Compositions of Personal Smart Spaces in Multi-Blogging

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Abstract

Smart-M3 platform supports development and deployment of distributed multi-agent applications that share dynamic information in smart spaces. SmartScribo is a Smart-M3 application for multi-blogging that provides access to the blogosphere from various user devices, including context-aware blog retrieval. SmartScribo constructs its blogosphere smart space as a shared partial view to the blogosphere. This space consists of bloggers' personal spaces, and the bloggers can interact with each other by sharing context and blog-related information. In this paper we consider the problem of composing personal spaces in SmartScribo. Space composition takes dynamical relations between participating spaces into account leading to (1) less data duplication in the blogosphere smart space, (2) cooperation of SmartScribo users by inter-space links, and (3) collective, not individual blog retrieval from services, even if non-SmartScribo users own the blog. We introduce three methods for personal space composition and discuss their scheme for SmartScribo.

Index Terms: Smart spaces, Blogosphere, Ontology, Smart-M3, Smart space operations.

I. Introduction

Smart-M3 is an open-source information sharing platform for smart spaces applications [1], [2]. A Smart-M3 application consists of distributed agents (knowledge processors, KPs) operating in ubiquitous environments. SmartScribo is a Smart-M3 application that provides advanced access to the blogosphere [3]. The latter consists of all blogs on all blog services. In SmartScribo, it is represented in a smart space—an auxiliary information store where user and blog data are kept dynamically and semantically related. The space reflects the part of the blogosphere that is actually used by the SmartScribo users.

Users can interact with multiple blogs at many blog services using their (mobile) computers as clients. There are three types of SmartScribo agents: blog clients, blog processors, and blog mediators. Clients operate with blogs locally and send notifications to the blogosphere smart space for operations at blog-services. Blog processors track notifications from clients relaying particular blog-services. Mediators extend blogging with smart features (e.g., blog rankings).

A SmartScribo user has own smart space (blogger personal smart space) to represent the part of the blogosphere she accesses. The actual blogosphere defines friendship relations between bloggers. SmartScribo can reflect such relations composing personal smart spaces into interactive structures. Space compositions provide information sharing between spaces and can be used for reading blogs of friends or for aggregating data from several spaces. We consider compositions that can be constructed with basic space operations [4] and applicable for personal spaces compositions in multi-blogging.

The rest of the paper is organized as follows. Section II defines a blogger personal smart space and states the problem of compositions for such spaces. Section III introduces composition methods applicable in smart space multi-blogging. Section IV summarizes the paper.

II. Personal blogger spaces

Information in a Smart-M3 smart space is typically named “knowledge” since it potentially can represent habitual data, relations between them, and even such information as services and computations. A blogger personal smart space keeps actual blog data, i.e., those blog discussions that the blogger is aware of. Also, the personal space includes personal information, i.e., a part of the user profile and her current context state (from user’s devices). Figure 1 shows the space structure and the relations with user’s device and the blogosphere.

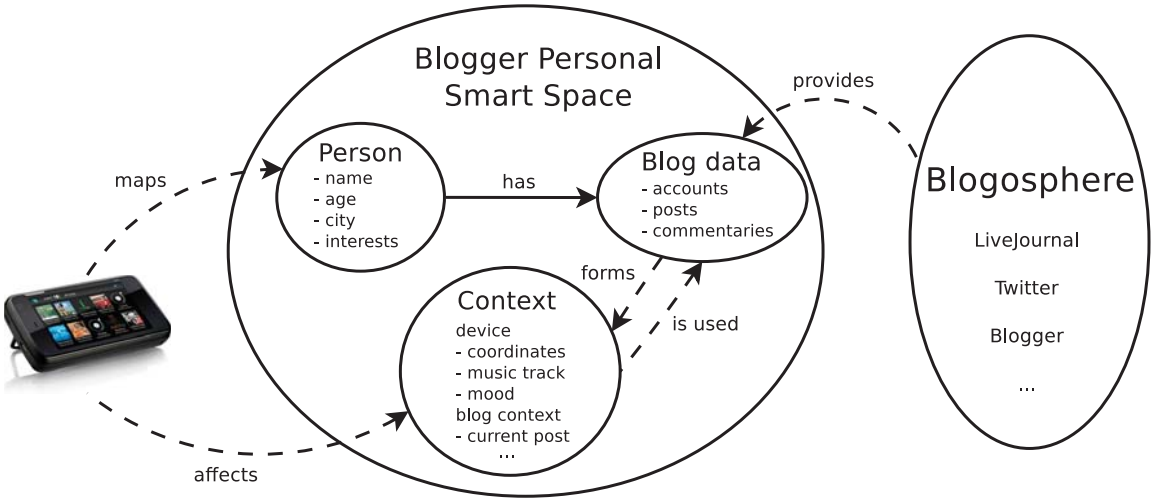

Fig. 1. Blogger personal space structure. The simple case when the user integrates a single client device to the smart space.

