FIGI: Using Mobile Agent Technology to Collect Financial Information on Internet

Marios D. Dikaiakos, Ph.D.
Department of Computer Science
University of Cyprus
1678 Nicosia, Cyprus
Email: mdd@ucy.ac.cy

ACAI ´99, Chania, Hellas

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OVERVIEW

- Motivation.
- FIGI: A Financial Information Gathering Infrastructure.
- Implementation with Mobile Agents.
- Conclusions and Future Work.

PORTFOLIO MONITORING

The goal:

- Support investors with an ongoing, continuous provision of up-to-date information on financial markets: market data (stock quotes), financial reports, technical and fundamental analyses, breaking news.

Gathering information on Internet:

- Users seek information by accessing Web-sites, Web navigation and using Search Engines.
- Information selectively flows to the user via subscription to email lists and newsgroups.

A PLAUSIBLE SCENARIO

Users keep track of their portfolio and investment options by:

- Checking email lists and newsgroups for investors. Storing some messages while deleting other.

- Navigating through a number of "known" sites stored in a bookmarks file. "Cut and paste" interesting bits.

- Using search engines - following unvisited links. Updating bookmarks.

A PLAUSIBLE SCENARIO (ctd.)

- *Checking email lists and newsgroups about investment. Storing some messages while deleting others.*

➔ Does collected information match user interests?

- *Navigating through a number of "known" sites stored in a bookmarks file. "Cut and paste" interesting bits.*

➔ Maybe too time consuming to locate new and useful stuff. Hard to keep track and sort out interesting information.

- *Using search engines - following unvisited links. Updating bookmarks.*

➔ Network disorientation. Information overload. Hard to locate resources.

AN INVESTOR HAS TO COPE WITH...

- A variety of heterogeneous information sources.
- Exploding volumes of available information.
- Inadequate tools for information retrieval and filtering.
- Collections of heterogeneous data. Inadequate tools for information integration and handling.
- Poor WWW performance.
- An environment oblivious to connection modalities and user priorities.

⇨ This issues apply to other information categories as well. Financial information is of particular interest because...

WHY FOCUSING ON FINANCIAL INFORMATION?

- There is a widening interest for investment information and services over Internet.
- A variety of financial information sources and investment services on Internet.
- Enormous amounts of information.
- Information provision involves a variety of data formats.
- Timeliness of information can be critical.
- Resource-cost constraints often dictate the provision of data.
- Need to cope with user mobility.

THE NEED

- Design and build portfolio monitoring tools to help investors automate the:
  - retrieval,
  - filtering,
  - integration and management

  of financial information.
- These tools should provide seamless support in the presence of *mobility* and *weak connectivity*.
- Information should flow to investors according to their connection modality and interest priorities.

THE VISION

- From "system oriented" services to human-centric systems.
- Towards a combination of the "pull" and "push" models of information retrieval, according to user connectivity and information requirements.
- Towards an integration of search, browsing and filtering along with personal information management.
- Towards services unconstrained by user mobility.

OVERVIEW

- Motivation.
- **FIGI: A Financial Information Gathering Infrastructure**
  - **Requirements.**
  - **Design considerations.**
  - **Architecture.**
- Implementation with Mobile Agents.
- Conclusions and Future Work.

