Using semantic technologies for scalable multi-channel communication

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Abstract. The development of the Web in the direction of user-generated content, information sharing, online collaboration and social media, have drastically increased the number of communication channels that can be used to interact with potential customers. In this demonstration we present the latest developments of our multi-channel communication solution, which enables touristic service providers, e.g. hoteliers and touristic associations, in dealing with the challenge of improving and maintaining their communication needs. We make use of semantic technologies, i.e. semantic analysis, semantic annotations, ontologies, semantic matching and rules in order to automate several multi-channel communication tasks.

1 Introduction

The rapid advance of ICT technologies and their increasing importance in the tourism domain brings an exponential growth in on-line communication opportunities. Being able to communicate and engage via a multitude of Internet, Web, Web2.0, social and mobile channels becomes more and more important for touristic service providers. The growing number of communication channels and interaction opportunities generates new challenges in terms of scalability. Hoteliers require new skills and more efficient access means to scale and filter the exponentially increased offer. A scalable communication solution is needed in order to address the growth of the multichannel monster [1].

The Online Communication group[1] is developing a new approach for the hospitality industry that enables scalable communication, collaboration and value exchange (i.e. booking) of users (i.e. tourists) through the multitude of on-line interaction possibilities. In this demonstration we present the latest developments of our platform. We show how semantic technologies are being used to automate several multi-channel communication tasks including flexible dissemination of content on multiple channels, collection and understanding of feedback as well engagement with possible customers. Our solution integrates and includes support for several platforms e.g. Facebook, Twitter, LinkedIn, YouTube, Flickr, Google+, WordPress and Typo3. The remainder of this paper is structured as

[1] oc.sti2.at

follows: Section 2 presents the overall architecture and how semantic technologies are used. Finally, Section 3 introduces the demonstration plan describing what the visitors will see and learn from our demo.

2 Architecture and Key Technologies

In order to build a scalable multi-channel communication solution, we specify and realize the concepts of the channel model, weaving process of content and channels and communication patterns. As depicted in Figure 1, our platform includes two major components: (1) *dacodi*, and (2) the *weaver*.

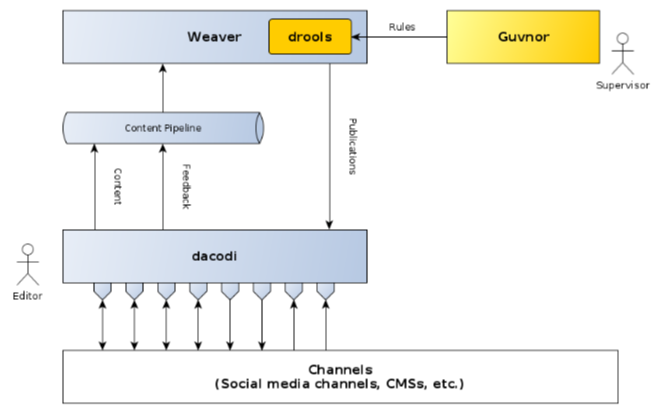

Fig. 1. The Big Picture of the architecture.

dacodi [2] is used to perform the actual distribution of content in various channels, to collect and analyze feedback from those channels and to engage in conversations. *dacodi* implements a set of wrappers to 3rd party APIs of the platforms that are supported including Facebook, Twitter, LinkedIn, YouTube, Flickr, Google+, WordPress and Typo3. Using *dacodi* one can have a federated view of social media stream, a central feedback collection, statistics and analytics on disseminated content as well as means to engage with the audience i.e. replying to comments, etc.

The *weaver* is responsible for the intelligent mapping of information items to the appropriate channels. It performs rule-based dissemination to social media channels using the underlying publishing functionality provided by *dacodi*. The *weaver* fits the right content in the right channels using the semantic annotations of the content (e.g. schema.org). It also handles fetched content and feedback from dacodi as a knowledge base.

Semantic technologies play four distinct roles in our approach enabling efficient and effective multi-channels communication. More precisely we use:

1. *Semantic Text Analysis* - Semantic Text Analysis enables our solution to "understand" the natural language statements in a communication act. Se-

mantic Text Analysis is commonly implemented by using Natural Language Processing (NLP) techniques. Among the various NLP techniques, opinion mining and sentiment analysis are especially important for online communication. Opinions and sentiments are identified using elements of computational linguistics, text analytics, and machine learning (e.g. latent semantic analysis, support vector machines, etc.). We make use of viralheat[2] for opinion and sentiment analysis.
2. *Semantic Channels* - The paradigm shift with respect to semantic technologies towards the Web of Data vision and its implementation Linked Open Data (LOD) provides new opportunities to integrate more data centric communication channels. Central to LOD are vocabularies and languages. Our solution can handle content which is annotated according to LOD vocabularies (e.g. schema.org) in various markup formats (e.g. RDFa, Microformats, or Microdata). We interpret LOD vocabularies as channels. If we map an information item in such a vocabulary, it can be understood by other agents that are common to this vocabulary. In our view, LOD vocabularies are means to disseminate and share information and not means to model information.
3. *Semantic Content Modeling* - Semi-automation of online communication processes is only possible if content can be understood not only by human agents, but by machines as well. Semantic Technologies in general and Ontologies in particular provide the means to conceptualize and share content, a prerequisite for automation. In our approach we use domain ontologies (e.g. Accommodation Ontology[3]) for semantic content modeling. Furthermore we also map domain content with LOD vocabularies when we see a gain in broadening our range of communication through them.
4. *Semantic Matching* - Content and channels are brought together via a weaving process. Through the use of semantics, channels and content are matched automatically. We have implemented a rule-based approach using drools[4]. Rules are fired depending on the semantic annotations of the content to be disseminated. Content is thus matched, transformed and updated to the right channels. Typical transformations include the shortening of text to fit into tweets, attachment and resizing of pictures, and the transformation and adaptation of videos or slides where needed.

