



Integration Architecture of User Models

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Outline

- ❖ The Concept of User-Describing Profiles
- ❖ Integrated User Profile
- ❖ Integration of Data from User Profiles
- ❖ Conclusions and Future Work

Motivation

- ❖ There are two major goals of producing a general user model in the data warehousing field:
 - *Improvement and extension of a data warehouse model (developer perspective).*
 - *Personalization of the data warehouse reporting tool (user perspective).*

The Concept of User-describing Profiles

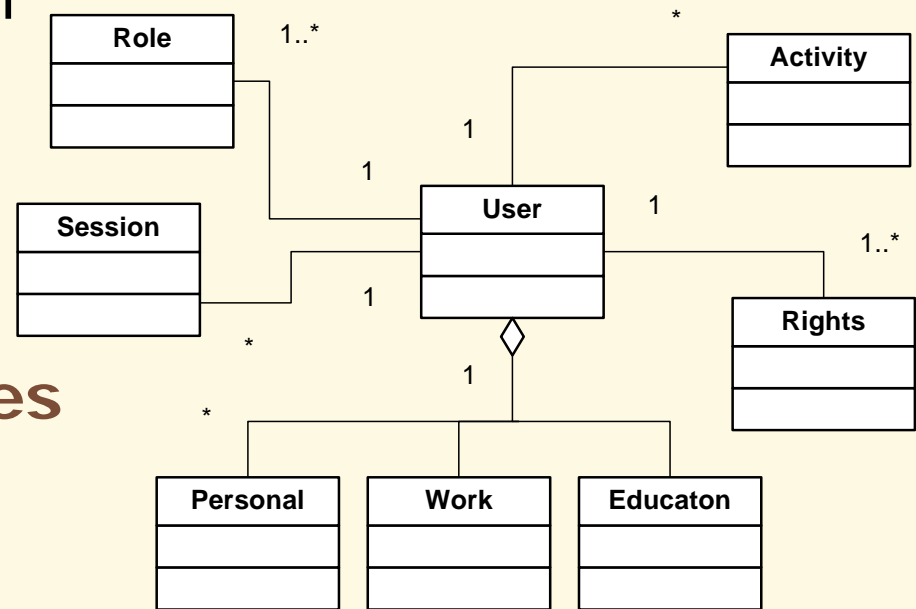
- To give a detailed characteristics of data warehouse user interaction with the system environment

Question	Description	Profile Type
<i>What is the user expecting to get as a result?</i>	User preferences data	<i>Preferential</i>
<i>Who is the user?</i>	Basic user data (personal data, session, activity, rights, etc.)	<i>User</i>
<i>Where is the user located?</i>	User physical location data & geolocation, according to user IP-address	<i>Spatial</i>
<i>When does the user interact with the system?</i>	Time characteristics of user activities	<i>Temporal</i>
<i>How does the user & system interaction happen?</i>	Characteristics of user device (i.e. PC, laptop, mobile phone, etc.), which is used for signing in as well as user software (e.g. web browser) characteristics	<i>Interaction</i>
<i>Why the user is interested in this particular system?</i>	User preferences are being gathered and analyzed. Recommendations are generated, according to user characteristics and preferences..	<i>Recommendations</i>

