Ontologies in Agent-Enabled Distributed Information Retrieval

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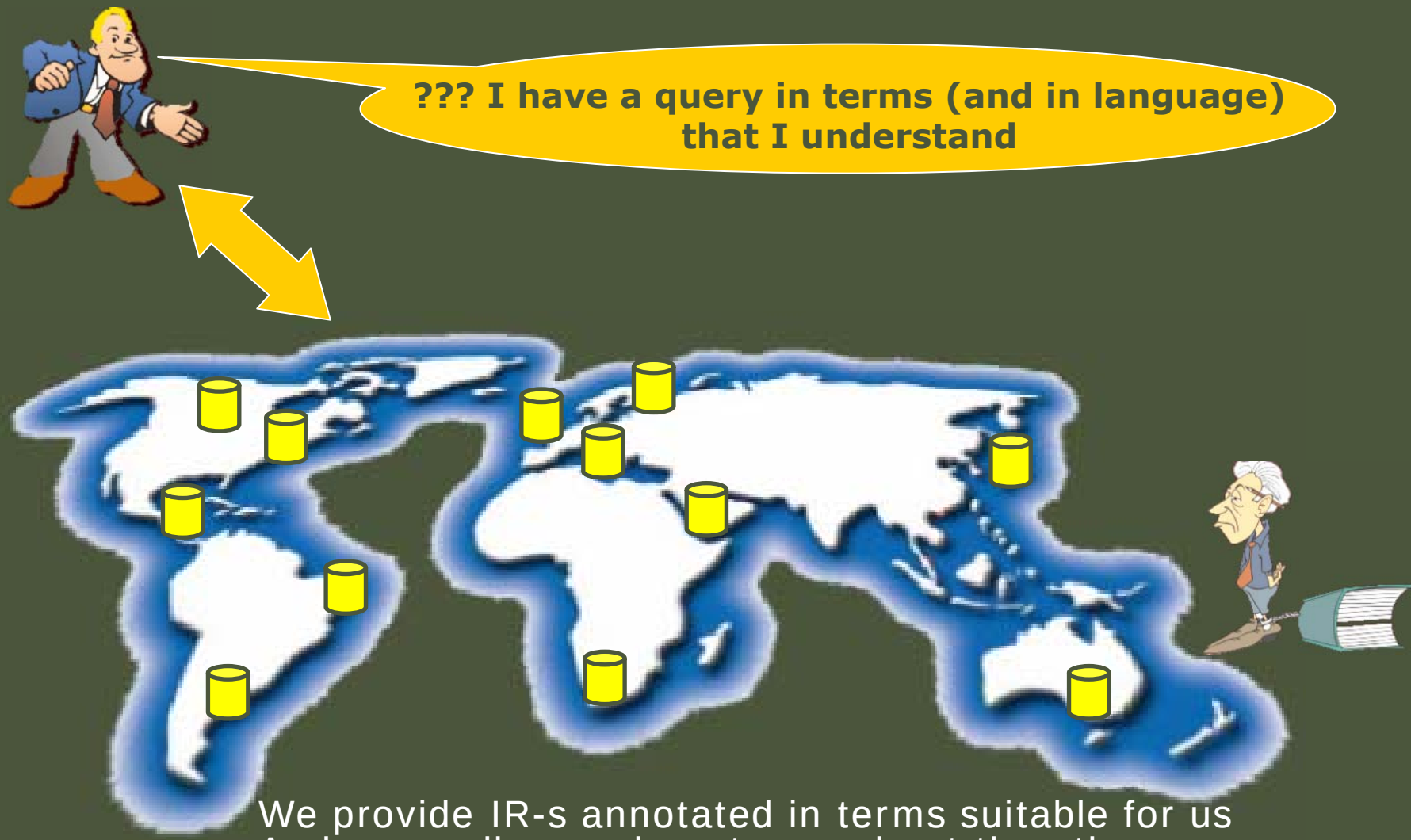
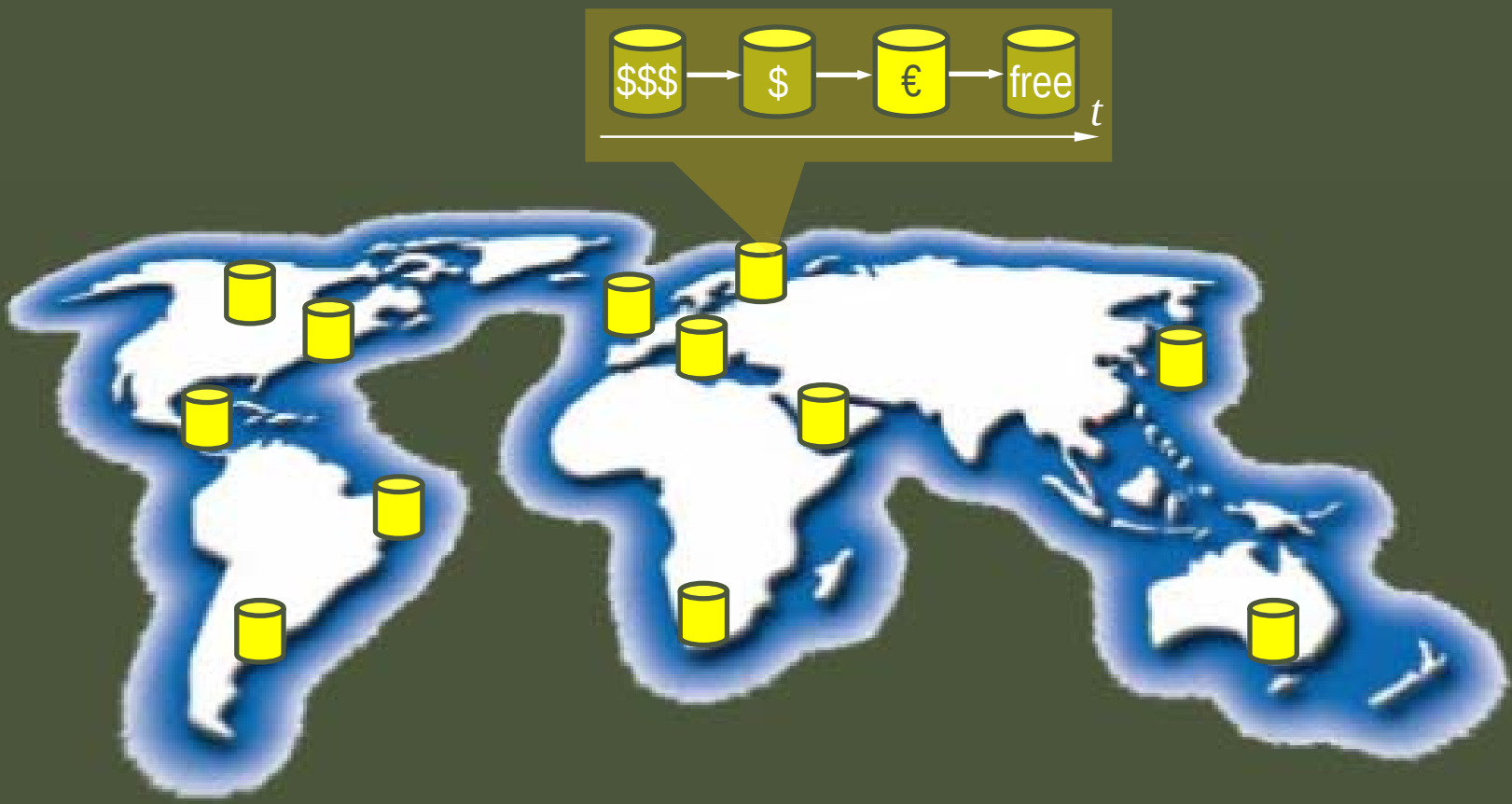
Distributed Information Retrieval:



In Web Economies IR-s are Dynamic

- Price and terms of payment change in time



IR-s are Dynamic

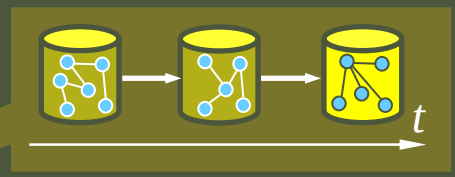
- Availability changes in time:
  - e.g., bandwidth, copyright, subscription policy, ...

IR-s are Dynamic

- Geographical location and possibly ownership change in time. E.g.:
  - **My Papers IR** moves with me to another University.
  - I transfer my **IP rights** to a publisher

IR-s are Dynamic

- IR Semantics changes in time:
  - IR-s belong to autonomous owners
  - Owners change IR-s without notifications



Don’t yet mention pragmatics!

All these Changes

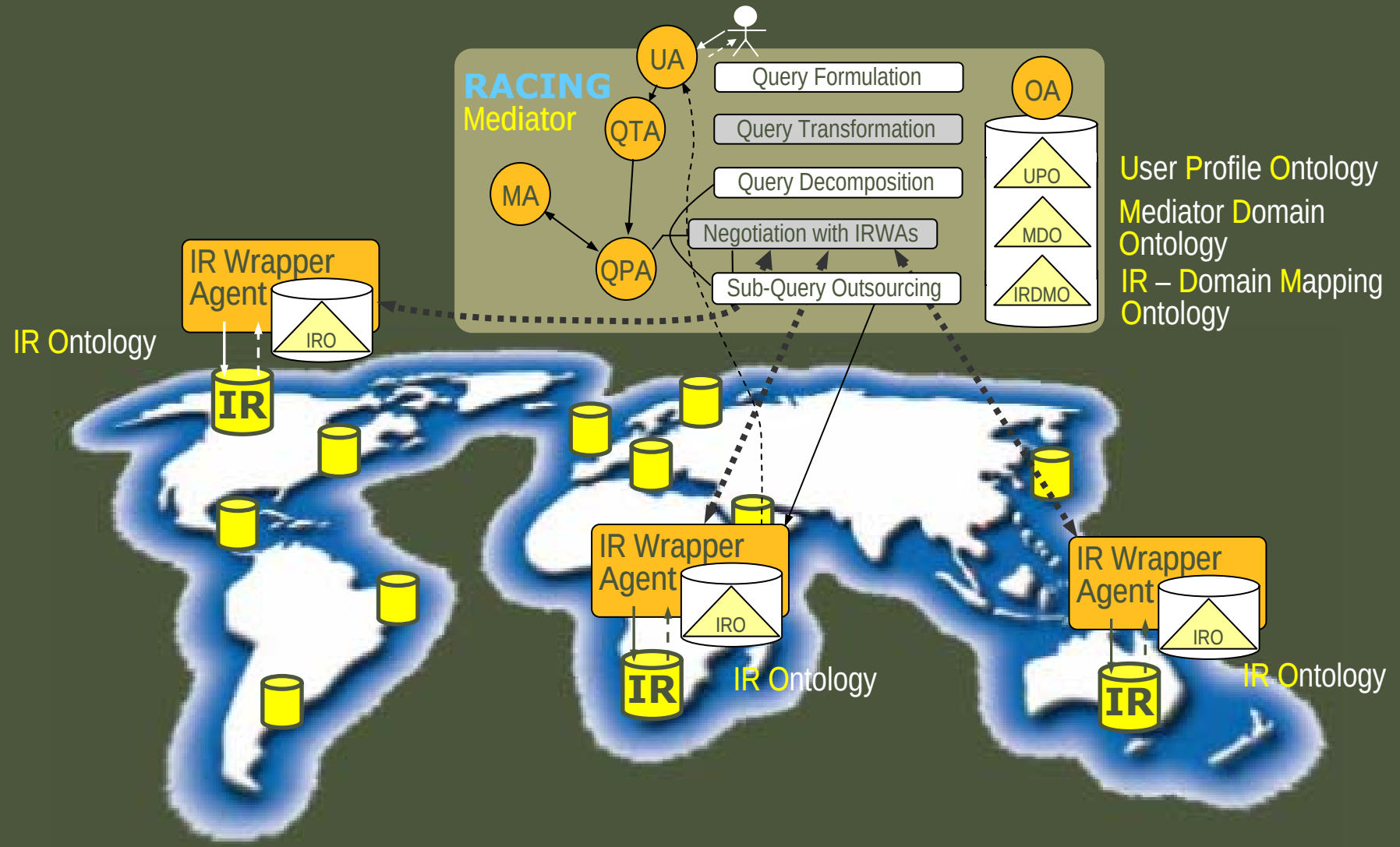
- Availability
- Price and terms of payment
- Geographical location and ownership
- Semantics (pragmatics)
- …

