Towards Overcoming Limitations of Community Web Portals: a Classmates' Example

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Abstract. Current distributed ontology practices are analyzed and illustrated with typical web portals supporting communication, data sharing and activities of former classmates. The inflexibility and restrictions imposed on users of such portals are demonstrated to support the thesis that introduction of community-driven ontology management is crucial for full-fledged satisfaction of the end user needs on the Web.

1. Introduction

An idea of providing a service for reunion of ex-classmates is proved to be a success by resulting in a large number of highly popular web portals with a multitude of users registered at the largest portals. For instance, more than 75 thousands of classmate groups are registered internationally at Yahoo groups[1] and more than 35 millions of users are registered at a national US and Canadian level (portal Classmates.com uniting graduates of the US and Canadian schools). In relation to other commercial services offered on the Web, the service providing a communication environment for ex-classmates also proved to be promising. For instance, the portal Classmates.com has one of the largest subscriber bases on the Web for paid content and is consistently ranked by Nielsen//Net Ratings as one of the most highly trafficked Web channels.

One of the success reasons for social networking activities across ex-classmates and other user groups [10] is that the portals supporting these activities fill in a novel niche of user demand. Specifically, many e-commerce sites offer what people have always been able to find outside their front doors: books, magazines, toys and groceries. Compared to most online businesses, community web portals are privileged to offer a service that only the Web can provide: the power to connect people who would otherwise be out of touch.

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[1] Yahoo Groups: http://groups.yahoo.com

We define ***ex-classmates*** as a group of people who once had a common educational experience and used to live in the same area. We use the term ***classmates*** equivalently to the term “ex-classmates”, because people who once studied together and lived in the same area can be identified as belonging to the same “class”. Specifically, from the virtual community point of view, whether the community is united physically by the past or by the present is usually irrespective for modeling community activities. A ***community Semantic Web portal*** is a web portal which is based on Semantic Web technologies [1] and maintained by a community of users. Further, a ***web portal*** is a web site that collects information for a group of users that have common interests [5]. Yahoo is an example of a web portal, however, Yahoo is not a community web portal, since (i) it is resource consuming and anti-collaborative in providing information, (ii) it is maintained by a special department of the host company, but not by a community of users.

Nowadays, with an exception of few cases, existing community web portals are not Semantic Web portals. We demonstrate below that they suffer from a lack of flexibility, missing functionalities, data input overhead and sparse interactivity. These problems are expected to be resolved by employing technologies constituting community Semantic Web portals. In the Semantic Web, information is semantically represented according to ontologies, evolving and shared knowledge structures, allowing advanced usage of the Internet as an information repository [4]. Further, enabling the Semantic Web to be ***community-driven***, i.e., endowing users and developers with a wide access to ontology management, will make the community Semantic Web portals more dynamic and more responsive to the users’ actual needs.

An extensive overview and state-of-art of existing Semantic Web portals is delivered by Lausen et al. [9]. An approach embedding all phases of a community Web portal (i.e., information accessing, information providing, portal development and maintenance) is described in a paper by Staab et al. [15]. Our work is focused on the existing classmates’ portals. Demonstrating the limitations of available solutions, we show the need for development of Semantic Web content and services.

The paper is organized as follows. In Section 2, an overview of existing classmate web portals is provided and usage scenarios are discussed, highlighting a self-assessment scenario. In Section 3, community-driven ontology management is introduced. Observed limitations of the classmates’ community web portals are described in Section 4. Section 5 concludes the paper.

2. Overview and Scenarios

In this section, we provide an overview of the web portals supporting communities of classmates and outline scenarios at these portals. We highlight the scenario of self-assessment in order to illustrate the complexity behind a thorough support of community scenarios and to show the possibility of applying solutions across domains and communities. In particular, the solutions developed for personnel evaluation can be easily applied to the self-assessment classmates' scenario, provided that the solutions are available as services on the Semantic Web.