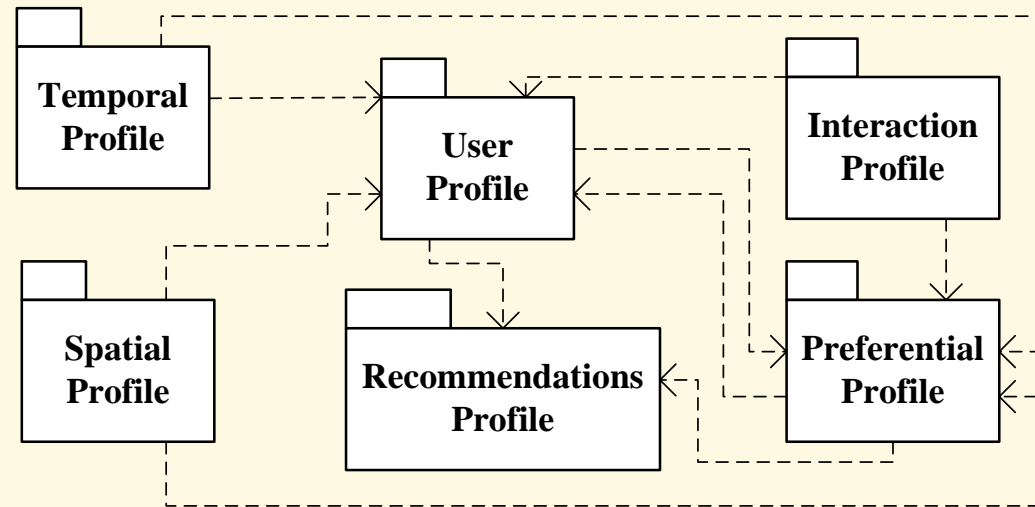
The Method for Profile Construction

- ❖ **Literature studies:**
 - Data Warehouse literature,
 - CWM standard (Common Warehouse Metamodel),
 - Scientific and technical articles
- ❖ **Practical experience with data warehouse tools and web-services**
- ❖ **Collecting attributes from different information sources**
- ❖ **Splitting logically a set of attributes of each profile into classes**

