

Devising Secure Communication for Decentralized Environment

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Many of contemporary personalisation systems are developed in the centralized way. The personalisation itself is done almost entirely on the webservers. That has several disadvantages, e.g., low flexibility due to too many data on single place, privacy. Another approach is a decentralized model, in which each client (an agent in the multi-agent system in essence) keeps a model of its user, determines what will be shared with others and personalizes the content and navigation to the actual needs of the user. This is called distributed or decentralized user modelling.

Previously, whilst commencing our research we analysed the most essential requirements for our work, which are:

- A network of distributed components must be able to adapt itself, especially because the same communication partners and technology are not always available.
- Information should be able to move among multiple users and platforms without the need for centralized controlling.
- How to locate an agent who has the relevant model with regard to the context and the purpose for which this model is required?
- How to make sense of potentially inconsistent, contradictory data?
- In general, how to interpret models created by other agents?
- How to ensure durability and the integrity of user models in this environment?
- How to ensure user privacy?

As the decentralized user modelling requires wide range of issues [1] to be addressed and those aforementioned are definitely not all of them, our research should not focus on every one in detail since there has already been done significant amount of work. Instead of that we must analyse and choose the most appropriate existing methods and helper tools. That will allow us to focus on the main goal of our work – to build up the

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decentralized client-side solution, which would provide the functionality similar to a personalized proxy server.

So far in our analysis we studied several approaches to ensure user privacy. The motivation for privacy care is to protect user private data and to encourage him to safer interaction, which has potential that user will use system more often and frankly without fear since he knows his data is protected and secure. This leads to more information about the user and hence a better basis for personalization.

There are multiple proposed standards for agent communication which have been already used in several works. Knowledge Query and Manipulation Language (KQML) is both a language and protocol originally designed as an interface to knowledge based systems, but later repurposed as an agent communication language. Another agent communication language is FIPA-ACL proposed by the Foundation for Intelligent Physical Agents. As the most recent, the platform for privacy preferences (P3P) protocol has been developed and officially recommended by the World Wide Web Consortium, which allows websites to declare their intended use of information they collect about users who can thus better manage their personal information while browsing.

To devise a communication infrastructure we discovered LoudVoice [2], which is an efficient multi-agent communication platform based on the concept of channelled multicast. Messages are sent on a channel and received by all agents that subscribe to it. Channelled multicast reduces the amount of communication needed when more than two agents are involved in a task. Moreover, LoudVoice presents several other features including the ability to distinguish streams of messages by their theme, and to address agents by their characteristics. Multi-agent systems can benefit from the possibility of broadcasting messages to a wide audience. The audience may include overhearing agents which, unknown to senders, observe conversations and, among other things, pro-actively send suggestions.

LoudVoice has been designed to support the notion of implicit organizations. An implicit organization is a group of agents playing the same role on a given channel and willing to coordinate their actions for the sake of delivering a service. The term “implicit” highlights the fact that there is no need for a group formation phase, since joining an organization is a matter of tuning into a channel. By definition, implicit organizations are formed by agents able to play the same role. LoudVoice allows senders to address messages either to specific agents or to all agents that offer a certain service on a channel, for example providers of a particular type of information.

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References

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