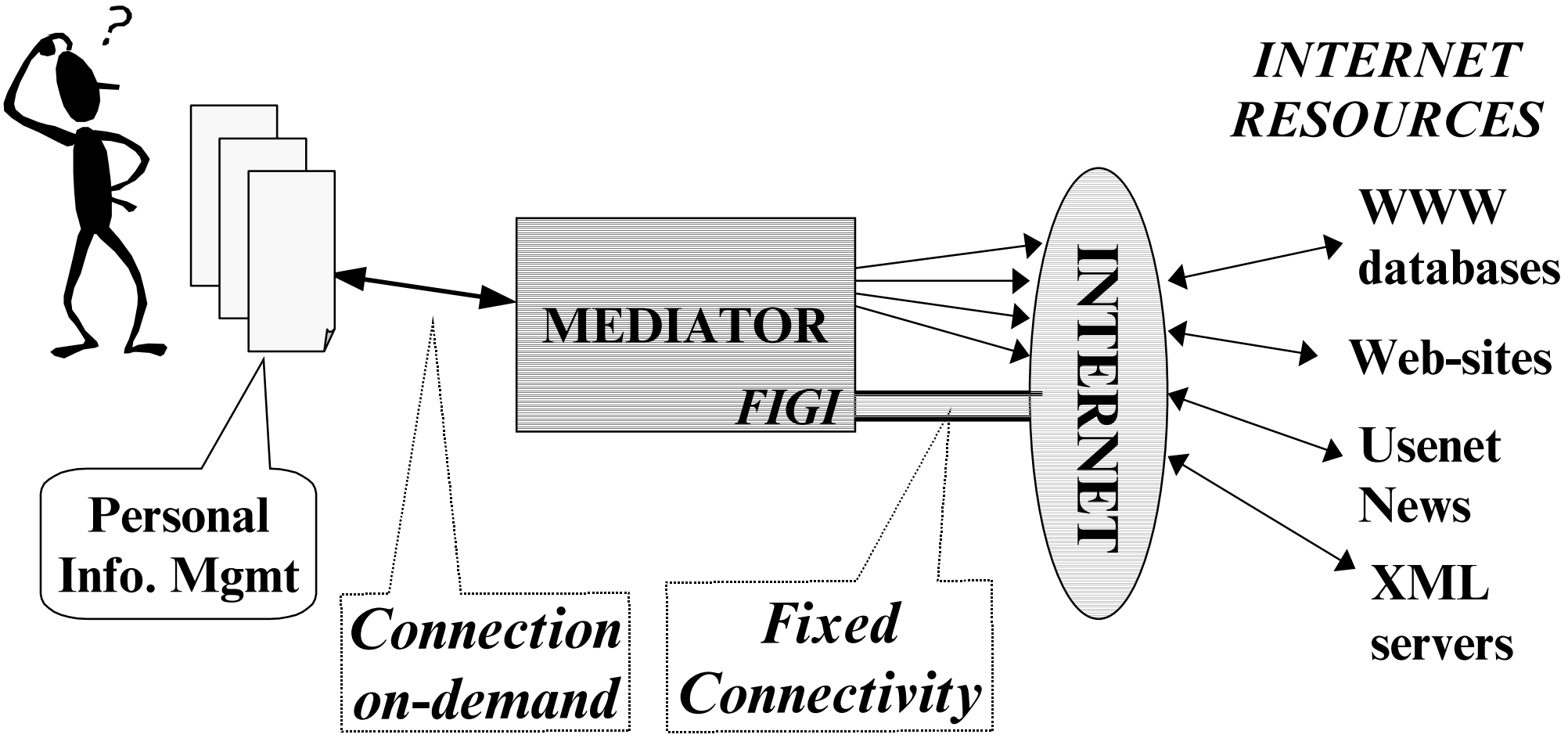
PORTFOLIO MONITORING REQUIREMENTS

- Provide users with local "views" of the global information space, pertinent to user interests.
- Collect information on user behalf, on a continuous basis and according to user interests.
- Feed information to users selectively, adapting to:
  - their priorities
  - the urgency of the information
  - connection modalities
- Allow users to record and update their changing interests and priorities via "user-centered" interfaces.

PORTF. MONITORING REQUIREMENTS (ctd´)

- Present information collected from heterogeneous sources in a coherent, integrated fashion, using a simple information provision paradigm.
- Sustain user interaction in the presence of user mobility and weak connectivity.
- Allow the easy integration of new information sources and interoperability with emerging Internet services and E-commerce models.
- Guarantee security and privacy of users.