- ❖ **User profile class diagram (without class attributes):**



Connections of user-describing profiles

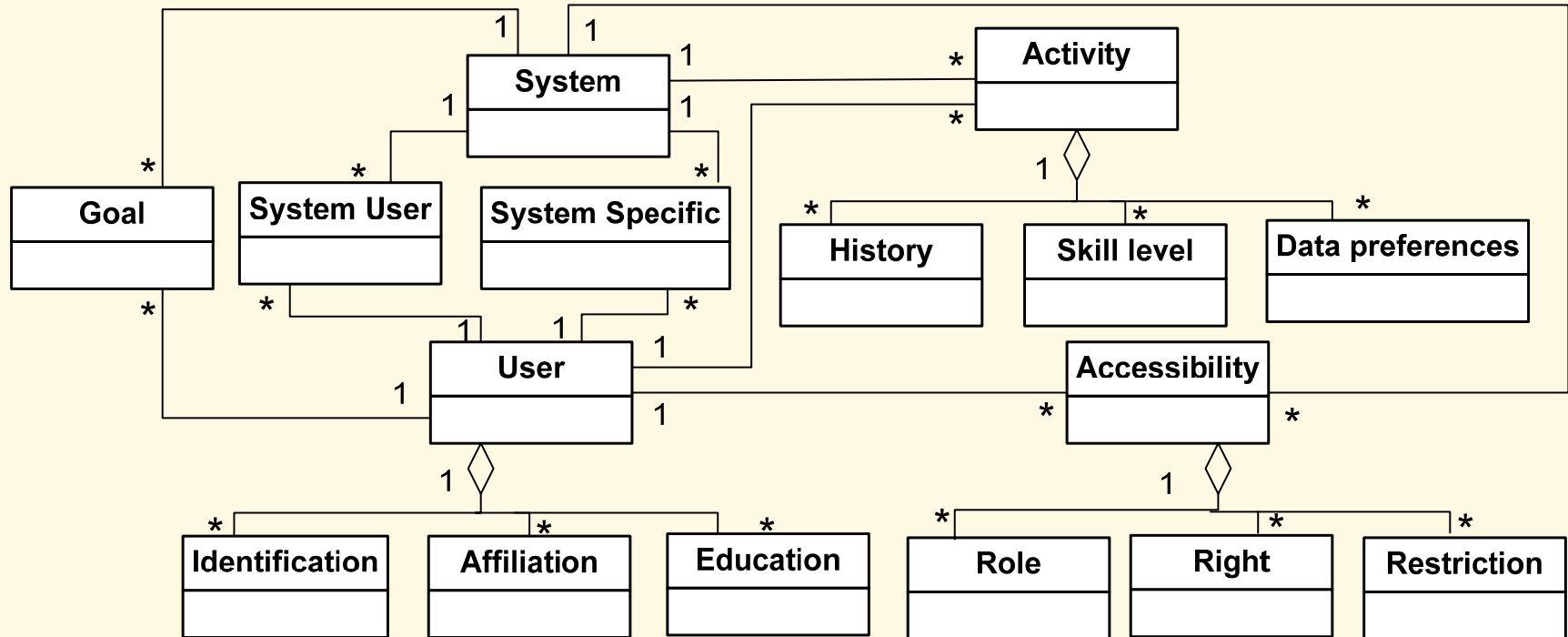


- ❖ One user may have more than one spatial, temporal, interaction, preferential and recommendations profile when he/she works in different environments.
- ❖ Preferential profile is connected with all other profiles, because of the definition of the profile, but recommendations profile is used to describe offers to the user from other users' preference sets and the choices of the users among them.

Integrated User Profile

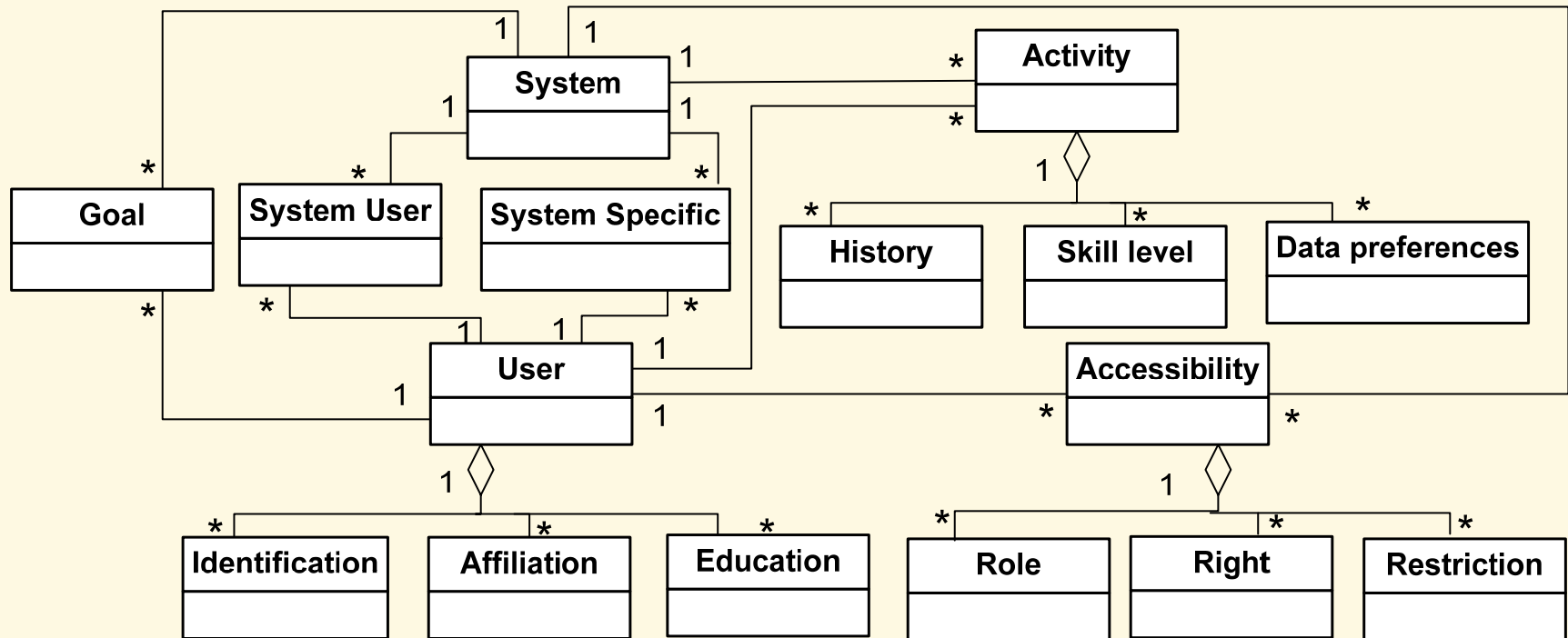
- ❖ Based on the user-defining profiles, we enhanced this model to get a general user model that represents the needs of more than one system that has its own user profiles.
- ❖ In this research only one component of the general user model – the integrated user profile – is analyzed in more detail.
- ❖ We will consider the case when the user interacts with internal systems of an organization and when a data warehouse is one of these systems.

