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Work package I

Pilot Application 1

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1 Introduction

1.1 Abstract

This document serves as a rationale for the selection of pilot applications within the FollowMe project. For this purpose we propose several knowledge domains in which we plan to implement pilot applications, point out in which way the pilots demonstrate the key features of FollowMe and compare them to existing web application within the same know-ledge domains. For each proposed pilot application we report our efforts in establishing relations to information providers and users that will participate in the pilots. Finally we point out risk factors that affect the implementation of the pilots. For a general discussion on applications using autonomous mobile agent technologies see internal project deliverable DD1 (survey on autonomous agents).

1.2 Architecture overview

Information currently available on the world wide web is mostly unstructured and only accessible to human readers. Despite the fact that one can find almost any information on any topic on the web, the user gets lost on his/her way to locate it. Therefore there are currently lots of web research activities dealing with data mining, knowledge retrieval and knowledge representation.

Besides this loosely coupled and unstructured information there exist more sophisticated web services and applications, but they are usually maintained by a single service provider and do not interact. Another issue with the web today is that locating relevant information sources and collecting information from various sites is very time-consuming.

In observing this situation we realized that there is a strong need to improve the interaction between information providers and information consumers. The core features of the pilot applications should therefore be as follows:

- The system should function as a mediator (broker) between information providers and information consumers.
- The system should enable automated task execution while the user is off-line. Information retrieved by agents should be stored close to the user (i.e. in the user's LAN or at the site of the user's internet-provider) to allow fast and reliable access.

- The system should allow the user to be mobile. That means the user should be able to access the system from different end devices (i.e. any Java-enabled device, fax-machines, mobile phones) and from any geographical location.
- Information related to the user should be stored in a trusted environment.

In order to ensure that the system is scalable and adapts to new requirements, one of our requirements is to de-couple its core components, as there are users (information consumers), information providers (offering access to data-objects), service providers (offering services that perform operations on data-objects on behalf of a user) and brokers (mediating between the other components).

The following use case scenario briefly describes how these components incorporate within our pilot applications:

- The user connects to the system via any Java-enabled internet device.
- All communications between the user and the FollowMe system is handled by the user's personal user agent (PUA).
- The PUA connects the user to a service broker that allows the user to select a specific service the user wants to use. This de-couples the user specific components (such as the PUA) from the rest of the system (available information sources and services).
- The broker links the user to the selected service. The user specifies input parameters required by this service, a time schedule that specifies when to execute the service and a location where the user wants the results of the service to be stored.
- After specifying these input parameters, the user can disconnect from the system. The specified services will be executed automatically according to a user defined schedule.
- When a service is executed (triggered by the user defined schedule for this service), the agent that is in charge of executing the respective task will contact another broker that links it to information provider sites that hold data objects related to the task. This de-couples service providers from information providers. The service provider does not need to know about available information sources – this information is provided by the broker. New information providers can join the system by registering at the broker service without the need for changes to existing services. The same holds for the integration of new services operating on data offered by information providers.
- The agent contacts these data sources, collects data objects that match the parameters specified by the user, may performs certain operation on this data and delivers the results to the PUA, which, in turn, stores the information in a location close to the user (trusted space).
- Via his/her PUA, the user can specify when and how he/she wants the results of a specific service to be delivered to him/her. Output devices could be any Java-enabled internet device, standard fax devices or phones.
- The user can keep a diary that holds information on when he/she is reachable through which devices. This enables event triggered information delivery (in addition to scheduled delivery).

1.3 Pilot applications and related knowledge domains

The pilot applications chosen for the validation of the FollowMe system architecture should in general meet the following requirements:

- The proposed knowledge domains should be of interest to a significant percentage of users of the Bavaria Online Network (the testbed for our pilots).
- The pilot applications should offer added value compared to existing web applications within the same knowledge domain. The added value of the pilots will neither be the complexity of the offered services nor the amount of information provided. There already exist very sophisticated (but centralized) web applications that offer large amounts of information on specific topics. Competing with these services in trying to provide more information than them is beyond the scope of this project. Instead the pilots should focus on demonstrating features like web automation, mobility of the user and scalability in the sense of the integration of new users, services and information sources.
- The data structures of the information the proposed knowledge domains deal with, should be well definable. Otherwise it will be very difficult to automate data retrieval and data refining.
- Structured data should be available from more than one information provider. Information providers within the proposed knowledge domains should have strong interest in distributing their data to as many consumers as possible and should not be concerned about competing with other information providers.
- Among the basic use cases of the pilots should at least be scheduled execution of data queries that match parameters specified by the user and event triggered user notification (these use cases demonstrate the core feature of the FollowMe system architecture: web automation and device and location independent user access).