DESIGN CONSIDERATIONS



MEDIATOR´s ROLE

- User-system interaction:
  - User authentication.
  - User-profile registration and update.
  - User communication and information service provision.
- Proxy service:
  - Registration of information sources.
  - User services and user profiles.
  - “Wrapping” and caching of collected information.
  - Optimizations: information re-use, expiration and garbage collection.

FIGI-USER INTERACTION

- FIGI mediators are servers with fixed Internet connectivity.
- A user connects to a FIGI server through a "Personal Information Roadmap" (PIR) Java-applet interface.
- PIR is a personal financial information manager that can be used in three modes:
  - Profile registration and update: the user registers his interests with FIGI.
  - FIGI-session: the user connects and downloads collected information
  - Interactive: the user connects and retrieves information directly from information sources.

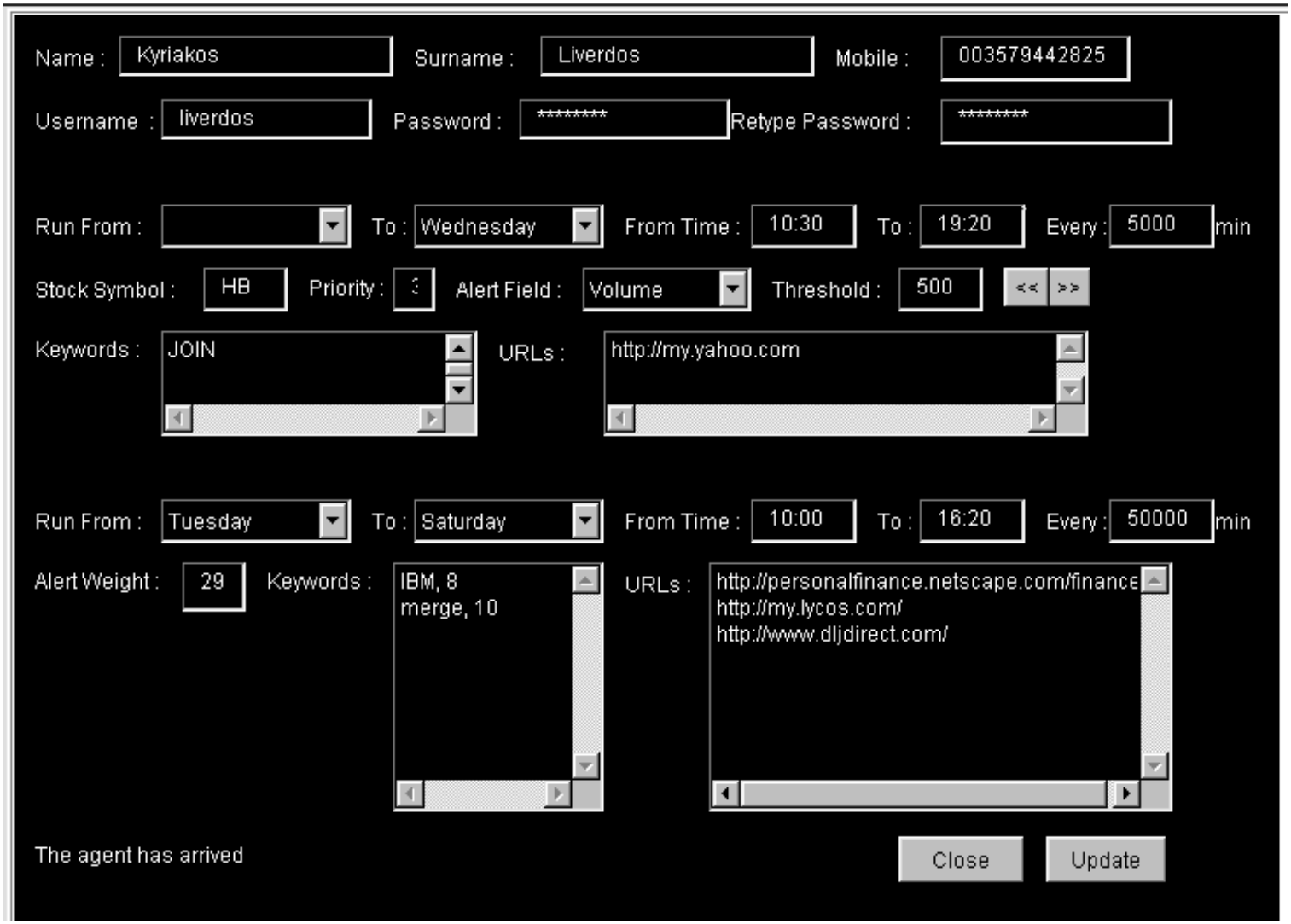
USER SERVICES IN FIGI

- FIGI provides a number of available services :
  - Database access to collect financial data (stock prices, index values, exchange rates, etc.).
  - Retrieval and filtering of financial information from the Web.
  - Searching for WWW resources of interest.
  - Combined retrieval of database and semi-structured (Web) information.
  - Information alerts.
- Each user adapts FIGI services to his own interests by annotating a "profile template."