User Model Properties (I)



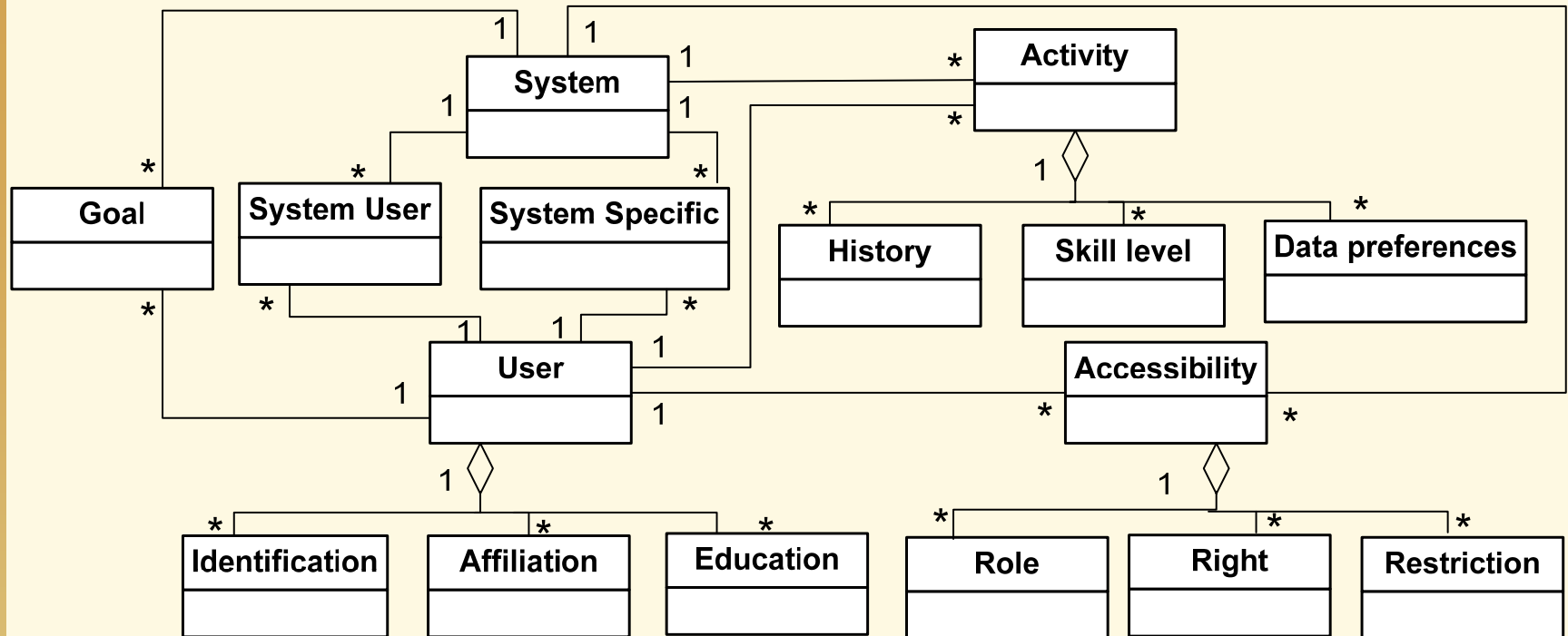
- ❖ *Identification* includes user's personal information
- ❖ *Affiliation* contains user professional attributes
- ❖ *Education* class describes the education of the user

User Model Properties (II)