2.1. Overview

A summary of typical community web-portals that are created for support of classmate communities is given in Table 1. Geographical coverage and functionality of a portal are important characteristics defining the portals' applicability and usage. Geographical coverage in the context of the classmate portals is its geographical restrictions regarding the countries and cities where ex-classmates used to study. Most observed classmate portals are restricted geographically, i.e., they permit a correct representation of the fact that "somebody studied somewhere" only for restricted values of "somewhere". In Table 1, examples of such national classmate portals are Classmates.com, Odnoklassnik and ILoveSchool. Additional examples are www.passado.de (Germany), www.passado.fr (France), www.passado.at (Austria) and www.chinaren.com (China). At each of these national portals, information is represented solely in the national language of an addressed country. Analyzing functionality of the classmates' portals reveals a tendency of decreasing the portals' functionality with increasing the portals' coverage (including geographical). For instance, Lycos Classmates, Yahoo groups or a widely international alumni portal www.alumni.net provide less of functionality comparing to any other of the national-targeted portals listed in Table 1.

2.2. Self-Assessment Scenario

The demand for self-assessment is often a driving force of a substantial amount of communication activities which take place within the classmate portals. Members of the classmates' portals have a demand for information on positions held by their classmates, what they have acquired, etc. Examples of typical queries for this information are: "What kind of job do you have?", "How many children do you have?", "What kind of car do you drive?". After obtaining answers to their queries, the portal users can evaluate their position and achievement in relation to their classmates' positions and achievements. Self-assessment in relation to one's classmates is often found especially meaningful, due to possession of the similar background and the same starting point.

Self-evaluation support within the classmate portals can be addressed reusing solutions from a job-related domain for the problems such as personnel selection, personnel management, personnel evaluation, assessment of staff's performance. For the emerging services such as self-assessment in the classmates' scenario, reuse of the well-elaborated solutions in similar areas is especially beneficial.

Name	URL	Geographical Coverage	Functionality
Classmates.com	www.classmates.com	USA, Canada and American / Canadian overseas schools	Registration/search, message board, games, chat, photos sharing, "compare" tool, shopping
Lycos / Classmates	www.lycos.com	International – over 40 countries	Registration/search
Odnoklassnik	www.odnoklassnik.ru	Russia	Registration/search, addresses, telephone and ICQ numbers, photos sharing, message board, chat, polls
ILoveSchool	www.iloveschool.co.kr	Korea	Registration/search, mailing lists, games, whiteboard, news of school, avatar, SMS, shopping

Table 1: Web Portals for Classmates

Conventionally, evaluation of job performance can be ***trait-based***, ***behavior-based*** or ***result-based***. Trait-based criteria focus on the personal characteristics of an employee, behavior-based criteria focus on specific behaviors that lead to job success when exhibited, and results-based criteria focus respectively on what an employee has done or accomplished [11]. In addition, evaluation of job performance can employ ***objective*** and ***subjective*** measures. Objective measures are quantifiable measures of performance (e.g., cars/hour, bottles/second, etc.), while subjective measures are less quantifiable (e.g., leadership, presentation, etc.). Another opportunity to classify evaluation systems is to track whether they evaluate somebody's performance on the ***absolute*** scale or ***comparatively*** to other performances.

Normally, a typical personnel evaluation system considers one of the criteria for evaluation of job performance, objective and/or subjective measure and a particular (absolute and/or relative) scale for evaluation of personnel. The approaches for realization of the evaluation systems vary substantially.

For example, BOARDEX [7] is an expert system for selection of the candidates to attend military schools. Evaluation performed by the system is result-oriented, dominantly with objective measures with absolute and relative scales. Knowledge representation of the BOARDEX system is accomplished using Prolog and the selection process is performed by applying rules which check each candidate's resume with respect of several important for military school factors such as height, weight, military education, assignment history, etc. and produce a recommendation on the acceptability of the candidate. The system was reported to attain highly significant correlations and evaluation concordances with the human experts, justifying chosen methodology. Shaout and Al-Shammari [14] describe another expert system which is based on fuzzy logic and performs evaluation of faculty members in an academic department at the educational institution. This system evaluates personnel against behavior and result-based criteria using objective evaluation measures and an absolute scale in order to assign human resources to the goals of the institution.

Herrera et al. [6] apply a genetic algorithm for a personnel assignment task (when the number of positions equals to the number of the candidates) and for a personnel selection task (when the number of candidates is greater than the number of positions). The evaluation factor values are represented as linguistic variables for each candidate. At first, the candidates are assigned randomly at the positions, then a selection mechanism and specific genetic operators such as crossover and mutation are applied to refine the result. The methodology employed in the system is based on trait-based criteria, subjective evaluation measure and relative scale.

