



Agents for Intelligent Communications Systems

Almende A Case Study

1 Introduction

In this document we examine an intelligent communications system (ASK) developed by Almende [1] and marketed by ASK Community Systems (ASK CS) [2] that provides several mechanisms for matching users requiring information or services with potential suppliers. The system offers intelligent and self-learning solutions using dynamic classification, scheduling and feedback mechanisms, and is targeted at intelligent routing, dynamic resource planning and distributed knowledge management applications. Almende and ASK CS work in a synergistic collaboration, with Almende providing the continuing development of the ASK system using feedback given by ASK CS gained through its experience with deploying the system with clients.

2 Almende

Almende was founded in 2000 in Rotterdam. Its name translates into English as commons, which is some resource, usually understood to be a piece of land, over which other people – often neighbouring landowners – could exercise one of a number of traditional rights, such as allowing their cattle to graze upon it. Almende uses this metaphor to describe the kinds of areas they tackle, developing tools and products that can help companies and businesses to manage the common resources at their disposal. Their approach focuses on self-organisation techniques, adaptive company management and innovation, and their main technology areas include systems for human-agent networks, genetic algorithms and distributed systems in general. Almende also collaborates with a wide range of knowledge institutes and universities around the world, and develops products for businesses or organisations where communication with customers, suppliers and clients plays a key role.

2.1 The Application Area

Effective communication is vital if businesses and organisations are to operate efficiently and competitively. Getting hold of the right person with the right information at the right time is clearly important if business goals are to be met and problems are to be solved. However, obtaining such effective communication is difficult when people are on the move, are not free to talk or do not have the necessary information to hand. With the increased penetration of mobile communications devices, however, it is possible to streamline the communication process and make it much more efficient than traditional methods in which people simply attempt to call directly and hope that the person they are contacting is available and in a position to provide the necessary information or assistance. By leveraging the ubiquity and power of mobile devices, Almende offers communication solutions that can greatly increase the effectiveness of companies to provide accurate information between its employees and customers.

3 The ASK System

The ASK system allows people to contact each other via phone, email or other means based on information stored in a database. The database maintains information about each person in the system and provides contextual knowledge that enables the ASK system to provide the right kind of contact between individuals depending on their current availability. For example, If a person is out of the office, ASK might route the call through to a mobile device. Similarly, if several possible people can address the needs of the person attempting to find help, then ASK can select between the candidates based on their current availability. ASK allows many different kinds of queries to be made that can then be used to organise a particular service for a user. For example, calender information can be imported to allow the routing of queries in a way that is sensitive to peoples' activities. ASK also allows users to provide feedback on the service provided so that subsequent service provision can be improved. Furthermore, the system is fully distributable and each component can be duplicated to provide increased redundancy, thus minimising the impact of failure in any one component.

Currently, the ASK system has been deployed in several companies, such as Pfizer, RaboBank, Vestia and Start, to improve their communications. From September 2005, a new company, ASK Communications Systems, was founded to handle the commercial side of marketing the ASK system.

3.1 The Main Three ASK Components

At the highest level, the ASK system consists of three components: a web interface, a database and the ASK engine. The web interface provides the front end through which the system can be configured, and online access provided. The database stores the information for each person in the system that is used to determine the best way for contact to be established. The final component, the ASK engine, consists of a set of software agents, and is where the core functionality of the ASK system resides.

3.2 The ASK Engine

Within the ASK engine are several agents, each of which provides a distinct service for the system. If we consider the system as a pipeline through which requests for contacts pass, then the following agents each carries out their role in the following order.

First incoming requests are processed and classified by the Reception agent. Once a request is classified it is passed by the Reception to the Matcher agent, which matches the caller with a person that can provide assistance (requester and responder in the terminology of ASK). Matching can be problematic since the preferences of the requester and candidate responders must be taken into consideration. The Matcher tries to find several potential responders and selects between them using one of four possible methods, as follows.

- Round Robin: the Matcher randomly selects a responder from the set of candidates available.
- Last Spoken: the Matcher selects the responder that was selected previously.
- Rating: the Matcher uses feedback provided by the requester about potential responders and selects the one with the highest rating.
- Friendly Rating: the Matcher again selects based on the received ratings, but occasion-

ally randomly selects a different responder in order to provide them with the opportunity to improve their rating.

Because application domains differ in their requirements, the Matcher can be configured to make selections in different ways. Once a match has been found, the Executor agent is called; this has the role of determining how best the requestor and responder can be connected, and involves the use of information stored about the responder, such as location, the skills and information available to the responder, availability for different levels of emergency and so on. Once the best method of connection is determined, the Resource Manager agent makes the connection between the requestor and responder in the manner identified by the Executor. For example, if the communication medium identified by the Executor is, say, SMS, then the Resource Manager sends a text message to the responder indicating the nature of the request. Possible communications methods that ASK supports are: analogue and ISDN telephony, GSM, VOIP, SMS and Email.

The final main component within the ASK engine is the Scheduler agent, which is responsible for the learning capabilities of ASK. Once a connection with a requester and a responder is finished, the Scheduler can contact both to obtain feedback about the interaction. In addition, the Scheduler is responsible for ensuring that there are enough potential responders available. It does this by contacting potential responders when their available numbers fall below a given threshold, in which case a request can be made for them to become available.

4 The Development of ASK

The development of ASK took place over two years. Initially, ASK was a project sale, in that it began as a pilot project for a telecommunications company to investigate how computational systems could be used to reduce the cognitive load placed on support staff, and to improve the efficiency of communications between departments. However, subsequent development enabled the commercialisation of ASK as a full product. Around six people were involved in its development: one architect, three to four coders and one

customer relations manager. A large amount of time was spent developing the sales pitch for ASK, since it was not immediately apparent to customers how the system could add value. Adopting ASK involves a complete change to the way a company works, in terms of how it organises its internal and customer communications. For this reason, a very clear sales strategy had to be developed to enable the benefits of the system to be demonstrated to potential clients.

4.1 Agents in ASK

The use of agent technology in ASK helps to provide the necessary autonomy for the various different components of the system. For example, the Matcher can autonomously decide which responder is most suitable for a given requester based on the requirements of the requester and the stored information about the responders. The agents in the system are lightweight and relatively simple, and this is entirely appropriate. Indeed, although Almende finds that using the agent metaphor helps to facilitate a client's understanding of what ASK does, pushing the agent aspect too far can make the client wary of the system. This happens because the perception becomes one of an autonomous system that may begin to act in unpredictable ways that the client cannot control. The simple nature of the agents does not hinder the goals of the system designers, and allays the fears of the client that the system may begin to act in ways that are unexpected.

5 Summary

In this document we describe the ASK system, an intelligent communications system composed of intelligent agents that perform a number of roles and interact with each other to provide the functionality of the system. The system aims to reduce the cognitive load placed upon people whose responsibility is to manage the communications routing between clients and employees. The benefit of the agent-based ASK system is in its ability to dynamically adapt to changes in the availability of responders, and to intelligently route requests to appropriate communications devices, while taking into account several constraints derived from both the requester and responder. The success of the ASK system and its subsequent use by numerous

clients, has led to the establishment of ASK Communications Systems, a company whose main role is to promote and market the ASK system to industrial and commercial clients.

References

[1] Almende. <http://www.almende.com>

[2] Ask Communication Systems. <http://www.ask-cs.nl/>. Magenta Technology, <http://www.magenta-technology.com>

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