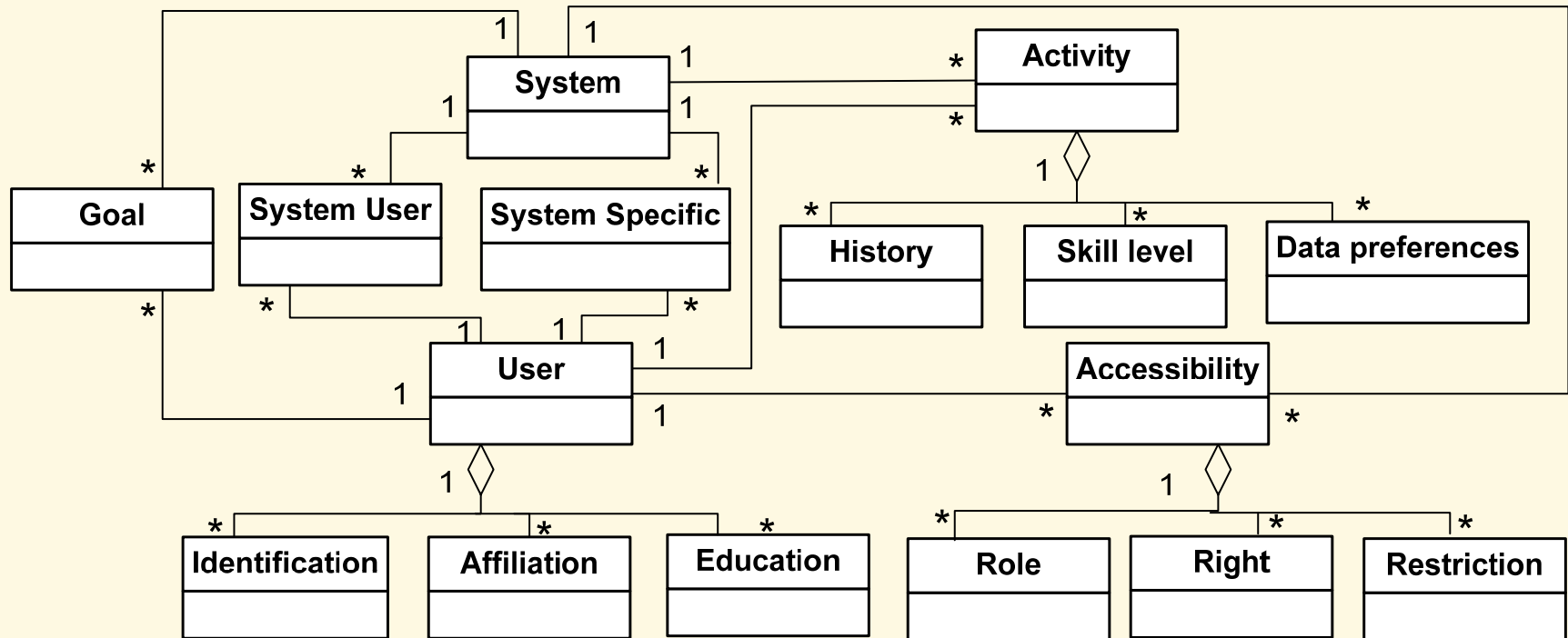
- ❖ **Accessibility** describes the user's ability to interact with the data source or data warehouse environment
- ❖ **Accessibility** consists of such components as the *Role* attributes of the user, user's *Rights* attributes in each data source, and *Restrictions*

User Model Properties (III)



