

- Application Catalogue for SmartSDK services
- **Orchestrator for SmartSDK services**
- **Compatibility with FIWARE Lab for SmartSDK orchestrator**
- User Management integrated with FIWARE Lab for SmartSDK platform
- Cloud Edge support for Data Management
- Cloud Edge support for IoT Management
- Architecture Pattern for Multi-site deployment of FIWARE IoT Management stack
- Architecture Pattern for Multi-site deployment of FIWARE Data Management stack
- **Architecture Pattern for Scalable deployment of FIWARE IoT Management stack**
- **Architecture Pattern for Scalable deployment of FIWARE Data Management stack**
- **Architecture Pattern for High Available deployment of FIWARE Data Management stack**
- **Architecture Pattern for High Available deployment of FIWARE Data Management stack**
- Architecture Pattern for Authentication of APIs against FIWARE Lab IDM

The development of features and user stories related to epics identified in the “Sprint 0” foresees the first release including a minimal set of functionalities (end of January 2017) to be enriched by the

second release (by May 2017).

3.2. Data Management

The Data Management activities will focus on contributions that will enrich the FIWARE Data Management chapter and improve interoperability of NGSI (w.r.t. devices and open data models). Activities have been defined and prioritised taking into account SmartSDK applications' requirements.

3.2.1. Epics

During the first design sprint (Sprint 0, September – October 2016), the following epics have been identified to extend the FIWARE Data Management stack:

- SDK for Mobile operating systems supporting NGSIv2
- Linked Data extension for Context Broker
- **Time Series backend for NGSI**
- **Time Series frontend for NGSI**

The development of features and user stories related to epics identified in the Sprint 0 foresee the release of a minimal set of functionalities by the end of Sprint 1.0 (end of January 2017) to be enriched by the end of Sprint 2.0 (by May 2017). In bold the Epics that will be prioritized up to May 2017.

3.3. IoT Management

The IoT Management activities will focus on contributions that will enrich the FIWARE-ready IoT ecosystem, in particular with the aim of improving Cloudino⁷ framework. Activities have been defined and prioritised taking into account SmartSDK applications' requirements.

3.3.1. Epics

During the first design sprint (Sprint 0, September – October 2016), the following epics have been identified to extend the FIWARE IoT Management stack:

- Enable store data offline to support connection / disconnection scenarios on cloudino hardware
- Support cloudino hardware energy saving through NGSI configuration
- Support automatic upload on connectivity availability
- **Support connection to Context Broker without an IoT Agent**
- **Support NGSI connection via Cloudino.io cloud service**
- **Support online stream processing using 3G/4G connectivity**
- Support online stream processing using satellite connectivity

The development of features and user stories related to epics identified in the Sprint 0 foresee the release of a minimal set of functionalities by the end of Sprint 1.0 (end of January 2017) to be enriched by the end of Sprint 2.0 (by May 2017). In bold the Epics that will be prioritized up to May 2017.

⁷ <http://cloudino.io>

4. CONCLUSION

This deliverable is the first one of a series of four deliverables that summarize the R&D roadmap of SmartSDK. The next release of this document (May 2017) will refine the Epics and priorities according to the evolution on the project and requirements in the application scenarios.

In this deliverable, we quickly overviewed the following items for each of the application scenarios covered in Work Package 2:

- The user perspective covered in the scenarios for the first releases.
- The epics covered in the R&D phase to support such a user perspective.
- The usage of FIWARE Enablers.
- The contributions to FIWARE.
- The priority by May 2017

As regards the Platform (Work Package 3), the deliverable highlights:

- The planned contributions to FIWARE.
- The priority by May 2017 of such contributions.

REFERENCES

- [1] SmartSDK Consortium. Description of Action. July 2016.
- [2] SmartSDK Consortium. D5.1: Quality Assurance Guidelines. November 2016.
- [3] Dean Leffingwell. 2011. Agile Software Requirements: Lean Requirements Practices for Teams, Programs, and the Enterprise (1st ed.). Addison-Wesley Professional

APPENDIX A SMARTSDK AGILE METHODOLOGY

To drive the creation of tangible project outcomes, SmartSDK adopts an agile iterative methodology. The methodology is driven by the applications in the Smart City, Smart Healthcare and Smart Security domains and the applications' validation into trials.

The analysis of the state-of-the-art and of the applications steers the Research and Development of planned outcomes (SmartSDK Platform and the Applications to be trialled). The R&D outcomes are then validated through the trialling of the Applications with real-users. Validated outcomes are then adopted into Technology transfer activities (i.e. trainings and contributions to standardization bodies). Feedbacks and outputs of the process feed the next cycle of activities.

The whole project foresees 2 major cycles, each of which will include two minor iterations. The first set of outcomes will be trialled in Mexico at the end of the first cycle (M12), while second stage trials will leverage on the European FIWARE ecosystem (M24).