In contrast to the outlined above methodologies, assessment of expertise level does not have to necessarily employ representation of personnel skills, results achieved, traits or behaviors, but can rely solely on the behavior of would be experts by using their performance in the domain [13]. Specifically, the approach by Shanteau et al. relies on checking whether a person whose level of expertise is being evaluated demonstrates discrimination and consistency, i.e., if he/she is able to differentiate between similar but not identical cases and repeat his/her judgment in a similar situation. Thus, the proposed approach is behavior-based, employing the objective evaluation measure and the absolute scale. This approach for expertise evaluation is especially appropriate in the absence of a widely accepted standard, when one can not compare experts against the standard and select whoever is closest to the standard.

As a reply to the demand of self-assessment in the classmates' scenario, the Classmates.com portal offers a special tool: the user can answer suggested questions and compare his/her answers to the answers of his/her classmates, represented in percents. Naturally, the questions that can be asked at different portals may vary, depending on the creators of the portals. For example, the questionnaire of Classmates.com portal covers five subjects: leisure/vacations (7 questions), family/relationships/children/home (5 questions), financial status (4 questions), feelings/opinions about life (4 questions), the Classmates.com portal services (4 questions).

3. Ontology Management: from Distributed to Community-Driven

There are examples of ontologies that became widely accepted and reused for the purpose of distributed data exchange and integration. Specifically, RDF, FOAF, Dublin Core and RDFS vocabularies are the most successful with being populated by more than one million of Web documents each [3]. Very often such ontologies were organically grown and quickly found a large number of creative users, even though a for long time they were not endorsed by any of the popular standards committees.

Meanwhile, the amount of available ontologies for reuse and sharing is practically very limited. For example, SchemaWeb[2] is nowadays is an exhaustive resource for publishing ontologies and it links to ca. 250 ontologies only. This quantity of available ontologies refers to ontologies specified in multiple existing different ontology languages (e.g., RDFS, OWL). Many of these ontologies are not supported by a large amount of instance data. The linked ontologies are mostly vocabularies describing limited specific domains (e.g., Person, Publication, Project). Some domains are supported by several ontologies (e.g., Person and Publication), while many domains are not supported by ontologies at all. Finally, the number of domain-independent (functional) ontologies that can be widely applied is negligent, and ontologies for certain aspects like Semantic Web publishing, data delivery and community and personalization support are not available. All these factors diminish ontology usage and thus success of the Semantic Web.

The limitations of centralized ontology development display the need for dynamically extendible large-scale ontologies with distributed character. For example, the RSS working group states that as RSS continues to be re-purposed, aggregated, and categorized, the need for an enhanced metadata framework grows. Channel- and item-level title and description elements are being overloaded with metadata and HTML. Some producers are even resorting to inserting unofficial ad-hoc elements (e.g., <category>, <date>, <author>) in an attempt to augment the sparse metadata facilities of RSS.

The other communities who appreciate usefulness and value of RSS also report that it has reached its limits. There is a demand for more advanced portal syndication which RSS can not satisfy. One initiative in developing technologies to overcome the limitations of simple ontologies for Web publishing comes from Apache Software Foundation and proposes portal syndication with Web services and Cocoon [8]. Another initiative is Atom[3] that is aimed to define a feed format for representing and a protocol for editing Web resources such as Weblogs, online journals, Wikis, and similar content. The feed format is to enable syndication, and the editing protocol is to enable agents to interact with resources by nominating a way of using existing Web standards in a pattern. Overcoming the limits of distributed small-scale ontologies, organization of user-driven ontology

[2] SchemaWeb: http://www.schemaweb.info
[3] AtomEnabled: http://www.atomenabled.org

extension, support and metadata communication within Web portals is generally considered in the approach of the People's portal [16].

