Functional specifications of intelligent services and content

Survey

The present document summarises the content of the deliverable "**D1.3_1 Functional specifications of intelligent services and content**" in relation to *RI 1.3 Framework requirements and architecture for the customised delivery of content and services*, within the scope of the first Development Objective (DO 1) "Study and analysis of the state of the art".

Definition of the concept of an intelligent service is a fundamental part of developing an architecture able to customise interaction with users. The possibility of making the services provided by the platform "intelligent" clearly represents one of SAPI's most innovative aspects. Basically, the notion of intelligence attributed to SAPI services concerns the ability to adapt to the needs and characteristics of users and context through suitable evolution logics combined with the use of paradigm to separate service composition levels (content, business logic and presentation).
The activity is directly linked to development of the functional architecture (Figure 1) insofar as it marks out the "software" elements managed by the blocks forming the SAPI platform and identifies the way to compose them in order to form a customised service.

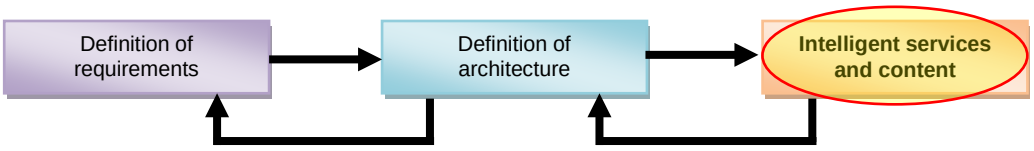

Figure 1: SAPI design

Firstly, the notion of intelligent services and content with regard to SAPI needs to be defined, also on the basis of what was studied in relation to international research carried out. The activity is then concluded with a detailed description of the logic modules comprising the intelligent services and content, highlighting responsibilities and input/output behaviour.

The term intelligent service is used to refer to a complex content with a high level of interactivity, linked to an implied business logic, to a set of states which it may be in at any moment and to a set of transition rules which allows users to perform a task in order to satisfy a need, while at the same time ensuring maximum customisation of interaction. While an intelligent content compared to a service has the same capacity of adaptation but an elementary business logic.
The notion of intelligence attributed to SAPI services concerns in particular the possibility of the service to self-adapt to the user and context, offering major customisation features. In other words, the SAPI service is able to adapt to user needs, inserted within a specific context of use, basing itself on information obtained from the user's record of favourites and interaction, and from the session information related to the user/context.
The SAPI intelligent service adopts a paradigm which separates the three areas of adaptation in order to ensure greater versatility of self-transformation on the basis of user characteristics, domain and context of use:

1. **Content**: this refers to the process to select and transform content so as they correspond to the user profile (e.g. need, interests, level of experience, etc.).
2. **Business Logic**: this regulates the operations performed by the application. Adaptation of the business logic refers to the way in which possible interactions to provide services are structured according to different user groups.
3. **Presentation (User Interface):** this determines the way in which users interact with the application and includes visual and graphic presentation and navigation aspects used to obtain specific information or to enable a specific operation. Customisation of presentation may also include adaptation of use which caters for the user's need to use various types of devices (multichannel) and various interaction modes (multimodal) in order to interact with the platform.

On the basis of the above considerations, a SAPI intelligent service is structured as shown in Figure 2.

