

Designing services for CoPs : first results of the PALETTE project

Bernadette Charlier¹, Aida Boukottaya¹, Amaury Daele¹, Nathalie Deschryver¹,
Sandy El Helou², Yannick Naudet³

¹University of Fribourg, Centre de Didactique Universitaire, Bd de Pérolles, 90, 1700
Fribourg. Bernadette.charlier@unifr.ch

² EPFL, Ecole Polytechnique Fédérale de Lausanne

³CRP-HT, Centre de Recherche Public Henri-Tudor

Abstract: In this contribution, we specify and categorize CoPs' needs (this includes the analysis of CoPs practices, resources and environments) in order to identify specific functions that meet these needs. This enables the efficient identification of possible interactions between PALETTE services' categories that will be used as the basis to refine functional specifications of PALETTE services and enhance the development guidelines.

Keywords : functional specifications, CoP's needs, services integration.

1. Introduction

The writing of functional specifications for PALETTE services are grounded on previous work done in collaboration with CoPs and PALETTE partners. The most important source has been the scenarios elaborated in collaboration and validated by the ten Cops involved in the project until now. However, these scenarios present two main characteristics:

- They are CoP specific: each scenario is dedicated to one specific CoP; but, some similarities between scenarios can be observed (e.g. the use of the same services in the same manner and under the same conditions, the same need expressed differently, etc).
- Scenarios describe the use of PALETTE services within CoPs; however we notice that some points regarding the integration of the services in CoPs environments are

not addressed. During virtual and face-to-face meetings developers, as well as mediators, have the same questions about integration issues (e.g. which repository CoPs will use? What to do with existing resources? , How to switch from existing tools from Palette services?, etc). Moreover, other questions are asked regarding the interaction of services (When do the services interact? How do they interact?).

To go beyond these documents and suggest new functional specifications, we have tried to:

1. Categorise CoPs needs: this categorization offers a global view of CoPs needs that permits to generalise the use of PALETTE services in order to produce generic scenarios.
2. Refine the categorization of PALETTE services: through the analysis of the produced scenarios, we also noticed that the specification of PALETTE services could be refined in order to answer efficiently identified categories of CoPs needs. This enables the developers to better identify the offered services (e.g. a specific function of a tool is offered as an end-user service).
3. Study the different types of PALETTE services interactions (at conceptual level) which will be a helpful input to enhance the technical guidelines regarding the integration of services.
4. Suggest future strategies for the development of PALETTE services.

In order to achieve these goals, we have proceeded in several steps:

- We first design a common template for CoPs. The template summarises the needs of the CoP as well as the PALETTE technological services (expressed in terms of functions) that could meet these needs. For each need, the template describes existing resources, environment and practice. Each adopted service is described in terms of changes in existing resources, environment and practice. The latter templates have been designed collaboratively by developers and mediators during face-to-face meetings. Moreover, interactions between services are also presented as well as questions related to the use of services (individually or with other services).
- The produced templates were analysed and generalised, namely, to refine the categorization of PALETTE services and categorization of PALETTE services interactions.

In the remaining of this contribution, the different obtained results are detailed.

2. Categorization of CoPs' Needs

One of the objectives of PALETTE is to develop “configuration of services” (technological and learning ones) which meet the developmental and learning needs of CoPs. This means that it is important to firstly represent patterns of needs that orient configuration of PALETTE services. In order to find these needs patterns we developed a categorization of the PALETTE CoPs' needs. In order to produce this categorization we used two models. First, we used the model of professional development within a community of practice, developed by Daele [1]. This model constitutes one of the “conceptual” bases of the PALETTE project. Second, we used the model of CoPs' actions proposed by Künzel, Charlier & Daele [2], a model which is anchored in observations of several CoPs in different domains of actions.