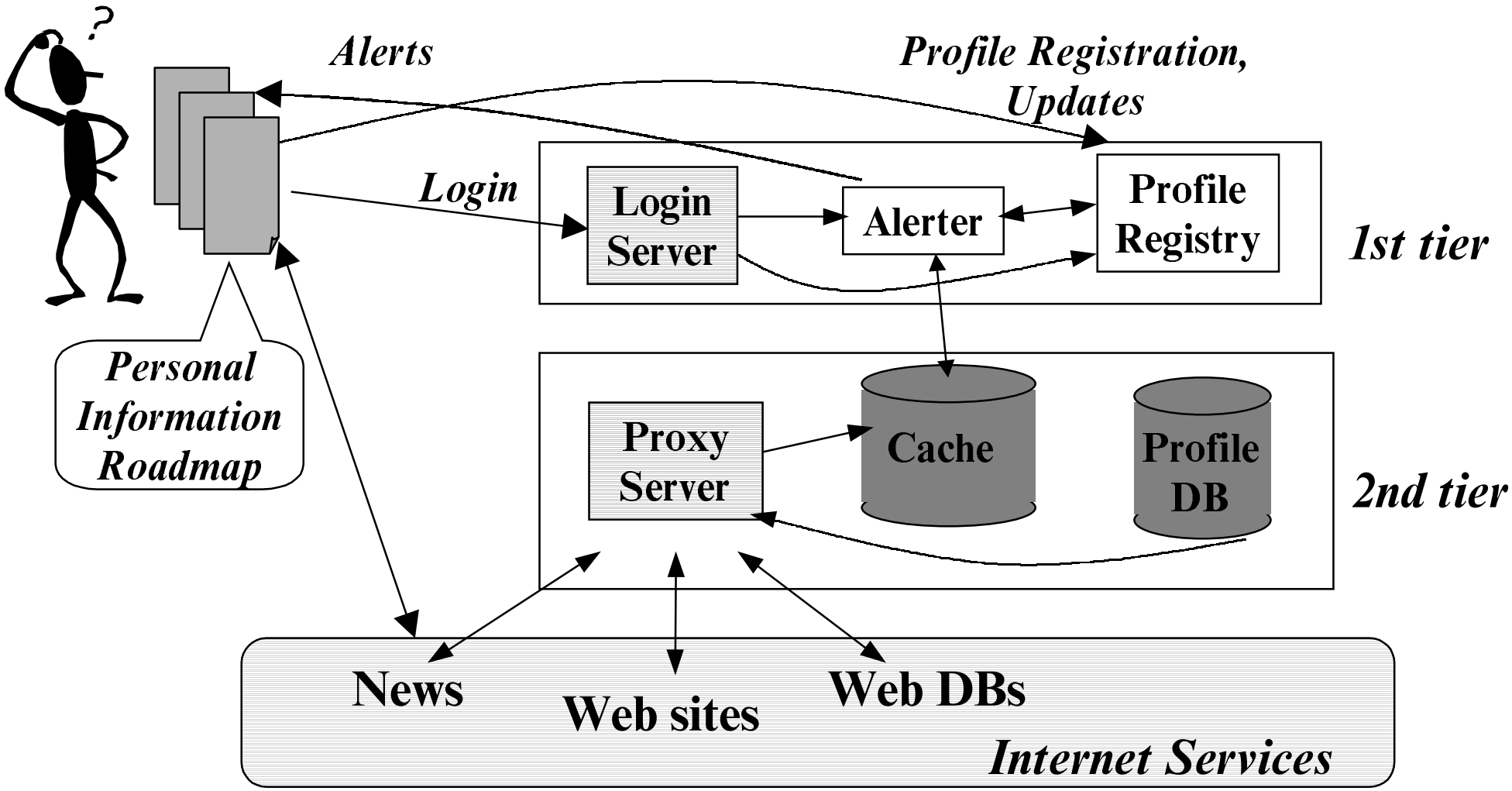
USER PROFILES

- The annotation of profile templates specifies:
  - the arguments of the queries that FIGI will execute for the user
  - the frequency of query execution
  - interest weights, notification priorities and alert mechanisms
- The annotated profile templates represent the *User profiles* of FIGI, which are essentially sets of long-term, continuously evaluated queries.
- A user profile incorporates user interests: stock quotes, analysis reports, news breaks, etc.

EXAMPLE OF A PROFILE TEMPLATE



FIGI ARCHITECTURE



OVERVIEW

- Motivation.
- FIGI: A Financial Information Gathering Infrastructure
- **Implementation with Mobile Agents.**
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IMPLEMENTING FIGI

FIGI is implemented using Java-based Mobile Agent technology:

- Java is the programming language of choice for Internet programming and interfacing to Internet resources.
- Mobile Agents are programs that can migrate from host to host in a wide-area network at times and to places of their own choice. The state of the running program is saved, transported to the new host and restored, allowing the program to continue where it left off.
- Java-based Mobile Agents are Java objects that run in Java-based execution environments.