The reasons why staying within the scope of simple ontologies (e.g., exchanging FOAF profiles and posting cross linked news stories from RSS) is not enough and far too limited for the existing Web are as follows:

- embedding and personalizing rich content and behavior from remote Web applications are becoming necessity for catering to specific user needs
- extension of simple ontologies, discovery and communication of these extensions are becoming necessity for bringing semantics to a larger amount of Web content
- mapping between simple ontologies and their alignment with other extendible ontologies are becoming necessity for large–scale data integration.

The introduced solutions by the RSS working group to handle the RSS limitations are as follows. One proposed solution is the addition of more simple elements to the RSS core. This direction, while possibly being the simplest in the short run, sacrifices scalability and requires iterative modifications to the core format, adding requested and removing unused functionality. A second solution, and the one adopted in the RSS specification, is the compartmentalization of specific functionality into the pluggable RSS modules. This is one of the approaches used in this specification: modularization is achieved by using XML Namespaces for partitioning vocabularies. Adding and removing RSS functionality is then just a matter of the inclusion of a particular set of modules best suited to the task at hand. No reworking of the RSS core is necessary.

Obviously, the problems and solutions for RSS ontology above are also valid for other simple widely spread ontologies. Having simple and easy to understand ontologies and ontology pluggable extensions on the user side, the complex processes of combination and reuse of these ontology components in ever-changing specification and conceptualization processes of the outside world are left encapsulated on the middleware and application side. Clearly, the development and especially reuse of the pluggable extension modules involve complex problems that are not resolved at the moment. These problems arise from the support requirements for practical large-scale extendible ontology management, such as:

- easy and quick extension opportunity to cater to dynamically arising and changing needs of ontology users
- discovery of existing pluggable extension modules
- composition of existing pluggable extension modules
- decomposition of existing pluggable extension modules
- matching of existing pluggable extension modules and core ontologies with other external ontologies and modules

- tools to support ontology extensions proposed from the user's side, discovery, composition, decomposition, matching and reuse of created earlier ontologies and extensions.

Thus, preserving the successful approach of simple usable ontologies and resolution of the issues above are clearly to be considered as major challenges in the practical state-of-the art distributed ontology management, and are addressed with creating supporting infrastructure for community-driven ontology management.

Specification and development of ontology management components were previously funded and carried out in USA and EU projects (in particular, EC IST projects such as DIP[4], SEKT[5], KnowledgeWeb[6], Esperonto[7], SWWS[8]). Progress in development of community Semantic Web environments brings in new positive influence, usage scope and wider acceptability to the basic ontology management components by setting new requirements such as enabling communities manage their own ontologies, making the ontology management knowledge services more flexible, reusable and proven in real-life scenarios thus attractive enough to make the Semantic Web accepted by the communities.

The scope of the work on community-driven ontology management is in reuse of the existing ontology management practices and tools and enriching them with features for supporting end users and communities to describe and manage community Web portals. One may envision ontology management support consisting of the following components adapted within the scope of community-driven ontology management:

Community-Driven Ontology Editing Service: It is an editor for editing ontologies (creating and updating ontology and instances). The front end is the user-friendly interface, which helps or guides users to easily create and update (add, delete, and modify) ontology and its instances. The backend is the data storage management systems, which can be databases, file systems, plain text files. A specific requirement for an ontology editor to be community-driven is an opportunity to integrate it tightly with Semantic publishing and delivery component, and enable consensual editing for multiple users, i.e. communities. This requirement is grounded on flexibility degree that is needed to provide in a community environment enabling community members to change and influence community processes and structures.

Community-Driven Ontology Storage and Query Management Service: The goal of this component is to efficiently store and query small and large amounts of ontology data and metadata by providing fast indexing, searching and querying to ontologies and its instances. Most current ontology storing and querying components from the functional perspective are similar to database and database

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[4] DIP: http://dip.semanticweb.org
[5] SEKT: http://sekt.semanticweb.org
[6] KnowledgeWeb: http://knowledgeweb.semanticweb.org
[7] Esperonto: http://esperonto.semanticweb.org
[8] SWWS: http://swws.semanticweb.org

management system components. In addition, the first Semantic Web search engines start to appear (such as Intellidimension Semantic Web search engine[9]). However, there is a long road to go to making Semantic Web database-like components and Semantic Web search engines mature and attractive to use. Taking into account that the communities publish their information on the Semantic Web in a distributed manner in simple ways (such as putting online FOAF files), in project work, the focus in storage and querying will be on maintaining repositories of reusable adding value Semantic Web content and composition/decomposition of distributed source content that is easy to maintain from the storage and creation point of view, thus involving critical community masses.