Daele's model represents different processes involved in the larger process of professional development, starting from the formalisation of professional practice: the exchanges, experience sharing, analysis, debate and creation of new methods and practices. All of these processes occur following a number of conditions linked with: the engagement, the participation (in the various modes of social interactions) and the learning (supported notably by the formalization of the exchanges) in the CoP. The first two conditions “engagement and participation” appeared in the PALETTE CoPs needs.

As illustrated beyond, the need for supporting participation is largely expressed and covers some modes of participation defined in the Daele's model (exchanges, debate and confrontation). We mean by ‘participation’ the extent to which members are involved in the activities of the CoP more or less actively and the extent to which they interact with other members of the CoP. Consequently to support participation means to support social interactions. De Montmollin [3] defines ‘social interaction’ as the effects resulting from the presence, the words and action of a person on the responses of another to his environment. So for supporting social interaction we consider as important to support verbal exchanges (from single exchanges to richer one like debate-confrontation) as the awareness of the presence of the participants. Some other conditions could be associated with the participation like: to give social and technical training for members, to enable them to truly participate.

Table 1 – Categories of needs of some CoPs

Categories of needs	PALETTE CoPs Needs
<p>1.To support participation :</p> <p>To support social interactions : verbal interactions (exchanges, experiences sharing, analysis, debate, confrontation, creation of new methods and practices) and presence</p>	<p>Learn-Nett</p> <ul style="list-style-type: none"> • encourage the tutors to share about practice • task sharing, analyzing the project, assessing the project, managing different opinions at a distance, support argumentation <p>Did@cTIC</p> <ul style="list-style-type: none"> • to support exchanges in discussion groups (f/f meetings) • to support the communication within the communities of practice during distance work periods <p>Adira</p> <ul style="list-style-type: none"> • to create documents through debates in f/f and at a distance
<p>2. To constitute common resources:</p> <p>To formalize tacit knowledge, to archive common resources and to make them retrievable and reusable</p>	<p>Learn-Nett</p> <ul style="list-style-type: none"> • to reuse students' research papers and other documents for the design of tutors' tools and for the work of the coordination team. <p>Did@cTIC</p> <ul style="list-style-type: none"> • to capitalize discussions and documents shared during f/f meetings about teaching practices • to reuse illustrations of teaching practices
<p>3. To support commitment:</p> <p>To develop the membership, to help members to clarify their own project and see how it can interact with the project of the CoP, etc.</p>	<p>Learn-Nett</p> <ul style="list-style-type: none"> • develop resources to better welcome new partners (the charter)
<p>4. To support realization of the activities:</p> <p>To support organization, follow-up and to have a common environment for all the activities of the CoP</p>	<p>Learn-Nett</p> <ul style="list-style-type: none"> • to propose a way for the coordination team to have a "context aware view" about what happens in collaborative groups in terms of activities of the actors and use of documents • to decide for a new workspace for all the activities • a tool that integrates forum and email messages for tutors.

Concerning the dimension of “engagement” in Daele’s model, we prefer the term “commitment”, which we define in terms of members clarifying their own project, seeing how it can interact with the project of the CoP, being actively involved in the activities of the CoP, and being personally committed to development of the membership. This is clearly linked with the welcoming of new members. It supposes some other conditions like the definition of the project of the community (and the regulation of it), the formalization of the project and the history of the CoP, and having a common knowledge of the participants (their competencies, interests, activities in the CoP, etc.). The need to support commitment is not often expressed by PALETTE CoPs (see need 3 in the table) but constitutes a potential need, which could be important. This potential need is observed in the practices of mature CoPs and could be interesting for new ones.

When we try to match Daele’s model with CoPs needs, it’s difficult to situate the dimension of exploitation of “produced resources” which is most expressed by CoPs. The formalization of the resources produced during the various forms of exchanges is contained in the conditions of learning (see above). So in our categorization of the needs we decided to dedicate one category for the constitution of the “common resources” (formalization, retrieval and reusing). These “common resources” belong to the CoP and can be appropriated by each member to support their own development. They represent the “wealth” of the CoP including its “memory”. It is similar to Wenger’s concept of “shared repertoire” [4].

