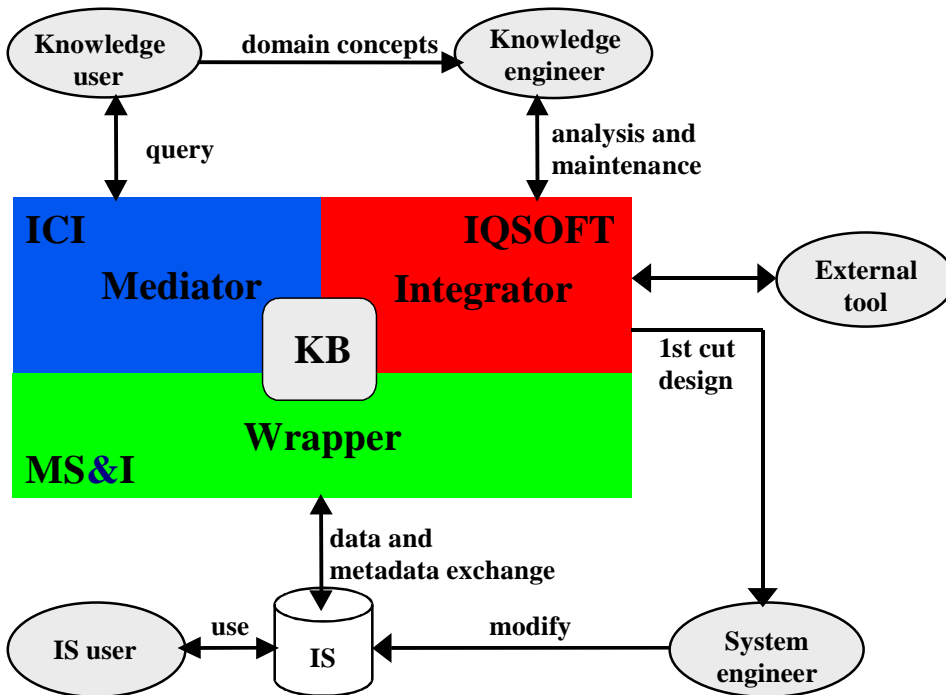


# Intelligent Information Integration via Logic and Knowledge Management



## Intelligent environment for application integration

SILK (System Integration via Logic and Knowledge) is a research project to create an application integration environment providing intelligent tools for three closely interconnected tasks:

1. **Wrapper** - uniform information access tools across wide range of information storage mechanisms (RDBMS, ODBMS, Excel, XML etc.)
2. **Integrator** - knowledge management tools for maintaining uniform, semantically rich descriptions of information sources and for synchronising data redundancies
3. **Mediator** - uniform query facility to retrieve information for heterogeneous user communities relieving them from technical burdens

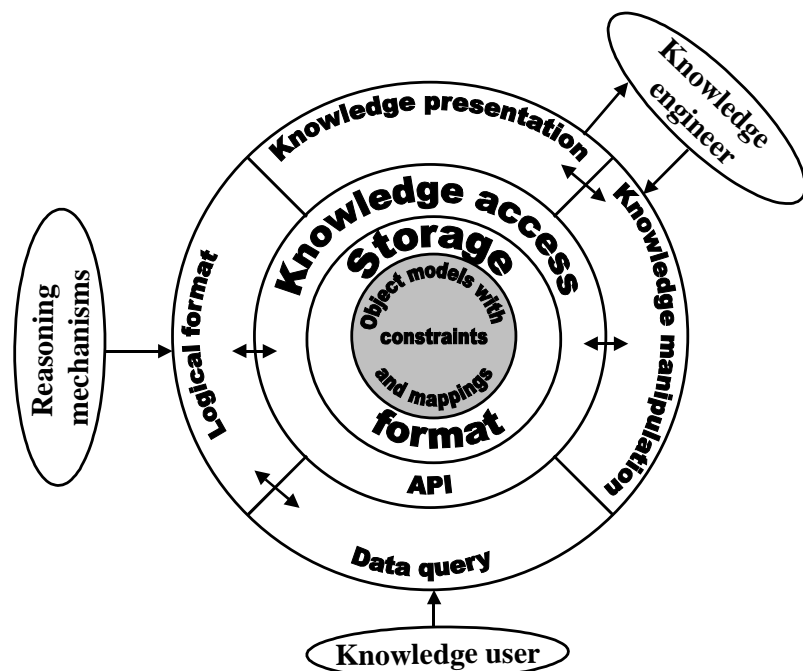
## SILan, a powerful modelling and query language