A SmartScribo user shares partially her profile from her devices. Each user may have several devices, leading to an aggregated personal profile. It describes permanent or long-term data (name, age, e-mail, interests, etc). They are not blog-specific and can be used in other domains. We use FOAF standard specification [5] for the ontological representation; it makes easier integrations of SmartScribo into other smart applications.

Context represents current and mutable characteristics of the person, e.g., current position (mobile device GPS), weather, music track, person’s mood, the message she is reading now. See [6] for more discussion on possible context data and their use.

Blog data include blog-accounts, posts, and comments. Blog data are linked with the personal profile since the person has accounts at several blog-services. Each account has its own properties (login, password, picture, etc). Any account is associated with a set of posts. A post has such properties as title, text, tags, date. Comments and comments to comments continue the post, leading to a blog discussion (thread).

In general, several spaces can be composed to another shared space, providing a powerful abstraction for smart space applications [4]. In SmartScribo, interaction of bloggers in the blogosphere, either SmartScribo users or not, results in certain relations between personal smart spaces. Such relations can be dynamic and depend on the context.

An example of space compositions is the friendship relation between bloggers. A personal smart space keeps blog discussions owned by the blogger. Additionally, she reads blogs of other bloggers. Establishment of the friendship relation is supported my many blog-services. Recent version of SmartScribo take into account the friend rules of LiveJournal.

A straightforward implementation duplicates (from the blog services) all blog messages the blogger needs to her personal space. Actually, it is the only way when the other bloggers

are non-SmartScribo users. However, when the blog has been already shared in a personal space of another blogger then his space can be composed with her space, and the relation is reflected explicitly in the blogosphere smart space.

Personal space compositions can also be applied for blog aggregations, collective recommendations, and rankings. In the next section we describe methods efficient for such compositions.

III. Composition methods

Personal smart space compositions appear between spaces from single smart application (such spaces have the same ontology) or between spaces from different applications. Three composition methods with ontologies are specified in [8]. Those methods are applied to ontologies and are used as universal methods on middleware layer. We propose composition methods in multi-blogging in terms of spaces on application layer. Three general approaches of composition constructing are: data duplication, ontological bridge-link establishment between spaces and blog mediators.

1) *Data duplication* is the simplest and straightforward way of personal smart space composition. This method can be applied when the smart space represents information from some external source (for example, web-service). If one personal space needs in data from another space then it can fetch such information from external source instead of searching it in smart space even if this data is present in personal space of another user. Such information is included in personal space of first user making this way a full or partial copy of already existing personal space of second user.

Figure 2 shows the usage of this approach in SmartScribo. When two bloggers (Alice and Bob) are friends we can fetch data about friend (personal information, posts) from blog services and store it in personal smart space. Thereby we duplicate friend information (Bob's data is duplicated to Alice's space) while this information can be stored in his own blogger space. In spite of this, such method can be applied when blogger's friend does not have his own smart space.

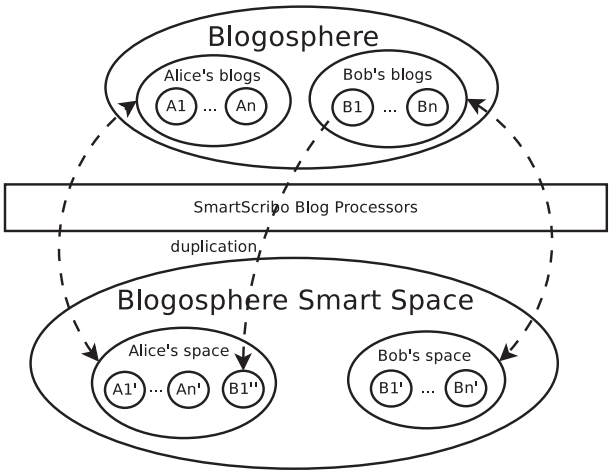

Fig. 2. Duplication of blog data already presented in the smart space: $A_1, \ldots, A_n$, $B_1, \ldots, B_n$ are blogs hosted at the services; $A'_1, \ldots, A'_n$, $B'_1, \ldots, B'_n$ are personal blogs represented (partially) in the personal smart spaces. Alice receives Bob's blog data via SmartScribo blog processors, and her client duplicates B_1 in her space as B''_1. The blogosphere smart space keeps two copies of B_1.

2) *Ontological bridge-link* is an another method of composing personal spaces which allows to prevent excessive data duplication. In this case, a special ontological link between spaces is added and one personal smart space has access to another personal space. If spaces from different applications are linked, then user who wants to get access to anot her space must know ontology of second application which is not always possible.