Finally, a fourth need appears within CoPs: the need to support the realization of the activities. It means the support of the organization, follow-up and management of activities (the work of the coordinator(s), animator(s) or moderator(s)). This need is common across all CoPs. It could concern each of the previous needs. We include here the need expressed by some CoPs to have a common environment for all the activities of the CoP.

We also make the connection between the CoPs’ categories of needs developed and the model of CoPs’ actions proposed by Künzel, Charlier & Daele [2]. This allows us to explicitly relate CoPs’ specific identified needs with possible actions. This can orient the elaboration of actions expressed in the CoP scenarios. This model is anchored in observations of several CoPs in different domains of actions. It depicts five groups of actions in order to highlight questions relating to the CoPs’ development: towards which organization or project does a CoP intent to develop? How to support it throughout its development? The five types of actions are:

- **Projects:** they are actions oriented towards a specific and well-identified goal, possibly organised in the long term and requiring a high degree of coordination between the members.
- **Social:** they are actions oriented to promote community cohesion; they can be spontaneous or consist in specific and organized events.
- **Sharing actions:** they are short term actions, integrated in the day-to-day life of a CoP; they are not necessarily coordinated at a high level and can be more spontaneous than projects.

- Management: they are actions oriented towards the organization and the facilitation of the CoP as a whole such as distribution of roles, meetings organization, management of the work process, etc.
- Metacognition: these actions are related on CoP's self understanding and self-direction; they can be spontaneous or coordinated; their purpose is to get feedback about the functioning of the CoP and to develop new actions taking into account the feedback.

So we make the connection between the CoPs' categories of needs and their actions in order to illustrate what kind of actions are privileged by CoPs in order to fulfil their needs. This can orient the actions outlined in the CoP scenarios. For example, CoPs organise social actions to support commitment, sharing actions (FAQ) to elicit the constitution of common resources, management actions to support the efficient realisation of CoPs activities and projects to constitute common resources. In the table 2 the categories of needs are matched with the categories of services that could be offered in PALETTE.

Table 2 – Categories of needs and adapted services

Categories of needs	Categories of technological services
1. To support participation	Collaboration and awareness services (CoPe_It and eLogbook)
2. To constitute common resources	KM and information services : Production, Restructuring, Metadata, Retrieval, Reusing, Awareness
3. To support commitment	Collaboration and awareness services
4. To support realization of the activities	Collaboration and awareness services

Each category of technological service represented different services which can interact to meet CoPs needs. We attempt in the section 3 to analyse these interactions between services.

3. Interaction between PALETTE Services

Our analysis of CoPs scenarios has shown that the interaction between services is a commonly expressed need among PALETTE CoPs. Thus, the feasibility, requirements and implementation of the interaction of services need to be examined. This section starts by describing the expressed CoPs' needs requiring services

interaction. Afterwards, the different types of services interaction are classified and then the problems related to each required interaction type are tackled.

3.1. Addressing CoPs Needs through Services Interaction

In order to fully answer the needs of CoPs, PALETTE services need to be able to communicate with each other or to be integrated. As a matter of fact, CoPs have explicitly expressed specific needs requiring interactions between PALETTE Services. In particular, problems linked to resources storage seem recurrent: for example, some CoPs would like to store their documents in one or more repositories and be able to access them transparently from one particular service; or to annotate documents stored e.g. in eLogbook environment, using other services offered by e.g. Amaya or SweetWiki. Another example would consist of calling CoPe_It! functions from eLogbook in order to sustain argumentation for a community of practice using eLogbook environments, at a time where the latter does not offer this feature. Alternatively, CoPe_It! users could benefit from the eLogbook context-Aware View, a rendering service not supported by CoPe_It!, but however important in collaborative environments supporting mediation and argumentation, because it provides seamless embedded awareness information crucial for decision-making. Moreover, more examples can be found in Table 3 which provides a summary of the expressed CoPs needs and specifies for each case, which technical services should interact to satisfy those needs.