These requirements did lead to the selection of the following knowledge domains:

- stock information systems
- real estate information systems
- regional event notification systems

Within these knowledge domains, we plan to implement at least two of the following pilot applications:

- A system that holds information on a users stock portfolio, continuously updates stock values and automatically informs the users whenever critical changes to specific stock values occur.
- A system that provides the user with information on real estate objects he/she might be interested to purchase. The information will be provided by querying a number of sources that advertise real estate objects. The queries will be performed according to a regular schedule and with parameters specified by the user.
- A system that provides users with information on regional events (i.e. cinema, concerts, markets, exhibitions). The information will be provided by a number of Bavaria Online access providers. Agents will query these resources on a user defined schedule.

These knowledge domains and pilot application will be described in greater detail within the following document sections.

Once these pilot applications have been implemented, it will be relatively easy to integrate other applications that also deal with businesses that require a broker to effectively mediate between information providers and information consumers (i.e. a market place for used cars or the advertisement of employment opportunities).

2 Stock Portfolio Management System

2.1 What is currently available on the Internet

At present there is a vast number of service providers on the internet who provide different types of information and at varied levels on the domain of stock information. The objective of this document is to compile the most prominent and useful features available.

The most comprehensive coverage on stock portfolio management is offered by "Yahoo Finance" (<http://quote.yahoo.com/>). Its features include:

- Summary of the various indices and links to more detailed information of the same.
 - DOW, NASDAQ, S&P 500 and 30 year Bond (Index, fluctuation & percentage)
 - Volumes of the NYSE and the NASDAQ
- Look up your own personal portfolio – input relevant ticker symbol and level of detail required

Basic:

- summarized information of portfolio (last trade, change, volume and links charts, news, research, profile, SEC)
- recent news related to the given organization

Detailed:

- information of portfolio in greater detail (last trade, day's range, 52 week range, change, bid, ask, earn/shr, P/E, prev close, open, div/shr, volume, Ex-Div, yield, thumbnail chart of the companies stock for the last 1 or 3 years)
- recent related industry news

DayWatch:

- summary of performance of stocks in portfolio for the actual trading day
- links to more detailed information (charts, news, research, profile)
- related industry news

Performance:

- performance of stocks in portfolio for the actual trading day with evaluation of personal portfolio
- links to more detailed information (charts, news, research, profile)
- related industry news

Fundamentals:

- fundamental data on stocks in portfolio (i.e. market capitalization, earnings per share ratio, 52-week value range)
- related industry news
- Investment Research:
 - no. of brokers recommending as strong buy/sell, moderate buy/sell or hold
 - average recommendation on a scale of 1 to 5 (strong buy to strong sell)
 - earnings per share
 - related industry news
- Profile:
 - address of company and it's board members
 - financial links and company's web presence
 - business summary and statistics at a glance
- SEC filing:
 - list of legally required documentation of the company (e.g. quarterly reports)
- Links to stock brokering firms which offer trading and other facilities to registered customers
- Listing of other international markets
- Exchange rates for the major currencies
- Volume leaders (most active) in the U.S. and Canadian markets
- Upgraded/downgraded companies and companies whose coverage has been initiated
- Upside/downside surprises
- Mutual fund top performers
- Mortgage and automobile loan rates
- Internet stock report
- Features on trading services
- Latest market news
- References – ticker indices, calendars (economic, earnings etc.), financial glossary, research by industry

All quotes except the NASDAQ index have a delay of 20 minutes, while the NASDAQ has a 15 minute delay.

Given below are some other features not available at "Yahoo Finance" obtained from two other sites, "DLJ direct" (http://www.dljdirect.com/dljd/dljdirect_yahoo.htm?qbutton_yahoo) and "The NET Investor" (http://pawws.com/How_phtml/):

- Personalized stock ticker alerts
- Intra-day charts

- On-line trading of stocks options and mutual funds
- Automatic adjustments for posted dividends, splits and mergers
- Daily sweep of idle funds into your choice of interest-bearing money market accounts
- Reinvestment of dividends available on selected equities.