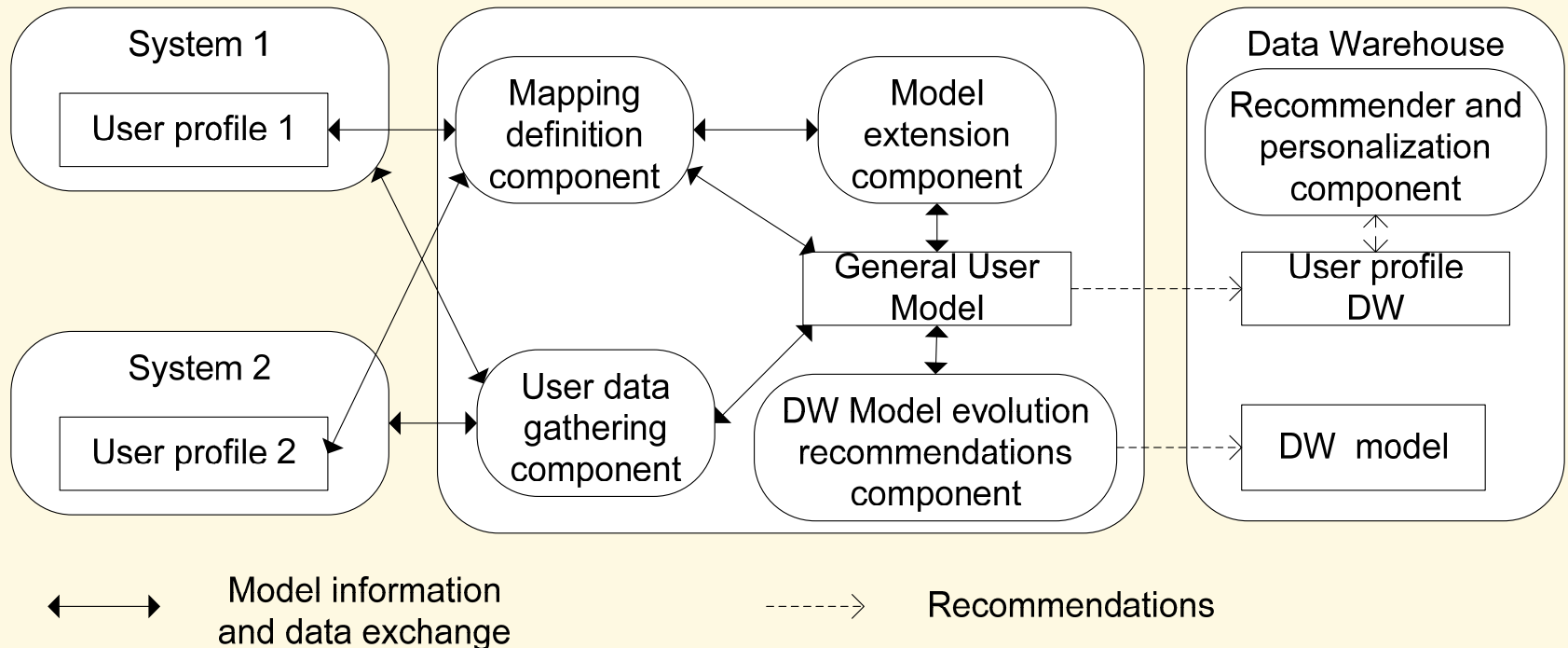
- ❖ *Activity* is used for keeping track of either detailed or summarized history of user actions and frequency of use of each system's components.
- ❖ *Skill level* attributes defines user's experience in working with data sources and data warehouse reporting tool.
- ❖ The *Data Preferences* include user preferences on data in data sources and in DW reporting tool, preferences on reports' structure, and others.

User Model Properties (IV)



- ❖ *Goals'* attributes are associated with user's role in each system, we can determine the goals of usage of the system – e.g. business, personal, learning, analytical, data entry, and others.
- ❖ *System specific* attributes are meant to be used for the extension possibilities of the described general model,
- ❖ *System user* attributes describe the users' login information for each particular system.