Community-Driven Ontology Alignment Service: A regular ontology aligner supports ontology mapping processes that now mostly are performed manually, e.g., OWL Ontology Aligner[10]. A basic ontology inference provides consistency checking, related class or relation name identification, instance updates etc. The front end is the user interface for semi-automatic ontology mapping (such as recommendation lists and help for defining the mapping rules). The back end is the inference support (ontology inference engine). The upgrade of a regular ontology aligner to a community ontology aligner is adding a widely available repository of ontology mapping solutions that result from the usage of the ontology aligner. Special ontologies are used to specify relevance, reusability and reliability of certain ontology mappings from repositories (employing social networking and statistical information). The ultimate goal of the community alignment service activity is to enable knowledge services of external applications to reuse (i.e., gain benefit from) these annotated mapping repositories and alignment services.

Community-Driven Ontology Versioning Service: The versioning service represents different versions of the ontologies, including backward consistency support and related instance versioning. The front end provides a report on version information, changes and their effects, for example, the difference of two versions of the ontologies. The back end supports backward consistency in the different versions of the ontologies and their instances update. The Ontology Versioning Service is to be interoperable with Ontology Editor, Ontology Storage and Query Manager and pluggable inference engines for performing additional optional tasks such as checking consistency. On top of the ordinary functionality of an ontology versioning service, a community versioning service needs to have a set of simple understandable interfaces, be available and easily accessible on the Semantic Web, and track the changes taking place in distributed ontologies and instance data sources, reporting relevant inconsistencies and its resolutions to community versioning service users.

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[9] Intellidimension Semantic Web Search: http://semanticwebsearch.com
[10] OWL Ontology Aligner: http://align.deri.org

4. Limitations

In this section, I generalize typical limitations of the classmates' community web portals, and briefly outline the way to overcome these limitations via community-driven ontology management on the Semantic Web.

4.1. Overview

Observation of the functionality of the classmates' portals allows us to identify several limitations restricting their usage. These limitations are general enough to be applicable to existing web portals supporting different communities than classmates. The limitations are as follows.

Geographical restrictions

Most classmates' web portals have geographical restrictions, i.e., a classmate can register adequately only within a portal providing opportunities to state the fact that this classmate comes from a particular school of a particular country.

Absent or simplified functionalities

Most of the reviewed web-portals for interaction of classmates support very basic activities such as registration and search, but not the advanced activities such as maintenance of the common calendar to organize meetings or support of and access to a query service over the instances provided by portal members. Sometimes, the support for advanced activities is present at the classmates' web portals, but usually this facility is not extensive enough. For example, the compare-tool at the Classmates.com portal described in the previous section allows an user to compare his/her answers to the answers of other classmates using only one type of simple predefined queries. Specifically, the user is asked to choose his or her age group, gender and a particular question as the basis of comparison. Thus, for instance, finding out how many of your classmates of your gender and age have cats as home animals is possible, but finding out how many of your classmates of your age and gender live in the USA and have at least two children is impossible. This limitation arises because Classmates.com portal does not support construction and processing of queries with conjunctions or disjunctions. Therefore, in the light of existing personnel evaluation research described in the previous section, the state-of-art support of the self-assessment feature looks especially shallow on the classmates' community web portals.

Generality of services

Apart from the classmates' web portals such as the ones listed in Section 2, other web environments can partially satisfy demands of classmates' communities. For example, Yahoo Groups provide such groupware as registration of a group/group members, mailing-lists, chat, file/link sharing, voting, personal calendar. However, the Yahoo Groups' functionalities prove to be too general, as they are designed to support an environment for any group of people and thus comprise groupware items one can find anywhere else. Therefore, Yahoo Groups and similar general-purpose environments can hardly be considered as a perfect solution for communities of classmates, due to the lack of functionalities and services specifically interesting for these communities.