2.2 FollowMe portfolio management system

As stated previously the portfolio management pilot application is not intended to provide the same services that already exist within the Internet, but to illustrate the additional value that could be obtained by using mobile agent technology and the idea of service brokers. Hence this system cannot be compared with sites such as "Yahoo".

The main functionality of our system is to maintain a user's stock portfolio along with their respective cash accounts in order to track transactions. Since the system is of a scalable nature, more services (e.g. information providers wishing to provide related industry news) could be incorporated within this system throughout the implementation phase.

The FollowMe portfolio management system offers the following value added features:

- The most important feature in this pilot application is the ability for the user to be mobile and still be reached by the system. From a diary located in the profile of the user within the system, the system knows how to get in touch with the user to provide critical event triggered information (e.g. value of stock going above or below a certain predefined limit). Also the medium is not limited to e-mail as is the standard case. It could be a mobile phone or fax.
- New stock ticker providers can join the system and the user will be provided with quotes from more stock exchanges (e.g. NYSE, London, Frankfurt, Tokyo etc.). However, the user need not be involved in redefining any parameters.
- As there is no centralized control, new service provider can easily join the system and provide information such as company news, historical charts etc.
- The system will carry out the processing of information (retrieving stock values and evaluating portfolio) while the user is off-line.
- User can access his/her portfolio through different devices at different locations.
- The user's personal information (i.e. stock portfolio) is stored close to the user (in a trusted environment) and is not accessible to others. Presently, sites offering such a service require users to store their personal information in the service providers' databases.
- User can define when he/she wants the system to output the results after processing (e.g. daily at noon).

2.3 Potential information providers

As described above, the first implementation of a FollowMe portfolio management system will offer the basic functionality to maintain a user's portfolio. In order to perform this task, the systems needs to access information providers, that offer regularly updated stock values. A typical data-object provided by these sources would consists of stock identifier (i.e. ticker symbol), a value and a timestamp

for that value. In addition, the data-object itself should have attributes - probably as part of the object's name - like source of information (i.e. Berlin stock exchange), a timestamp reflecting the date of the creation of the data-object and a reference to the service that requested the creation of the data-object (these object attributes are comparable to traditional file attributes like owner and creation date, which are attached to the file rather than part of the content of the file).

Potential information providers for this pilot application are mainly stock exchanges, news agencies and financial brokers. After contacting several people involved in financial brokering business, we found that none of these information providers might be volunteering to provide us with the required information at reasonable costs - not to mention our need for the information being presented in pre-defined format so that our agents can handle it (see section 2.5).

2.4 Potential users

In our first discussions with the CEO of the "Dachverband der Buergetznetze e.V." (head organization of the local network providers that form up the Bavaria Online Network), the CEO stated, that there is strong interest in the FollowMe project in general. Furthermore, the CEO stated, that he expects that lots of his user's will show interest especially in the stock domain and in using our portfolio management system. He promised to link us to users with interest both in the stock domain and in the technical aspects of our system as soon as we can provide a first prototype of our application.

2.5 Risk factors

In this section we only address risk factors that arise from the application viewpoint. Technical issues should be discussed in the technical work packages (i.e. the architecture report).

One source for potential risk factors are issues that involve system components that require the cooperation of partners that are not under direct control of the consortium members. In our scenarios these are the users and the information providers.

Information providers:

As pointed out in section 2.3 we see a risk in not being able to convince information providers to join our pilot system.

Our approach to solve this problem is to use existing on-line stock information systems to query them for the information and implement a gateway to the FollowMe agent system within our own network. This clearly does not conform to the intention of the FollowMe system architecture (to serve as a mediator between information providers and consumers). The mediator functionality is better demonstrated within the other pilot applications. The portfolio management application focuses on the demonstration of the mobility the system offers to the user.

Existing stock information systems that could be queried for stock values are:

- Financial Yahoo! (quote.yahoo.com): see section 2.1.

- Stock exchange Stuttgart (www.boerse-stuttgart.de): a regional stock exchange trading about 600 different stocks and offering values to all these stocks with a 15 minute delay.
- Deutsche Boerse AG (www.exchange.de): head organization of all German stock exchanges offering values for the stocks that form the German DAX index (30 titles) with a delay of 15 minutes.
- On-line service of the Deutsche Bank AG (www.deutschebank.de): offers DAX values and values of about 50 more German and 50 international stocks with a delay of 15 minutes.
- Various sites that offer values of all stocks traded in Germany, but update only once a day.