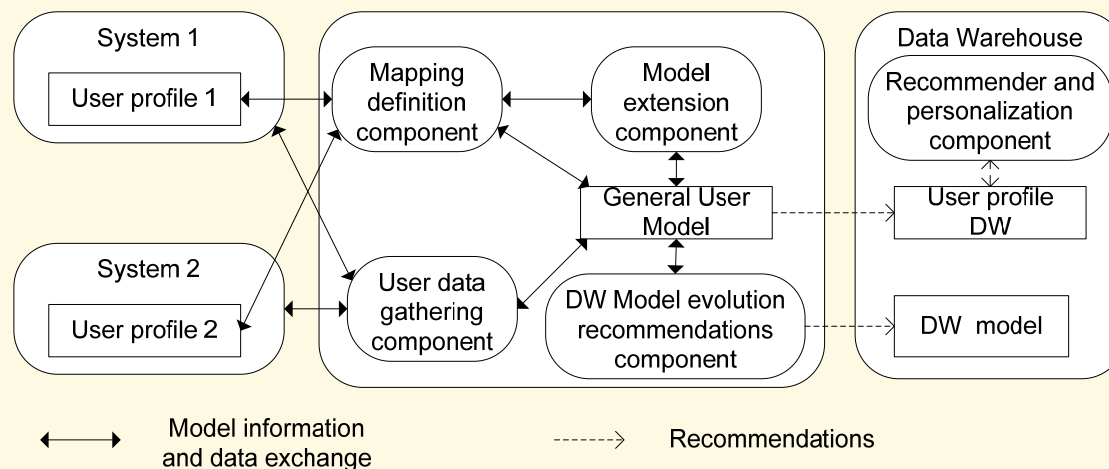
Integration of data from User Profiles



- ❖ Let us consider a situation when one physical person interacts with two different source systems for a data warehouse.
- ❖ Both systems have their own local different user profiles.

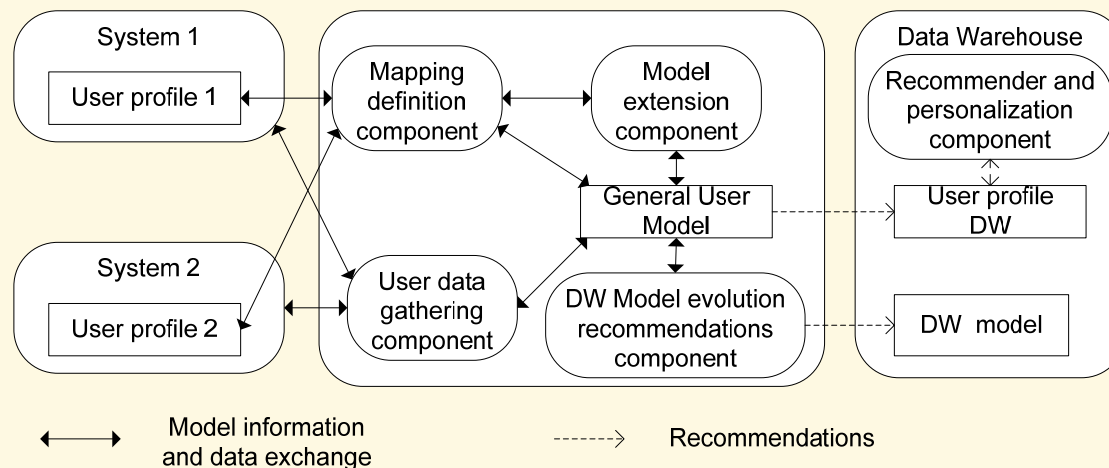
Integration steps (I)

- ❖ **Step 1. Mapping is defined for each particular user model against the general user model.**
- ❖ **Three different situations can happen:**
 - there are automatically detected corresponding attributes by identical attribute names,
 - semantically equal attribute exist with different attribute names,
 - corresponding attribute can not be found.
 - Last two cases should be processed manually and in the last case the next step is performed.



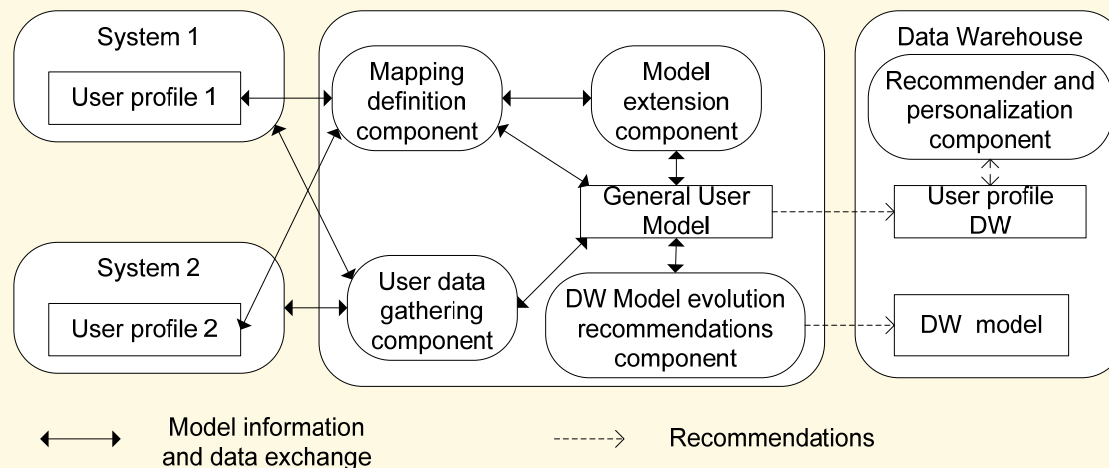
Integration steps (II)