are out of the sphere of our direct control

The Environment

- Composed of the IR-s of independent owners:
  - Is **dynamic**
  - Is **non-deterministic**
- This implies:
  - It is possible to try to apply Agent metaphor
  - Negotiations resulting in series of deals should be performed to retrieve information

Mediator-Wrapper Architecture



Problems to Solve:

- **Q1**: **How to add a new IR to a Retrieval System**?
  - **A1.1**: Wait until its owner volunteers to provide the annotation (**IR registration**) – **RACING** and **UnIT-Net**
  - **A1.2**: **Crawl** the Web for publicly available IR-s
- **Q2**: **How to align our beliefs on IR to its actual state**?
  - **A2.1**: **Wait until the owner informs** about the changes, then align – **RACING** and **UnIT-Net**
  - **A2.2**: **Mine** the changes from IR-s regularly. Align accordingly

Problems to Solve:

- **Q3**: **How to formulate & perform queries to such an IR Grid**?
- **A3**: **RACING**
  - Assist a User to **formulate** his query in terms familiar to him
  - **Transform** the query to the terms commonly accepted for the Domain
  - **Match** the query to the set of semantically appropriate IR Wrappers
  - **Decompose** the query to sub-queries
  - **Negotiate and sub-contract** some IR Wrappers from the matching set
  - **Outsource** sub-queries to sub-contractors
  - (**Fuse** and) **Return** the **results** to the User

Ontology and Language Aspect:

Mediator

UA

Query Formulation

UPO

OWL

RDQL

QTA

Query Transformation

MDO

OWL

RDQL

NO

MDO

MA

IR semantics per query

Semantic Match and Query Decomposition

MDO

IRDMO

OWL

Negotiation Ontology

QPA

. . . . .

RDQL

NO

RWA

Terms of delivery per price

Negotiation with RWAs

. . . . .

