AUGMENT OPEN AND DISTRIBUTED SOCIAL NETWORKING WITH CONTEXT AWARENESS

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Abstract: Nowadays Social Networking phenomenon is gaining a significant momentum. Social Network's users are disclosing a lot of information about their relationships, profiles, preferences and interests but also an increasing amount of multimedia contents. The Web is being populated by Social Networking Web sites which are introducing fragmentation and mining future evolutions. In this position paper we propose a concrete alternative to the current state of the art, to overcome vertical silos' aggregation and enable open, distributed and Context Aware Social Networking focusing on users' privacy and data ownership.

1 INTRODUCTION

Online Social Networking is determining a new paradigm of experiencing the Web. The interaction paradigm has definitely been evolving from Human to Machine to Human to Human.

Online Social Networks have introduced and fostered this dynamic but may not be future proof. The main concerns are about data ownership, Identity management and information overcrowd. In prospective, mash up Web sites could be useful to serve as directory to find friends but should not mandatory mediate all interactions and store whatever contents users would like to share.

The consumer electronic market is expanding and highly sophisticated technology is rapidly becoming affordable. New market segments are created (tablet, e readers etc.) and costumers are extremely responsive.

These devices are increasingly powerful and capable of managing, creating and consuming different kind of digital contents also in mobility. Meanwhile the Web is targeting TV sets, Network Access Storage and IP appliances are rapidly spreading in domestic Upnp/Dlna environments, storage's cost is decreasing and bandwidth gets cheaper.

In this context Telecom Italia is researching new paradigms of peer to peer Social Networking to seamlessly share multimedia contents, devices and digital experiences without central aggregators' mediation.

The Web platform (W3C Social Web IG final report, 2010) already provides the means to create such a kind of infrastructure but new standards and practices should be pursued to maximize interoperability and properly address specific security requirements.

Telecom Italia is investing on this research area within EU FP7 project SOCIETIES.

The SOCIETIES project (http://www.ict-societies.eu/), aims to investigate and address the gap between pervasive and social computing by designing, implementing and evaluating an open scalable service architecture and platform for Community Smart Spaces (CSSs).

2 OPEN AND DISTRIBUTED SHARING WEB BASED PLATFORM

With respect to a sustainable and distributed Social Networking platform we foresee and detail in the following paragraphs two main challenges:

- Managing a Web Identity
- Managing content Read/Write operations on the Social Web

2.1 Web Identity

Defining decentralized Identity management infrastructures would be the basis of an open Social

Networking ecosystem. We need a framework to univocally identify a person or other entities on the Web such as companies, organizations, web sites, contents or devices.

Whichever content these entities may publish on the Web their unique ID should serve to identify them as owners. Most importantly entities may reference each others, declare social relationships, let others access and consume contents also if their profile is not hosted on the same Web server.

Whatever you publish on the Web should be reconciled to your profile and accessible, without the need of creating and replicating profiles into different silos.

The game is quite simple, you identify yourself with a URL then you provide a document describing yourself, your social relationships and available resources at that URL. A certificate based architecture and procedure can then easily support authentication and enable access control list in a browser friendly, encrypted way.

Internet users should be able to store and publish on the Web, on their mobile or home server and grant access to a list of other entities still being in full control of their data and tracing requests.

Telecom Italia is contributing for this to become a standard as this would be the only way to collect requirements from heterogeneous domains prevent fragmentation and encouraging adoption.

WebID is already an unofficial submission to W3C, it basically aims at using X.509 certificates to associate a User Agent (Browser) to a Person identified via a URL. Telecom Italia is kicking off the W3C WebID incubator group (W3C Web Identity IG Charter, 2010) together with Apache Software foundation, Nokia and DERI. This initiative aims to pave the road for standardizing the WebID protocol by bringing together people involved in authorisation and authentication activities, building on the existing WebID initiative.

2.2 Distributed Social Contents and Services

In response to increasingly powerful handheld devices, people are constantly populating the Web of new contents. We define as content whatever can be read/written on the Internet ranging from Web pages, Live Audio/Video Streams profile information and so on.

As said the current practice pretends to force people to apply to different vertical silos to reach different audiences and this is extremely unpractical for managing one's information on the Web and for-

ces to waive data ownership.

The content sharing framework we foresee would not mandate to publish information into the same Web site but would let everyone choose where to store them just providing the mechanisms to reconcile to the owner identity.

In Telecom Italia we prototyped a Social context aware platform which can be instructed by users to seamlessly collect and correlate information, e.g. generating a geo referenced picture album, or an automatic daily blog to share with friends or acquaintances. This kind of information can be very privacy sensitive and would be unfeasible to store it constantly to an online social network, the average user would probably like to collect it into an home server for personal recordings and possibly share with very close friends.

The content storing/publication phase has to be structured in a way to easy the look up phase. Some of the contents (e.g. pictures) may span over different devices (e.g. Home Server, Mobile, third party Web site) but we expect the retrieval phase to be agnostic of the data store. With this specific respect we foresee the need of (standardizing) a minimal semantics (e.g. taxonomy) and a user friendly mechanisms (e.g. tags) to properly categorize contents in the act of publishing.

Contents (e.g. photo, video etc) will include further information in form of attributes (e.g. picture, date, caption, context etc).

W3C is already providing standard mechanisms such as RDFa (W3C RDFa Primer) to nest this kind of information within standard HTML page for use of semantic crawlers.