The methodology will be implemented using the Lean Agile approach by Leffingwell [3] adopted by FIWARE Agile Development Methodology⁸; this will allow a continuous monitoring of project progress in term of outcomes and exploitable results. The process is depicted in Figure 3.

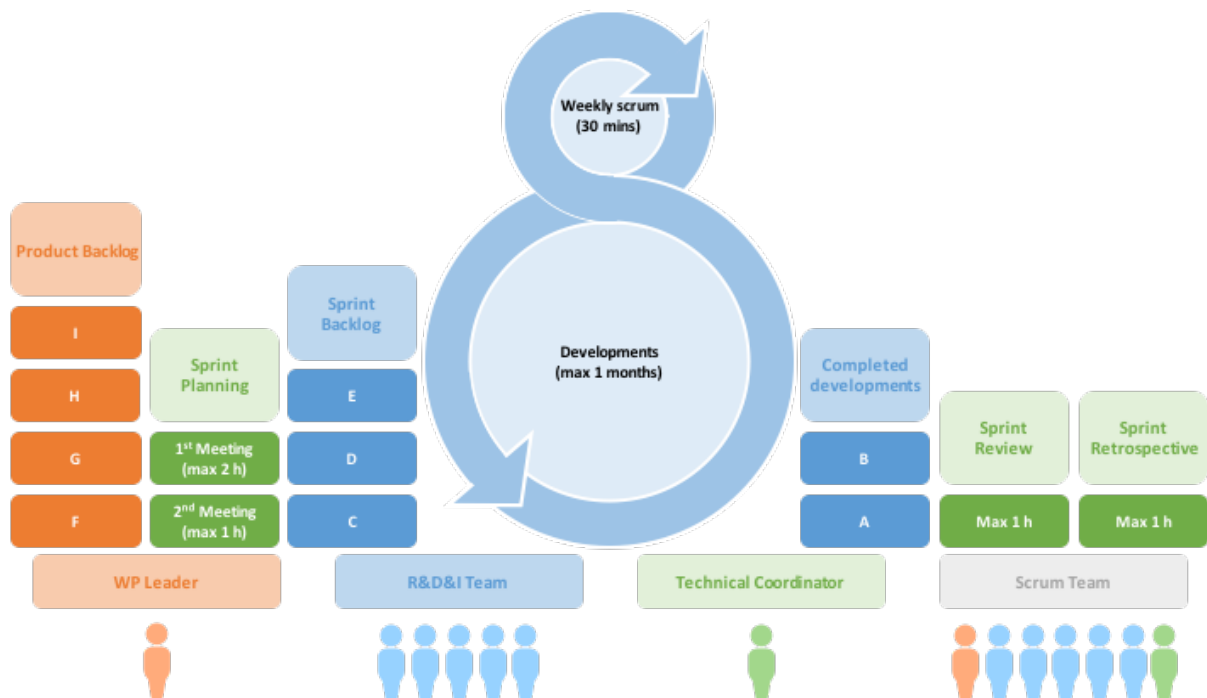


Figure 3. SmartSDK Agile Development Process.

The Agile meeting are planned as follows:

- ➔ Sprint planning 1st Monday of the month 16:30 – 17:30
- ➔ If needed also 1st Tuesday of the month 16:30 – 17:30
- ➔ Weekly scrum all Mondays 17:00-17:30
- ➔ Sprint review: last Thursday of the Month 16:30 – 17:30

⁸ http://forge.fiware.org/plugins/mediawiki/wiki/fiware/index.php/FIWARE_Agile_Development_Methodology

The first Sprint is only for design purposes and last longer (from the beginning of September to the end of October), then the Sprint are monthly. Every third Sprint includes a Release.

A.1 The Process

1. The application scenarios' requirements will be described in a plain-text document. From this description, Application owners will derive main Epics.
2. Epics will be assigned to a Component (an Application, a Data Model, or an Enabler; part of WP2 or WP3).
3. Component Owners will define a set of Features for each Epic.
4. Features will be decomposed in User Stories.
5. User stories will be then planned for specific Sprints during the Sprint Planning, and validated within Sprint Reviews that will include demonstration of achieved results.
6. Each User Story should be refined and detailed before being assigned to a Sprint.

The methodology will be implemented leveraging on the FIWARE JIRA management tool.

A.1.1 Roles and responsibilities

➔ Product Owner

- Who: All the task leaders
- What:
 - Define user stories
 - Define features
 - Define epics
 - Prioritize the backlog

➔ Developer

- Who: All the people active in the “Development” / “Delivery”
- What:
 - Refine and Implement user stories
 - Document progresses

➔ Scrum Master

- Who: Federico/Tomas (Martel)
- What:
 - Help to prepare the sprints planning and sprints review sessions
 - Check status of activities
 - Facilitate collaboration
 - Remove obstacles

➔ Scrum Team

- Who: Developers, Product Owners and Scrum Master
- What:

- Assign/Re-Assign stories to components (in collaboration with other product owners)
- Sprint planning
- Sprint review