Table 3 – Examples of PALETTE services interaction¹

Category of needs	CoPs	Technological services	Examples of Interactions of services
1. To support participation	Learn-Nett Adira	CoPe_it! Services and eLogbook services (mediation services)	CoPe_it! should call eLogbook services.
2. To constitute common resources	Learn-Nett Did@ctic Adira	Document Production: services offered by Amaya, Limsee3, Sweetwiki tools Restructuring service (to produce structured documents from existing ones) Metadata production: eLogbook and, Sweetwiki tagging services. Amaya, Linkwidget, Generis, BayFac annotation services Information Retrieval: Generis, Corese (Linkwidget and Sweetwiki), eLogbook search engines Reusing of structured documents: DocReuse matching service	Documents produced by Amaya should be consumed by DocReuse and restructuring services. Documents tagged within Sweetwiki could be retrieved using Corese

¹ The reader will find the description of all PALETTE services on <http://palette.ercim.org/content/view/13/30/>

		Awareness : eLogbook services	
3.To support commitment	Adira LN	eLogbook	eLogbook services could interact with external services (e.g., calendar)
4.To support realization of the activities (common environment)	Learn-Nett Adira	eLogbook	eLogbook services could interact with external services (e.g., calendar)

3.2. Classification of Services Interaction

From a general point of view, there are different levels of interaction between services:

1. Information Exchange: transmission of data and metadata between two or more services;
2. Integration: direct call to a service function from another service;
3. Composition: strict composition refers to a service, which is built from a composition of other services' functions.

Allowing information exchange between services requires the adoption of a common protocol including a common understanding of the exchanged messages. This is also the case with integration, which requires the calling service to know how to actually call the function it wants to use, being able to input information to the function in the good form; and being able to retrieve and understand returned information so as process and integrate it. Composition requires all that is needed for information exchange and integration, plus orchestration; service orchestration dealing with the composition of services or their functions and the management of the information flow between these services.

The examples listed in the previous section show that until now the CoPs needs require services integration (call of a service's function from another service) and information exchange (data and meta-data access and sharing among services). To start with, we will tackle the issues related to the exchange of information between services supposed to satisfy the expressed CoPs needs to access data and metadata stored in different environments by interfacing one particular environment or some kind of cross service. Then, we will address the questions related to the need for integration.

3.3. Challenges with Information Exchange

PALETTE services are implemented based on different partners' tools. They have their own data and meta-data storages, and specific ways to handle these data and meta-data, using their own vocabulary and data structures. From a pure service composition point of view, we are in a context where independent peers need to

exchange and share information, which is technically related to service choreography [5].

The way data and meta-data will be shared and accessed by services is an important issue that raises several questions. In particular, is a common data repository needed? Do metadata and data need to be replicated in the different storage environments a CoP uses? Should all data and metadata be stored on the web to improve accessibility and sharing? For example, when a user wishes to tag a document initially stored in eLogbook, using Amaya, where should the tags or other metadata be stored? Moreover, if a community member using a particular service, wishes to see the tags and other metadata associated with a document should the annotations done through this particular service only be shown, or should the service automatically send a request to other tools in a transparent way, asking them for metadata related to the document in question? Or should this be done only based on a user's explicit request, to go and search in other tools? The same applies when a user wishes to retrieve documents stored in different places based on specific selection criteria. Should he/she use some kind of cross tool responsible for bringing together documents stored in different locations and relate metadata and awareness information gathered from different places, or should every service be capable of directly addressing other services for such purposes? Last but not least, right and access management issues should also be addressed, as exchange information stored in a specific environment is usually governed by right management policies, which are application or service-dependent. To solve this issue, common policies concerning the access to data and metadata need to be defined.