RDQL

IRO

RWA

QPA

Sub-Query Outsourcing

IRO

OWL

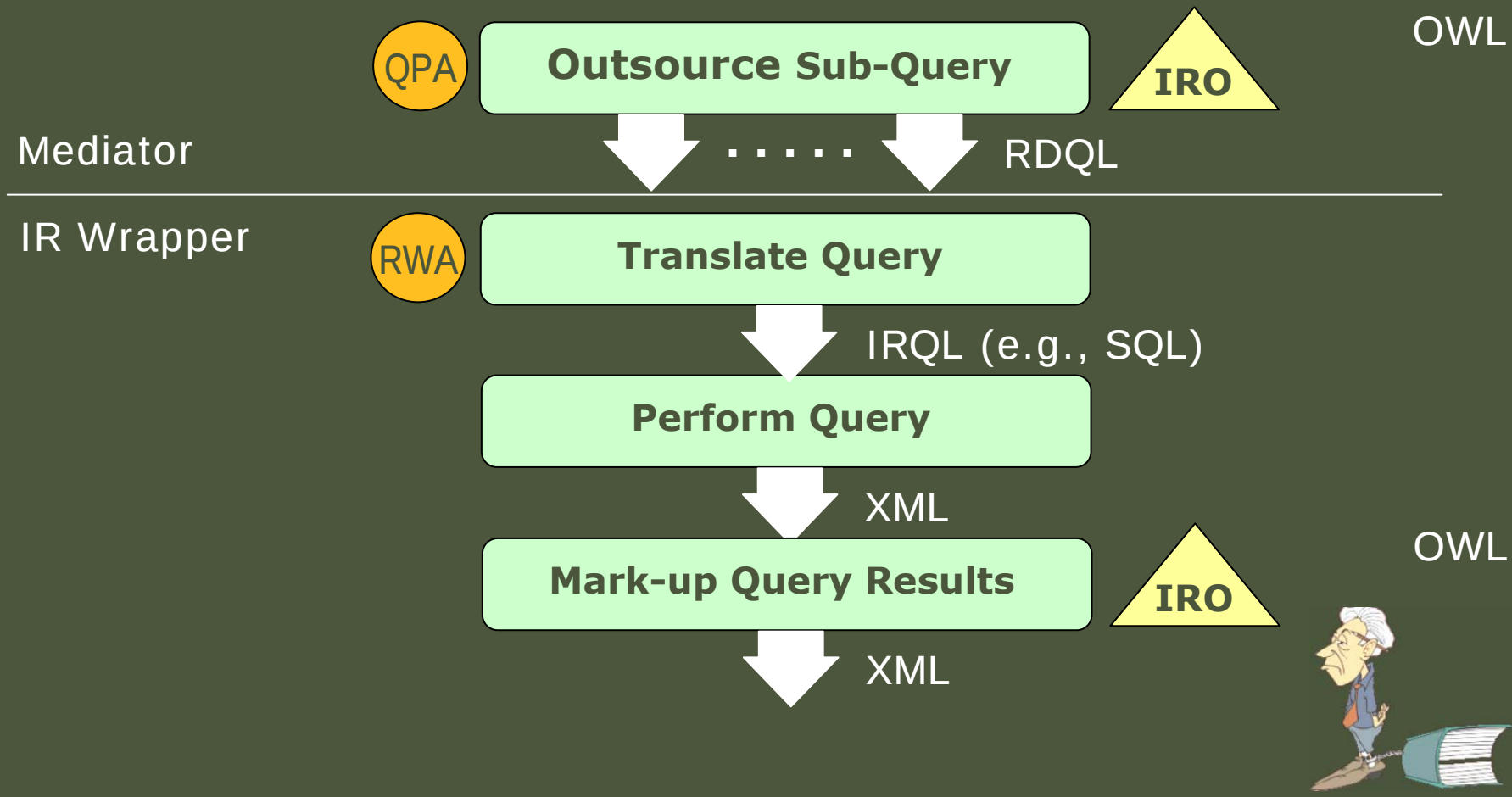
. . . . .