Merging Web Identity and Semantic categorization of contents, would consent to create effective views of one's multimedia contents stored into different devices or web sites (accessible by means of references to the actual hosting devices) and to share them without the need of passing those to third parties. Even if contents may reside on different devices, if they are organized by some semantic criterion, performing an integrated view would be an easy task.

Nevertheless we believe that electing some of them as the master storage would make sense and that a home server (e.g. Network Accessible Storage) would meet the requirements in terms of storage capabilities, processing power, continuous Internet connectivity and low power consumption.

Depending on the type of contents published (e.g. video) and number of concurrent requests (number of interacting friends) this may be the preferred option.

Pretending a home server to be the master node, users should be able to define the conditions under which a synchronization with any other device (camera, tablet, laptop) should take place, e.g. just in WiFi network mode.

3 SOCIAL CONTEXT BROKERING ARCHITECTURE

Multimedia sharing is definitely a critical asset of communication in online Social Networking. Often the descriptions turn out to be the real communication payloads instead of the content itself (Adrien Joly et al, 2009).

Multimedia content descriptions add both semantics and context information. They are crucial for optimizing the communicational benefits of a Social Networking application especially in a situation in which contents tend to increasingly overcrowd these sharing spaces.

Nevertheless adding this information maybe time consuming, which usually lead to low quality information which result useless or even misleading. We believe that automating part of this task could significantly improve the communicative factor of a multimedia sharing space.

There is some useful information which may be collected from a wide range of devices, sensors and information provider and automatically associated to the content which is being published.

In a multiple devices' appertaining to the same entity scenario, we foresee an architecture based on a context bokering/sharing node (e.g. home server) plus several providers and collector (running on various devices or clouds) for each entity.

For instance a context brokering node could be deployed in the said home server (one of each user) and in turn collect information from various mobile devices, assist the content publication phase and additionally provide user's friends and acquaintances with dynamic status information about a user (kind of next generation presence).

We've pursued a distributed context-aware system (Claudio Venezia and Luca Lamorte, 2010) capable of aggregating and processing a variety of context information provided by physical sensors embedded on mobile devices (Zhdanova et al, 2006). There is already a significant body of research on context modelling and brokering platforms (Claudio Bettini, 2010). Most of them address pervasive and ubiquitous computing requirements and do not explicitly target the Social domain. Furthermore

being Social Networking tightly coupled to Web technologies we resolved to target a lightweight environment, loosely coupled and based on Web protocols. Usually in context-aware systems, domain knowledge is very much tied to applications but we resolved to pursue a service agnostic definition of context. Current state of the art of online Social Networking mainly focuses on presence and location. Our definition of context spans over a wide collection of information available from user's surrounding environment, his/her terminal, network connectivity, current activity. It is indeed is a large amount of information which tends to grow proportionally to the observing time. Users' social graph role is twofold; it is a context source but plays also a critical role in the content sharing phase.

The "Social" Context management lifecycle consists of four phases: acquisition, representation, brokering, reasoning and publishing/sharing.

The context aware platform is therefore architecture capable of:

• collecting context information from different kinds of sensors or devices (e.g. domestic Upnp devices, mobile, tablet) with respect to a particular user

• storing and aggregating contextual information

• Perform a Blog like representation of the collected information so to be ready to share

• Show detailed current status/activity information to the Social Graph

This information can inspire several use cases: very close friends may be informed about the movie currently playing on my TV, the music I am listening to or the food I am actually preparing and decide to do the same or interact.

Moreover users can be triggered in case of similar context status thus creating dynamic sub-communities of people performing same activity or sharing the same mood.

As said different devices (e.g. mobile, tablet, hifi, IP appliances) belonging to the same entity (e.g. person) may concur to provide contextual information. We foresee that the home server, elected as master node, it could be the ideal host for a context aggregation and brokering component. We envision also a light client running on devices which we call local context broker (LCB) to collect data from sensors and provide it to the broker.

The various devices' LCB will trigger context updates to the broker which will store the overall information.

A common language for context information representation has been defined to enhance

interoperability: "ContextML", an XML-based language, which states a meta-model for the representation that all Providers need to comply with.

For simplifying context management user's information have been subdivided by into scopes, namely sets related to the same information category. For example, the scope named "position" groups latitude, longitude and range with respect a certain entity's (e.g. user) location.

In the act of publishing a content from any device a user may be automatically be provided with fine grained contextual information (e.g. his current state, location, activity) which he may want to add to the description.

4 CONCLUSIONS

It is timely to supersede Social Networking silos approach and unblock novel Social Area Network paradigms. The key Internet players' strategy consists in acting as brokers. They provide user friendly tools to publish and consume information while they keep on storing and mining it, as required by the asynchronous nature of the Web platform. The current Social Networking platforms have been designed and engineered to conduct people to keep on feeding this mechanism. The ultimate goal is increasing providers' profits rather then realizing the full potential of this technology/paradigm. Services are not for free, Internet users pay for those services by means of the information they release to the brokers. Being constrained to release your communications' payload to third parties in order to reach your audience will soon become anachronistic.

Decentralizing Identity management and profile information will avoid a centralized control and ownership of data. This will discompose the current Internet control's chains and disrupt the current monopolistic approach.

Each Internet user should gain a WebID, publish a Web document describing him/herself and exposing interactive interfaces to share digital life with friends.

Privacy sensitive Context awareness will enrich interactions and help surviving the noise produced by an exponential content production. Standard cryptography mechanisms and certificate based authentication should be put in place to protect interactions.

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