- ❖ **Step 2. User Model extension activity is used to decide which attributes from local user models from the previous step are essential for the general user model.**
- ❖ Then the necessary extensions are made to the general user model.



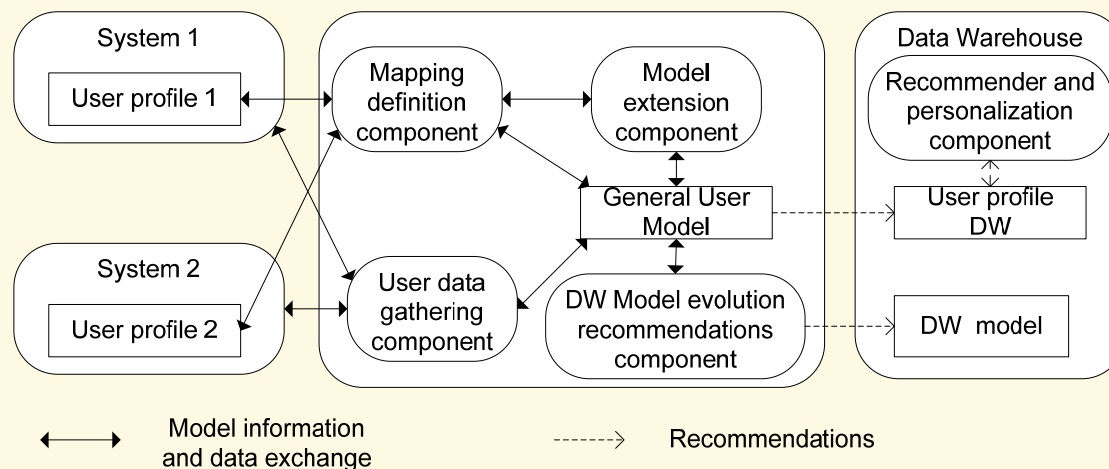
Integration steps (III)

- ❖ Step 3. User data gathering is performed according to the mapping information, the data is collected and moved into corresponding integrated general user model.



Integration steps (IV)

- ❖ **Step 4. Recommendations.**
- ❖ **Recommendations for the data warehouse user model are prepared:**
 - mostly this is useful, when new data warehouse reports or new data warehouse users are introduced to define access rights and personalization.
- ❖ **Recommendations for further development of the data warehouse are given, e.g. which new data marts could be the most interesting for the user.**



Conclusions and Future Work

- ❖ This paper describes the general user model taking one of the user-describing profiles – i.e. user profile – as an example.
- ❖ This component is the most essential in the whole user model, however, other user-describing profiles should be considered as well in the context of integration.
- ❖ A user profile integration architecture that employs the general user model is proposed and described for an example situation with two data source systems and a data warehouse.
- ❖ The number of the involved systems is not limited, but with more systems involved the manual adjustments in the integration process to solve the integration conflicts could be more often possible.
- ❖ We have not analyzed the likely conflicts of attribute values of integrated user profiles; different solutions are possible depending on the semantics of the analyzed attribute.
- ❖ The experimental environment, which is used for the implementation of the general user model development and integration of user profiles, is the university information system, e-learning system and university data warehouse.
- ❖ The evaluation of recommendations about data warehouse model development is the next step of the research to be performed.
- ❖ The data warehouse user model will be utilized as one of the data sources for the ongoing research about data warehouse personalization.



Questions ?



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