Several approaches and tools for multi-channel communication exist such as Vitrue[5], CrowdFactory[6], HubSpot[7], Radian6[8] or MeltWater Buzz[9]. However, none of these tools abstract and distinguish the communication or channel model from the conceptual descriptions of the information and provide support to au-

[2] https://www.viralheat.com/
[3] http://ontologies.sti-innsbruck.at/acco/ns.html
[4] https://www.jboss.org/drools/
[5] vitrue.com
[6] eu.marketo.com
[7] hubspot.com
[8] radian6.com
[9] buzz.meltwater.com

tomate communication tasks. In our approach we use semantic technologies to address the challenges of multi-channel communication.

3 Demonstration Plan

In this demonstration we present the latest developments of our solution, showing how various channels including Facebook, Twitter, LinkedIn, YouTube, Flickr Google+, WordPress and Typo3 can be registered with our platform, how information items can be disseminated by one click through this multitude of channels, and how feedback is collected and engagement with the users is supported. We will show how semantic technologies are used in our solution to achieve scalability. The demonstration is based on a simple use case, namely automatic announcement of events. This is a typical scenario in which a touristic service provider (e.g. touristic association) wants to disseminate information on multiple channels about the events in their touristic areas. The tourist service provider also wants to see the results of the dissemination actions, to check the received feedback and to engage in conversation with the interested parties. Several challenges are faced in such a scenario including where to disseminate the information (e.g. on the web site, Facebook, Twitter, and other social media, mailing lists, etc.) and when (repeated announcements in time, interrelation between time and channel, etc.). We show that such challenges can be addressed using semantic technologies.

The demo will present to the visitor, playing the role of a touristic service provider, a Web interface to register social channels accounts in dacodi and to manage them. The visitor can also specify the incoming channels, i.e. information sources from where the content is fetched, and then processed and published by our platform. In our demo we use yelp.com as one incoming channel. Events available in yelp.com are semantically annotated according to schema.org/Event, annotations which are used by our solution to decide on which channels and when the content is disseminated. Semantic annotations according to popular vocabularies (e.g. schema.org) and ontologies (e.g. Accommodation Ontology) are used as a basis for automation of multi-channel communication tasks.

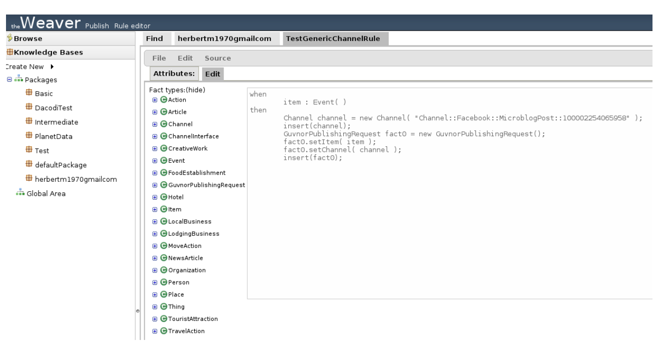

Fig. 2. Definition of rules using the Weaver GUI.

The weaver component performs rule-based dissemination to social media channels. The weaver rules can be defined using our interface (see Figure 2) based on Drools Guvnor[10]. Information items come either from registered incoming channels such as yelp.com, or can be defined using our user interface. Before publishing an information item, the item can be previewed and if needed modified by the user. After the information is published in multiple channels with a single click, our platform periodically checks for feedback, collects it from various platforms, aggregates and visualizes it (see Figure 3). Using semantic text analysis, our platform can detect opinions and sentiments in the feedback. Any interested user can try our on-line demo at https://dev.dacodi.sti2.at/.

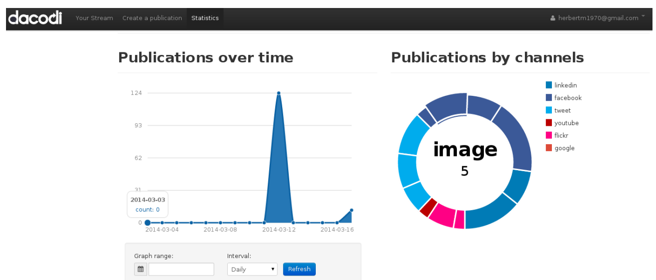

Fig. 3. Aggregate feedback.

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[10] http://www.jboss.org/drools/drools-guvnor.html