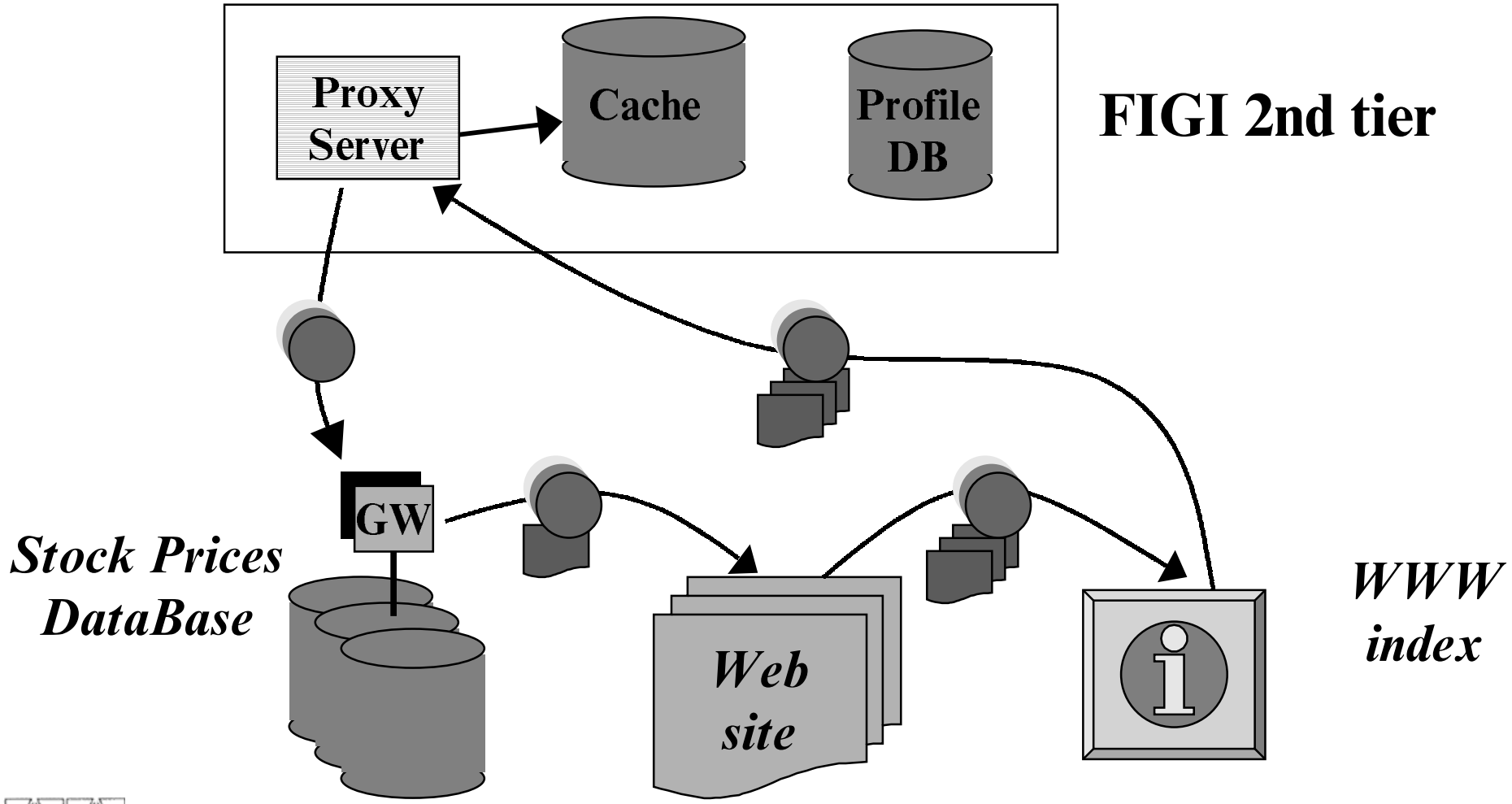
WHY MOBILE AGENTS?

- Programmability
  - Modularity, Flexibility and Adaptability
  - Easy integration of heterogeneous information
  - Monitoring and notification
  - Intelligence
  - Security & Robustness
- Performance
  - Efficient distributed database access over the Web
  - Distributed information retrieval and filtering
  - Reduction of network load

WHY MOBILE AGENTS? (ctd.)

- Autonomy
  - Asynchronous execution
  - Support for weak connectivity and disconnected operation
  - Information dissemination
  - Adaptability to various connection modalities