Some elements of solutions can be given, but agreeing on the best policies will require further and deeper investigations. Concerning data storage and access to data (most often multimedia or textual documents), a possible policy would be to consider that such data is stored in only one place, and any service that needs it works by reference (e.g. for adding metadata), or on a local copy of the data, that is serialized back to the original storage when the service has ended its processing. This however requires handling access rights on data, so as to avoid concurrent modifications; this can possibly be done by a specific orchestration service. Concerning metadata, annotations inside a document are de facto available to any service that can read them. Then, any service that does not annotate inside a document can work by reference, but references between a document and its public metadata needs to be kept somewhere in e.g. a specific awareness technical service, so that any service can have access to any metadata made public by other services.

From these reflections, it appears that as soon as a CoP will use multiple services, additional orchestration and awareness technical services will be needed, whether working in a centralized way or in a peer-to-peer architecture.

The second identified issue concerns the needs in term of interactions between services and the complexity of these interactions.

3.4. Challenges with Services Integration

Looking at the examples with CoPe_it! and eLogBook, we can derive the following generic scenario: “A CoP making intensive use of a given service, ‘A’, offering multiple functions, wants to benefit from additional functions offered by other services and use them in A”.

The integrations considered so far address interoperability very locally, as problems of integration have been often discussed between two tools offered as PALETTE services. A first step to reach a better interoperability level might be to agree on a standard for calling services’ functions and a common syntax to specify input and output information. However, even if this standardizes the external access to services’ functions, the logic necessary to allow actual integration remains on the calling service’s side. In particular, the integration at the user interface level will require specific coding, and semantic alignments between the terms and data structure used by both parties. Reaching a high interoperability level between PALETTE services, to avoid as much as possible specific coding could possibly be solved by securing interoperability at the semantic level. In other words, an adequate solution might be to define a common meta-model or ontology defining the concepts used by all the services, create mappings between this model and the vocabulary used each service, and modifying each service so that it can handle this model. The benefits would be that any service would be able to use any function of any other service, without having to know this latter service and the specific vocabulary it uses. Nevertheless, at this stage, no complete feasibility study of such an approach has yet been undertaken.

3.5. Future considerations

The challenges mentioned above and the issues raised in sections 3.2, 3.3 and 3.4 will pave the way for a deeper examination of the problems related to services interaction, in order to find solutions, which on one hand, are feasible for PALETTE services in terms of implementation and on the other hand, are able to satisfy the previously stated CoPs needs.

4. Conclusions

This contribution will guide a next important phase in our participatory design of integrated technological and learning services to support CoPs learning and development. Grounded on the “Description of six scenarios and of the results of six validated trials” to be produced soon, we will be able to identify generic scenarios fulfilling similar needs of various CoPs with specific uses of integrated services and learning services. The technological challenges highlighted in this contribution will be addressed by the teams of PALETTE developers and mediators reorganised according to this identification of generic scenarios. With this methodological approach we intend to find solutions which on one hand, are feasible for PALETTE services in terms of implementation and on the other hand are able to satisfy CoPs’ needs.

5. References

1. Daele A. (2006) A model for representing professional development through the participation in a virtual CoP: uses for developing enhanced services. Paper presented in *TEL-COPS 2006*. https://bscw.ercim.org/bscw/bscw.cgi/d173003/telcops2006_amaurydaele_camera_ready.pdf
2. Künzel M., Charlier B. & Daele A. (2007). Modelling activity and development of communities of practices. Conférence EIAH 2007 (Environnements Informatiques pour l'Apprentissage Humain).
3. De Montmollin, G. (1977). L'influence sociale. Phénomènes, facteurs et théories. Paris: Presses Universitaires de France.
4. Wenger, E. (1998). Communities of practice : learning, meaning and identity. Cambridge University Press.
5. Peltz, C., 2003, Web Services Orchestration and Choreography, IEEE Computer, Volume 36, Issue 10, Page(s):46 – 52.