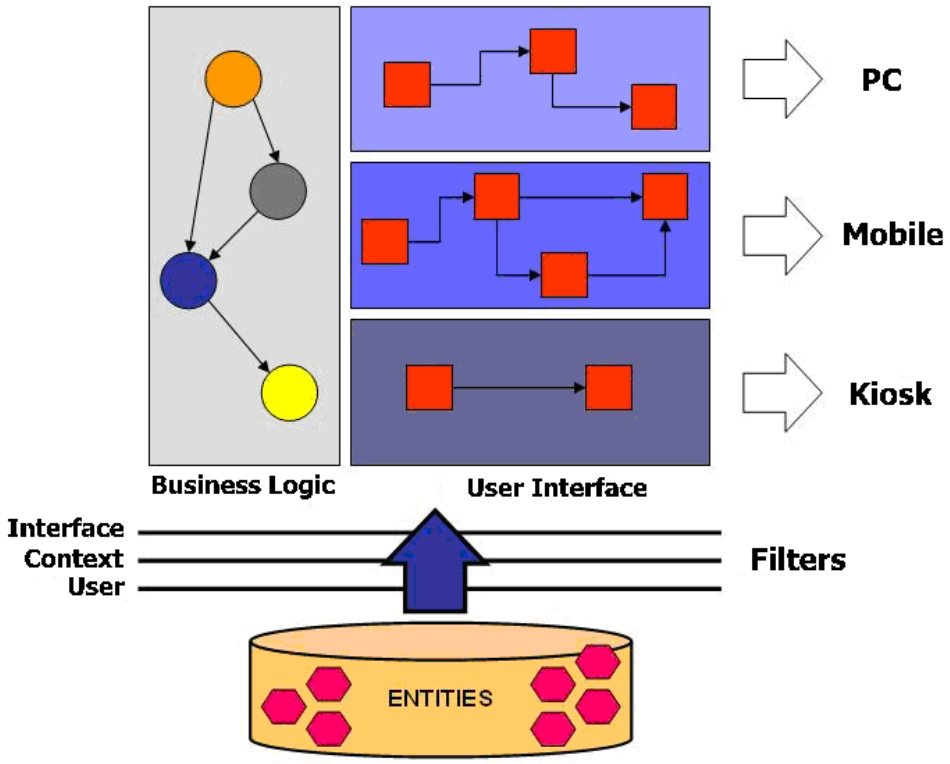

Figure 2: Structure of a SAPI service

As shown in Figure 2, the point of departure to construct a self-adapting service is the choice of suitable content to be submitted to users. More specifically, SAPI refers to "entities", the term being used to describe semantically enriched, multimodal elements, i.e. objects which are presented in various ways and which may contain the rules to adapt to a specific context of use. Basically, an entity can transport a semantic description of its properties so as to communicate certain aspects to external systems, such as how it can be used, how to transfer it and how to modify it.

The base which final composition of the service provided by SAPI rests on is the business logic dedicated to providing that specific service. Modelling of user-service interaction and hence of the business logic is expressed through formal specifications based on a graph in which the nodes (circles in Figure 2) represent atomic composition units of the service workflow ("Activities") while the arches (arrows in Figure 2) indicate the possible transitions. An additional look at the graph shows that not only does each workflow activity indicate the functional step that leads to provision of the service and satisfaction of the user's requirement, but it also contains the information for managing the entities (hexagons in Figure 2) needed to compose the service.
Composition of the user interface takes place in parallel. Said interface comprises an "Abstract Interaction Unit" pattern (sequence of squares in Figure 2), in other words a set of functional elements dedicated to managing presentation and user interaction.
Given the SAPI framework's capacity to customise service provision to meet the needs of users and context in the specific area of e-business, the most suitable user interface is bound not only by functional workflow requirements, but also by needs linked to the context characteristics (device, communication channel, presentation mode, etc.) and the end user's preferences and disabilities.
Composition of the intelligent service is the result of synchronisation between progress in performing activities and development of the AIU pattern: indeed, the presentation level and business logic do not directly communicate one with the other but align themselves on the basis of the state of entity contextualisation, the latter referring to the transformation of entities on the basis of user and context characteristics.
The contextualisation of entities and more generally of information needed to compose the service involves transformation and adaptation processes performed prior to inclusion of the entities within the user interface layouts; transformations which, also in this case, are determined by user and context-related needs. To this end, suitable adaptation filters are used which, on the basis of information related to users (profile and abilities), contexts (device, channel, context of use) and interfaces are able to select the adaptation rules which can be implemented and to apply the respective transformation primitives in order to contextualise the selected entity.
At this point , the shift from definition of an intelligent service to definition of intelligent content is immediate. SAPI intelligent content has all the characteristics of adaptability, adaptivity and customisability with regard to users, context and domain that services have, but is characterised by a low level of interactivity. In other words, content may comprise one or more entities composed within a user interface navigation pattern, but it does not have any implied functional logic: as far as content is concerned, the business logic collapses in a graph formed of a single, simple node.
The planned structure for SAPI services makes it possible to understand what directions the service's adaptation and customisation operations will be based on. Suitably optimised adaptation diagrams and logics must to be prepared in order for the end result to fully satisfy user-context and domain needs. Specifically, the framework needs to product optimal business logics from the point of view of efficiency/efficacy of interaction based on complex workflow graphs generated during service development. The user interfaces must also be adapted in order to cater for the enormous range of interaction systems, devices and channels as well as the various user needs in terms of style and layout. Filters and rules for transforming entities must also allow for extreme flexibility with regard to customisation and perfect correspondence with the end user's requirements. Hence the need for the services offered by SAPI to have intelligence features: intelligence responsible for the development of logics which subtend the generation of optimised graphs, adapted interfaces and increasingly versatile and efficient filters.

To conclude, the logical construction of intelligent services based on separation of adaptation levels fits in perfectly with the functional organisation of modules forming the SAPI architecture. The logic functions exposed by the elements comprising the intelligent service must also make it possible to completely customise the interaction of users with the service.