Data input overhead

Nowadays, a usual need to register and to log in for each web portal/environment every time their functionalities are required incurs overhead. The user has to enter the same personal information (e.g., name, surname, e-mail address, telephone number, etc.) multiple times for each of the different web portals used by him/her and permanently operate with multiple environments. Further, when a community member uploads an object (e.g., text file or image) to a community web portal supporting annotation of the objects (e.g., Microsoft SharePoint Portal Server[11]), most times he/she has to annotate the object manually by inserting data describing document in the form for each portal.

4.2. Overcoming the Limitations

To overcome the limitations of community web portals, the following milestones need to be passed:

Up-to-date annotations for people and objects

Corresponding to the Semantic Web vision, persons or objects should be provided with a machine-processible annotation that can be shared across applications. FOAF[12] and Dublin Core[13] are examples of wide-spread schemata for annotation of people and documents. Further, when certain properties of a person or object are changed (e.g., a person moves to a new flat), the change in the annotation needs to take place is communicated to the Semantic Web environments employing the changed (meta)data. This Semantic Web scenario has a potential to overcome the limitations of data input overhead, and has yet to be elaborated in details and achieved in the future on the broad scale. At present, even at the well-developed Semantic Web community web portals such as KnowledgeWeb[14], extensive data entering is required in order to register community members and introduce new objects for the community.

Access to weaving of the Semantic Web

Enabling wide communities of users and developers to introduce new ontology structures and services is crucial for Semantic Web to adapt to the actual users' needs and to spread widely [16]. An access to participation in the formation of the Semantic Web content is associated with *community-driven ontology management*, where ontology management actions (e.g., ontology editing,

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[11] Microsoft SharePoint Portal Server: http://www.microsoft.com/sharepoint
[12] The FOAF project: http://www.foaf-project.org
[13] Dublin Core Metadata Initiatiative: http://dublincore.org
[14] KnowledgeWeb portal: http://knowledgeweb.semanticweb.org

versioning, storage, querying) are performed in a distributed fashion by the users' and developers' communities, in addition to a limited group of web-resource creators and domain experts as conventionally. Letting the communities to weave their own Semantic Web will mitigate such current limitations as geographical and natural language restrictions, absent and simplified functionalities, generality of services.

Community-driven ontology/process alignment

Thus, As the Semantic Web becomes easily and widely extendable, many similar schemata and processes will be developed and maintained by different communities. Under these circumstances, the ability to easily align and combine similar or complementing schemata and processes is of crucial importance for cross-community interoperability. For instance, a person may belong to several communities and employ several Semantic scheduling services, e.g., as the service developed by Payne et al. [12]. Meanwhile, the scheduling services will be helpful to the person only in case of their interoperation, i.e., when making timing proposals, reporting the conflicts in the person's schedule, etc. is done considering the information in the range of all the scheduling services employed by a person. Community-driven ontology/process alignment has a potential to resolve such limitations as geographical restrictions and absent and simplified functionalities by combining or composing available services in personalized, required services.

Semantic desktop

Once the people/objects and processes are being annotated, the Semantic Web is easily extended by the communities of users and developers, and similar and complementing ontologies and processes can be aligned by individuals, presenting massive volumes of Semantic content and workflows to the community members is a major challenge. The solution is expected to stem from the active research fields in the Semantic Web area. For example, Decker and Frank [2] address this problem by combining the current Semantic Web developments in a *Social Semantic Desktop*, which will let individuals collaborate at a much finer-grained level as is possible and save time on filtering out marginal information and discovering vital information. Organizing Semantic Web content and services in personalized, cross-linking and supporting communities Semantic Desktop is the final step in overcoming limitations typical for the current community web portals.

5. Conclusions

Within a domain of ex-classmates' portals, the limitations of existing community web portals are identified. The analysis of the scenarios in the selected domain in general and of the self-assessment scenario in particular reveals an added value in combination of solutions across domains and communities where similar problems are addressed. Moreover, the examples of this paper illustrate that solutions developed for communities substantially vary even within one domain. Therefore, an infrastructure for community-driven ontology management is needed to for timely capture and alignment of the end user and developer efforts. Community-aware approaches such as evolution of Semantic Web annotations with respect to their usage, broad accessibility to creation of Semantic Web content and services, community-driven ontology management and alignment of efforts, and semantic desktop have a high potential to overcome the limitations of the current community web portals.

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