RDQL

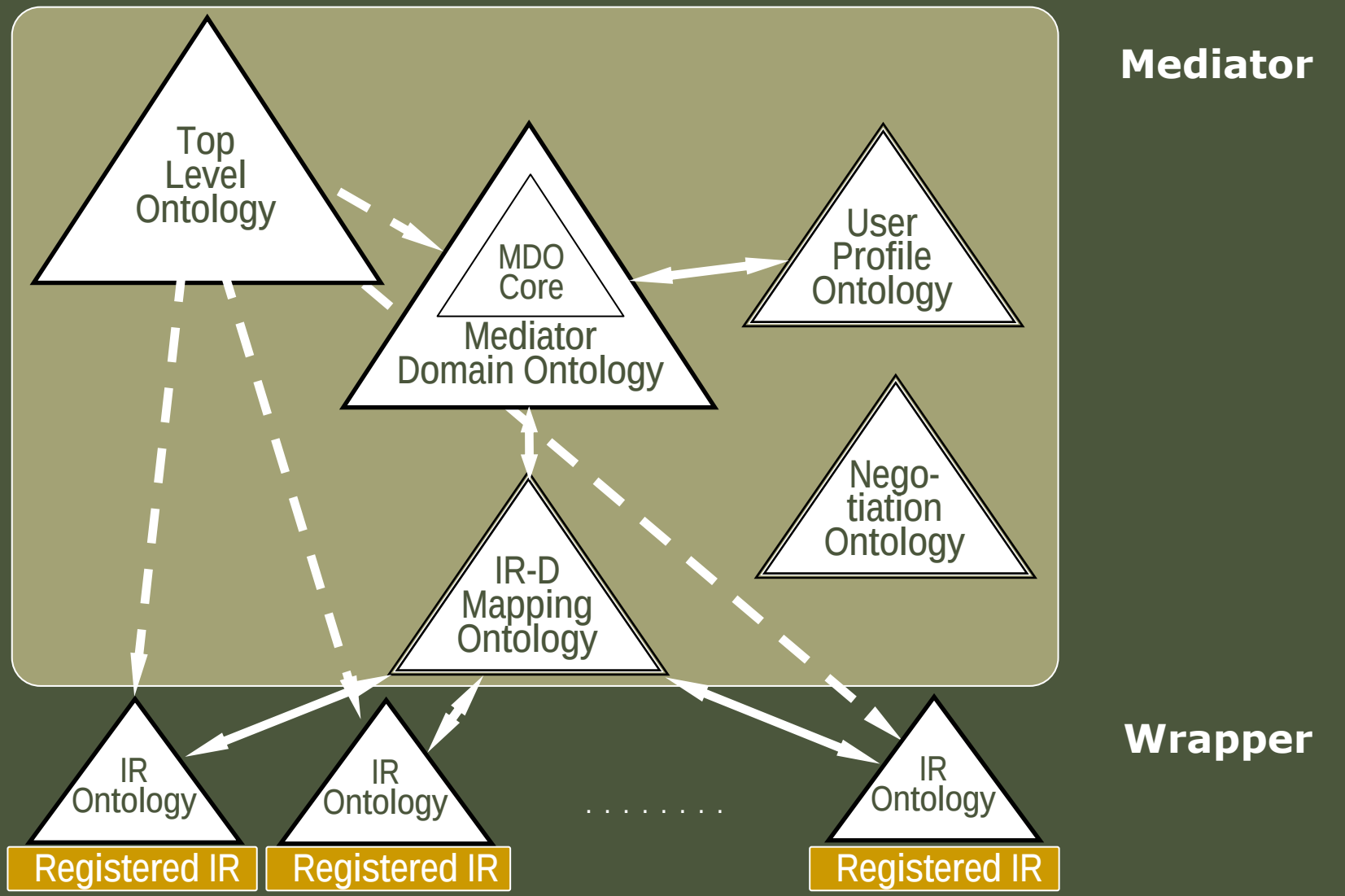
- semi-automatic

- automatic

Ontology and Language Aspect:



Ontologies Hierarchy



Summary: Usage of Ontologies in RACING and UnIT-Net

	Mediator Knowledge Base (MKB)						WKB
Processes \ Ontologies	ULO	MDO Core	MDO	IRDMO	UPO	NO	IRO
Query distributed autonomous semantically heterogeneous information resources	--	R	R	R	R/U	R	R
Register new information resource	R	R	R/U	R/U	--	--	R
Maintain coherent semantic descriptions	R	R/U	R/U	R/U	R/U	--	R/U

- **R** – usage for reference purposes only
- **R/U** – used as a reference and is updated
- **--** – not used

Projects: RACING

- **Title: Rational Agent Coalitions for INtelliGent Mediation of Information Retrieval on the Net**
- **Objective:**
  - Investigate and evaluate the applicability of agent-based approach covering rationality, agency, coalition, collaboration to market oriented sectors of Distributed Information Retrieval
- **Focus:**
  - Mediation of infromation search and retrieval from structured or weakly structured information resources of:
    - Full-text online collections of Scientific Publications
    - Online Teaching Materials
- **Performed by:**
  - Dept of IT, Zaporozhye State University
- **Funded by:**
  - Ukrainian National Ministry of Education and Science
- **URL:**
  - http://www.zsu.zp.ua/racing/

UnIT-Net - TEMPUS/TACIS MP-JEP-2010-2003

- **Title: IT in University Management Network**
- **Objective(s):**
  - Creation of the Ukrainian National "**Network of Excellence**"
  - Dissemination of the **best practices** – IT in University Management
  - Elaboration of the **Specifications** recommending reasonable ways of using IT in University Management
  - Design and implementation of the **Research Prototype** of the National **Infrastructure for Electronic Data Interchange** (mediator-wrapper, hybrid knowledge representation)
- **Participants:**
  - Kherson State University (project coordinator)
  - Ministry of Education and Science of Ukraine
  - Kharkiv national University
  - Zaporozhye State University
  - University of Nice – Sofia Antipolis, France
  - Glasgow Caledonian University, UK
- **URL:** http://www.unit-net.org.ua/