Since the data-objects to be retrieved do consist of only very few attributes, the additional effort of implementing a gateway between the FollowMe system and existing information providers will not be to huge. Once the system has been successfully introduced to a larger community of users, the interest of information providers in joining the system and thus being able to advertise their services might increase.

Users:

As pointed out in section 2.4 the risk of not having enough pilot users is minimal.

3 Real Estate Information System

3.1 *What is currently available on the Internet*

As is with stock information, there exists a large amount of information providers who provide users with varying degrees of information services within the domain of real estate information. Here we have compiled three sites which offer extensive real estate information.

Here too the most comprehensive coverage is offered by "Yahoo Real Estate Center" (<http://realestate.classifieds.yahoo.com/resources/realestate.html>). The user has to input the following parameters so that the search can be narrowed down.

- Required category (residential/Commercial; for sale/rent)
- Narrow search (to geographical location; according to following parameters; rooms, baths, price range, show details in chronological order, show all listings or only ones within a given number of days etc.)

Other features available

- Yellow page listing (gives the list of real estate agents who are closest to the given address; similar with appraisers, inspectors, loan bankers, real estate management, operators of apartment buildings, real estate developers and title companies)
- Additional resources (news from the real estate industry; road maps to given locations; driving instructions/directions)
- Other related categories (listings of real estate agencies, appraisals etc.)

The following information regarding real estate objects, which are not directly available at the Yahoo site, have been obtained from "HomeNet" (<http://www.homenet.com/>) and "RentNet" (<http://www.rent.net/>)

- links to real estate agents and sites in other countries

- floor plan and picture if available
- daily e-mailing of updated listings for a specified number of days.

3.2 FollowMe real estate information system

In the real estate pilot application we are trying to illustrate how the use of mobile agent technology will provide an enhanced service in any domain that involves brokers of any kind. Here too we will not incorporate all the features found at a site such as "Yahoo Real Estate Center", but focus on the value added features offered by the FollowMe system architecture.

The main feature here is that the system will function as an information broker where agents query all information providers and obtain the relevant information for the user. Since the system is scalable, new information providers could easily join the system.

The FollowMe real estate information system offers the following value added features:

- The mobile agents within the FollowMe system will access all information providers for this particular domain and obtain the relevant information according to the parameters given by the user while the user is off-line.
- The system can be instructed to deliver results at given intervals (e.g. daily at 5 p.m.).
- The user can also define the device which he/she would like to obtain the information from.(e.g. if the user prefers to know about real estate details at home, the system could be instructed to transmit the results to the fax at home) At present this type of information can be obtained only via e-mail.
- The user has to only input his/her requirements once, initially. It will be stored within the system in the user's profile. Each time a query has to be performed, the system will look up the user profile instead of prompting the user each time, similar to the current search engines which require user input each time.
- Event triggered actions – i.e. not predefined by the user(e.g. change in mortgage rate, real estate object at a bargain price etc.), can be communicated to the user by referring to the user profile which states at which device a user can be contacted at a particular time.

3.3 Potential information providers

As described above, the FollowMe real estate information system will provide the user with offers on real estate objects, that are collected at a regular schedule from various information provider sites. In contrast to data-objects within the stock portfolio management system, the data-structure of objects provided by these sources will be rather complex.

Attributes of such an object might be:

- Price
- Classification (apartment or house)
- Size of living space in m²

- Size of land in m²
- Number of rooms (number of floors)
- Parking slot(s) / garage
- Address
 - Country
 - Postal code
 - City
 - City district
 - Street / street number
- Floor number
- Date of completion of building
- Date of last changes to building
- Date of first use
- Estate in use / when available
- Textual description
- Multimedia description (audio, video, images)
- Link to information provider
- Address (phone/fax/e-mail) of contact person
- Timestamp of last update in information provider database
- Region infrastructure information (bus, subway, shopping opportunities)

Potential information providers for this pilot application are mainly news papers (with real estate advertisement section), real estate agencies and savings banks. After contacting several people involved in real estate brokerage, we discovered that attaching information providers to the pilot might turn out to be difficult for various reasons:

- There is no common standard data-model for real estate objects. Information providers use proprietary database systems. The effort of building gateways to the FollowMe system will be enormous. The news papers we contacted do not provide structured data at all. They store advertisements as ordinary text and use full text search engines to match parameters.
- The savings banks and agencies we contacted do not seem interested in joining the pilot, because they fear losing customers to other competitors. They state that the potential of gaining new customers does not compensate the risk of losing some of their well known customers.