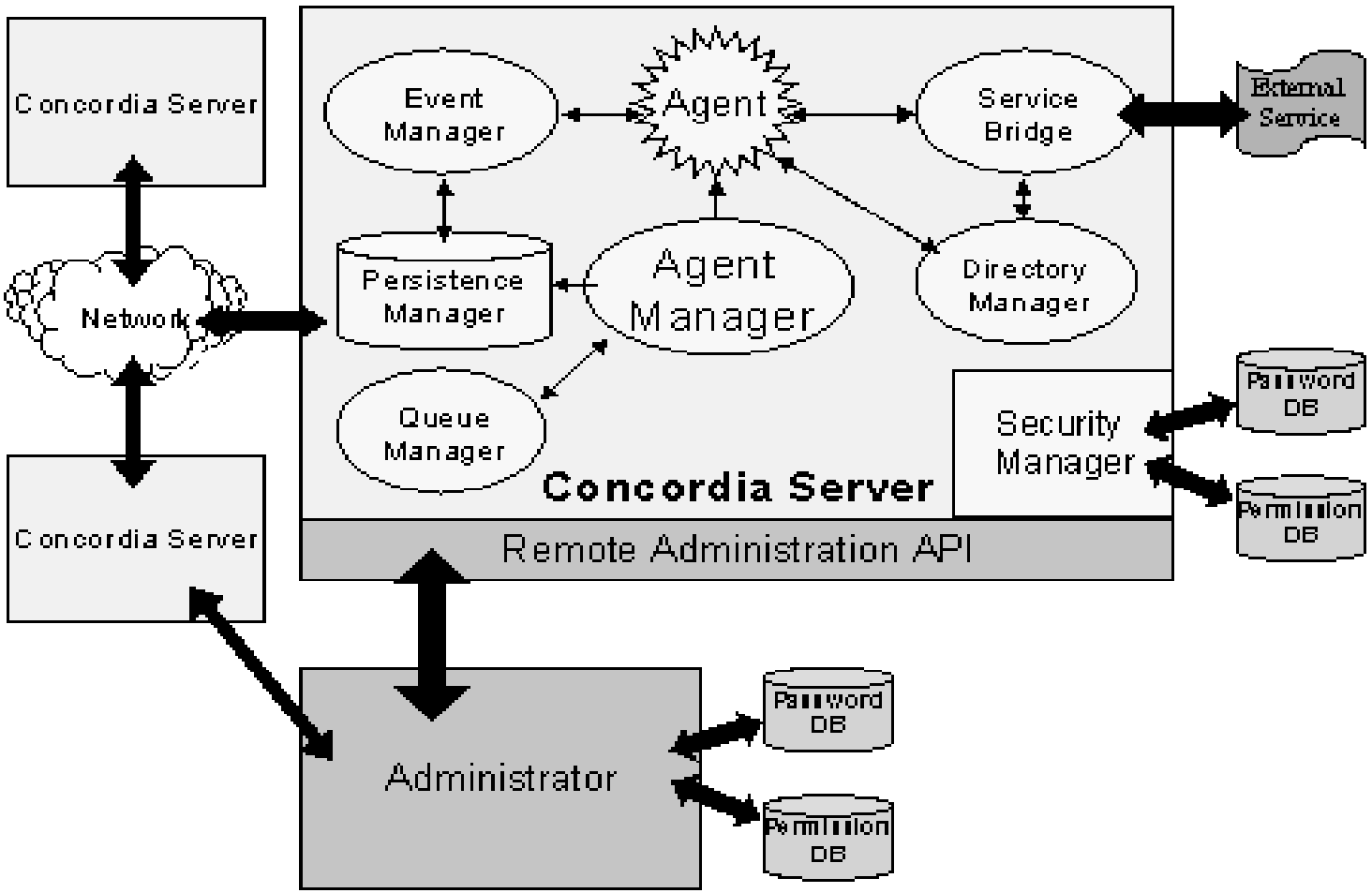
EMPLOYING MOBILE AGENTS IN FIGI



MITSUBISHI´s CONCORDIA PLATFORM

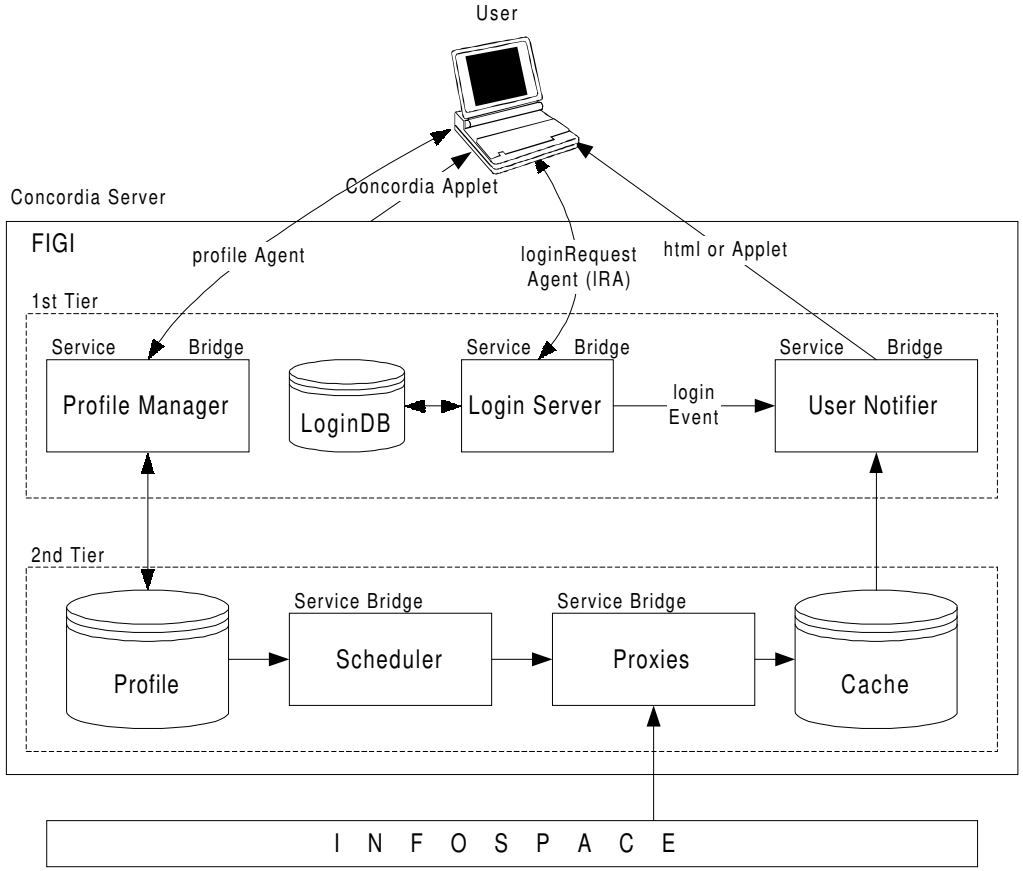
- To implement FIGI´s architecture we used Mitsubishi´s CONCORDIA, a framework for the deployment of Mobile Agents.
- CONCORDIA offers :
  - A platform for programming, launching and executing Java Mobile Agents.
  - Enhanced functionality for Agent synchronization, collaboration and messaging.
  - Service bridges (stationary agents)
  - Persistence, reliability, security.

CONCORDIA´s ARCHITECTURE



Source: http://www.meitca.com/HLS/Projects/Concordia

FIGI´s FIRST PROTOTYPE



Financial Information Gathering Infrastructure

Implemented Services

- Distributed access to Web-database with stock prices
- News breaks
- Web searches
- Combined Information Retrieval
- User Alerts

CONCLUSIONS AND FUTURE WORK

- Next-generation systems for financial information dissemination on Internet will entail:
  - a mediator-based architecture enhancing off-line information gathering and intelligent filtering
  - the intelligent regulation of information flow to the user
  - enhanced methods for registration of user interests
  - seamless support to mobile users
- Java-based Mobile Agents represent a promising platform for developing such systems and easily adapting them to emerging technologies for information dissemination and integration.
- We are currently investigating the employment of XML in FIGI.

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Prototyping FIGI, Concordia experimentation
A. Liverdos, M. Kyriakou, D. Zeinalipour

Mobile Agent Frameworks for distributed database access over the WWW
Prof.. G. Samaras, S. Papastavrou, C. Spyrou

Software Requirements of Internet-based Stock Exchange information platforms
N. Lysandrou, St. Savvidou, A. Loizou