In SmartScribo this method can be used to connect several blogger smart spaces with friendship relation. Figure 3 shows an example, where ontological property "friend" connects blog data from one space with blog data from another space. Thus the owner of first space (Alice) can use this link to grant access to Bob's smart space.

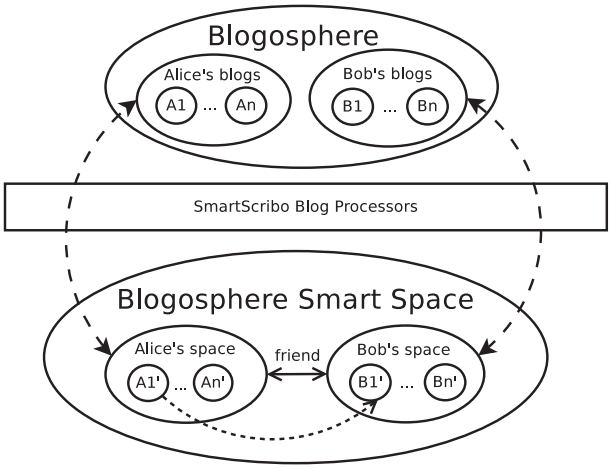

Fig. 3. Ontological relation "friend" is established between two or more personal spaces. $A_1, \ldots, A_n, B_1, \ldots, B_n$ are blogs hosted at the services; $A'_1, \ldots, A'_n, B'_1, \ldots, B'_n$ are personal blogs represented (partially) in the personal smart spaces. If Alice and Bob are friends at the blog-service then the relation is reflected in their personal smart spaces using the ontology. After that Alice accesses B_1 from A_1 directly instead of duplicating B_1 to her personal space.

3) *Blog mediator* is the third way to compose several smart spaces. In this situation smart spaces are not connected with each other and user agents might not know ontologies of another applications. Compositioning is achieved due to intermediate agent which knows ontologies of all spaces. This agent can synchronize information between spaces converting data from one ontological representation to another. Such mediator also can provide data from one space to another using information duplication or ontological link retreiving. This idea was applied in resolving the problem of simultaneous access to the smart space content [9] and access coordination to devices [10].

Figure 4 illustrates this method. In SmartScribo blog mediator can provide to one blogger some information about another bloggers or their posts. Besides this method is used to compose blogosphere and conference smart spaces and add blogging functionality to Smart Conference System [11]. Though in Smart Conference usecase mediator operates with heterogeneous smart spaces, blog meditor in SmartScribo application only process personal blogger smart spaces which have the same base ontology.

IV. Conclusion

This paper considered the problem of composing personal smart spaces in SmartScribo. We introduced three methods for the composition. Our solution provides a way for users to read posts of other bloggers regardless either the latter are SmartScribo users or not. The methods provide a mechanism for efficient processing friends' blog data. The same data are

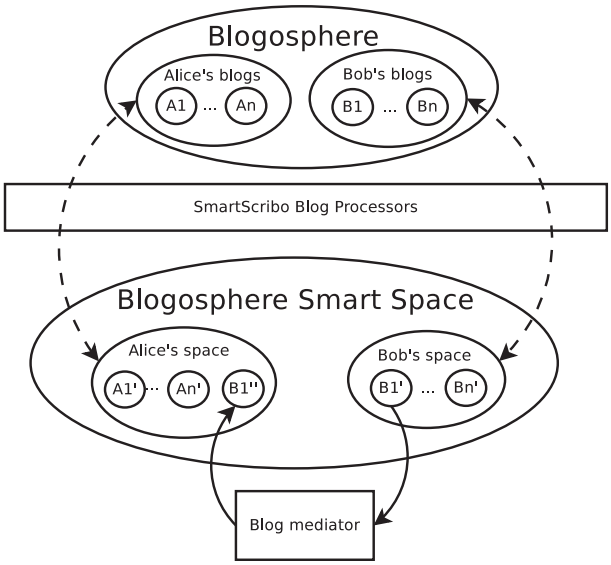

Fig. 4. Blog mediator is used to connect two or more personal spaces. Blog mediator (partially) duplicates data from blog B'_1 in Bob's space to blog B''_1 in Alice's space. Blog mediator can also provide ontological links from B''_1 to B'_1. $A_1, ..., A_n, B_1, ..., B_n$ — blogs on service; $A'_1, ..., A'_n, B'_1, ..., B'_n$ — personal blogs (partially) represented in Smart Space.

less duplicated in the blogosphere smart space. SmartScribo users can easily access and use information shared by other SmartScribo users. Blog retrieval form services becomes cheaper since if the user has a blog in her personal space then all her friends can access the blog. We plan to apply these methods also in SmartScribo blog mediators for cooperative blog aggregations and recommendations.

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