3.4 Potential users

As already mentioned in section 2.4 (potential users for a stock portfolio management system), the CEO of Dachverband der Buergernetze e.V. assured us that users of the Bavaria Online Network will in general show interest in FollowMe application. But he expects, that there will be significantly less interest in real estate than in stock information systems. He encouraged us to investigate in domains where more common interest can be expected.

3.5 Risk factors

As described in section 2.5 (risk factors relating to the stock portfolio management system) risk factors to be discussed are the degrees of cooperation that can be expected from pilot users and information providers.

Information providers:

As pointed out in section 2.3 the only information providers that seem to have interest in participating in our pilot are news papers with real estate advertisement sections. At present we do not have a definite commitment of any of these news papers to participate. If they participate, they will not be able provide us with structured data-objects (advertisements are text only). The only reasonable way to integrate them into our system would be to use their existing full text search engines and transform the results of a query into a data-format that is readable by our system.

In case we do not find enough information providers that commit to participate, we will have to look out for another knowledge domain. Possible alternatives we already considered, are the domain of employment opportunities or the domain of buying and selling used cars.

Users:

As pointed out in section 3.4 the amount of users interested in joining a pilot on real estate information might be very limited. At present we still think there might be enough potential user to participate. The only workaround to this problem would be to change to another knowledge domain.

4 Regional Event Notification System

4.1 *What is currently available on the Internet*

At present information on regional events is offered only by isolated information providers. Event calendars are offered by communities, associations and other interest groups. Each group offers event calendars relating to the specific topics they deal with. There is no distributed information system that would enable the user to check for various types of events taking place at different geographical locations. Information can only be retrieved from one source at a time. There is no way to get an overview of events within an entire region.

Moreover, the information offered is mostly unstructured and therefore can only be queried by human readers, not by software. Thus the task of collecting event information cannot be automated.

Some examples for regional event calendar systems can be reviewed at:

<http://www.bnla.baynet.de/bnla08/index.html> : "Buergernetz" of the city of Landshut

<http://www.muenchen.de/link/veranst.htm> : Web-Server of the city of Munich

<http://www.inmtal.com/kiefersfelden/veranst.htm> : "Web-Server of the city of Kiefersfelden and many others.

4.2 *FollowMe event notification system*

The core idea of the FollowMe event notification system is to build up a system of distributed event calendars and to implement an agent based application that queries these information sources for events that match parameters specified by the user. To enable agents to query information provider sites, the information needs to be provided in a well structured data format. Among the attributes of events are event-category (i.e. concerts, exhibitions, markets), event-subtypes (i.e. for concerts: classic, for markets: antiques), event-location, event-time and a human readable description. Users can specify their interests and define a schedule according to which the agent will generate reports. A user's query might look like the following: "Send me every Thursday a report that informs me about pop concerts taking place on weekends within a radius of 50 km around my present location. The concerts should take place within 1-3 weeks in the future."

4.3 Potential information providers

The information on regional events will be provided by a number of Bavaria Online access providers. Thus, in contrast to the other proposed pilot applications, information providers will be associated members of the FollowMe consortium, which means that deployment of interfaces to the FollowMe agent system can be done in close cooperation with these information providers.

4.4 Potential Users

Potential users are Bavaria Online users who want to stay continuously informed about regional events (not only in their hometown – otherwise they could just surf the web-page of their local service provider ("Buergetznetz") and have no need for agents that are capable of retrieving data from a variety of different information providers).

4.5 Risk factors

As the "Buergetznetz" will play the role of both information providers and service/agent providers, the risk of not having enough information providers is minimal in this scenario. Since users might not be interested in events taking place in a region far from their own location, the information providers ("Buergetznetz") chosen for the first implementation phase (a number of 4-6 providers) should be sited geographically close to each other.

It needs to be discussed with potential users whether they are interested in receiving information on events taking place in locations other than their hometown and thus are interested in a system that collects event information from more than one information provider ("Buergetznetz").