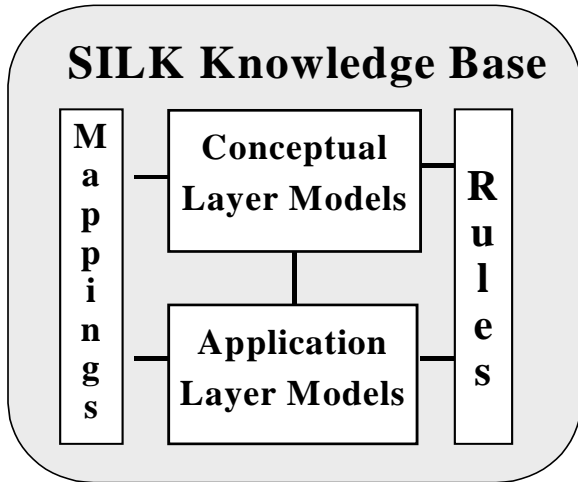
SILK/Integrator is an advanced conceptual and application modelling tool, which allows the user to create multiple UML models with inter- and intra-model constraints. The modelling language supported by SILK can express:

- the **standard UML object model**, enriched with OCL like *constraints*, and with description logic type *definitions* to represent derived classes and associations;
- **aggregate classes** together with their multiple hierarchically organised dimensions e.g., it is possible to represent multidimensional cubes over star and snowflake like models;
- rich set of **inter-model integrity constraints** (for query and synchronisation purposes), as inclusion and equivalence dependencies between model elements (eg. classes and associations) belonging to different models.

Complete logical reasoning is employed by the tool to verify the model descriptions, infer implicit facts, devise stricter constraints, point out inconsistency in models and compare models to support model evolution. **SILK/Integrator** is fully integrated with a very powerful **Constraint Logic Reasoning** server which acts as a background inference engine. The **CLR-server** uses a blackboard architecture to select the most suitable reasoning mechanism for solving a given verification, comparison or other inferencing task. These Solvers are based on various **Constraint Logic Programming** mechanisms, the high level reasoning extensions of Prolog.

The tool supports multiple models with intra- and inter-model constraints (mappings) enabling conceptual modelling of "classical" databases involving a single rich model with integrity constraints, as well as designing *ontologies* for various purposes.





## SILog, an object-logic knowledge base

**SILK/Integrator** reasons with (multiple) models by encoding them in a single *object-logic knowledge base*, and shows the result of any deductions such as inferred links, new stricter constraints, and inconsistent classes or associations.

The **KB Editor** component allows creation, editing, managing, and storing of several interconnected conceptual and application models, with a user friendly graphical interface (including an auto-layout facility). The **SILK/Integrator**, written in standard Java and SICStus Prolog, will be first available on Windows machines with Linux version coming next.

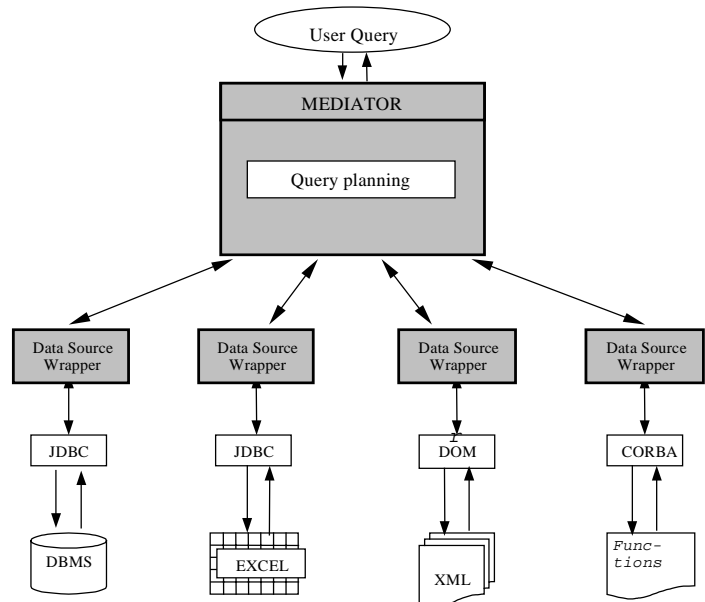
The **KB Editor** communicates via a CORBA protocol with the **CLR server**.

**SILK/Integrator** provides an interface for importing and exporting UML-models in XMI (the XML Metadata Interchange format).

The motivation behind **SILK/Integrator** is to provide an intelligent conceptual and application level modelling tool-set that supports the **SILK/Mediator**, using novel and powerful *knowledge representation* based technologies for *database* and *ontology* design.

## Mediation across heterogeneous information sources

The **SILK/Mediator** processes a user query translated into **SILan**, by a **Query Planning and Execution Monitoring** component that generates a number of information source (IS) specific queries and then attempts to execute them. For each information source type (e.g. DBMS, Excel, XML, function), there is an IS-specific query agent in the **SILK/Wrapper**, which generates the actual query for the specific IS. The retrieved results are converted by these IS-specific query agent to IS-specific results, which are used as inputs to a **Result Integration** component. The **Result Integration** component combines the IS-specific results into a generic result, also expressed in **SILan**. This allows for a uniform treatment of the knowledge obtained from the various information sources. The generic result is filtered by a **Result Presentation** component to produce the end result, which is presented to the user. This component reuses the **SILog** object logic knowledge base to express the generic result in a more concise and user-palatable form.



## Participants

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