Semantic Days 2011 Tutorial
Semantic Web Technologies
Lecture 1: Introduction

Martin Giese

7th June 2011

Department of Informatics

University of Oslo

Outline

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Who?

Teachers:

Martin Giese
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Tutorial Structure

- Introduction
  - Lecture, 45 mins
  - Break, install software, 15 mins
- RDF – representing information
  - Lecture, 30 mins
  - Break, solve exercises, 15 mins
  - Solutions to exercises, 15 mins
- SPARQL – querying
  - 30 mins lecture, 15 mins break/solving, 15 mins solutions
- OWL – modeling
  - 30 mins lecture, 15 mins break/solving, 15 mins solutions
- D2R – mapping databases
  - 30 mins lecture (15 mins break/solving, 15 mins solutions)

Used Software, Tutorial Web Page

- You will need:
  - A text editor for writing RDF
  - A web browser to play with some web services
  - Protégé for modelling
  - Some small Java apps we built for you
- Download
  - Required Software
  - Source code
  - Exercises
  - Solutions
- . . . from the tutorial web page:

`http://sws.ifi.uio.no/semdays2011/`

Outline

The Vision of a Semantic Web

A vision

I have a dream for the Web [in which computers] become capable of analyzing all the data on the Web—the content, links, and transactions between people and computers. A 'Semantic Web,' which should make this possible, has yet to emerge, but when it does, the day-to-day mechanisms of trade, bureaucracy and our daily lives will be handled by machines talking to machines. The 'intelligent agents' people have touted for ages will finally materialize.

Tim Berners-Lee

Quoted from: *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web.* Tim Berners-Lee with Mark Fischetti. Harper San Francisco, 1999.

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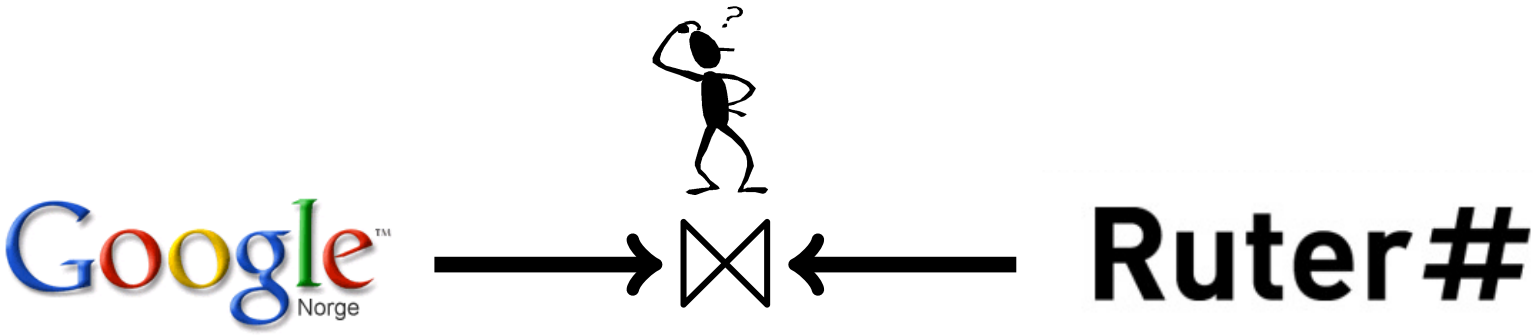
- Essentially a database join!



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- Can hardly wait for a separate mashup for each useful combination!

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- All those websites publish their information in a machine-readable format.
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- Enough domain knowledge is available to machines to make use of the information
- User-agents can find and combine published information in appropriate ways to answer the user's information needs.

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  - Information Exchange (XML, HTTP, etc.)

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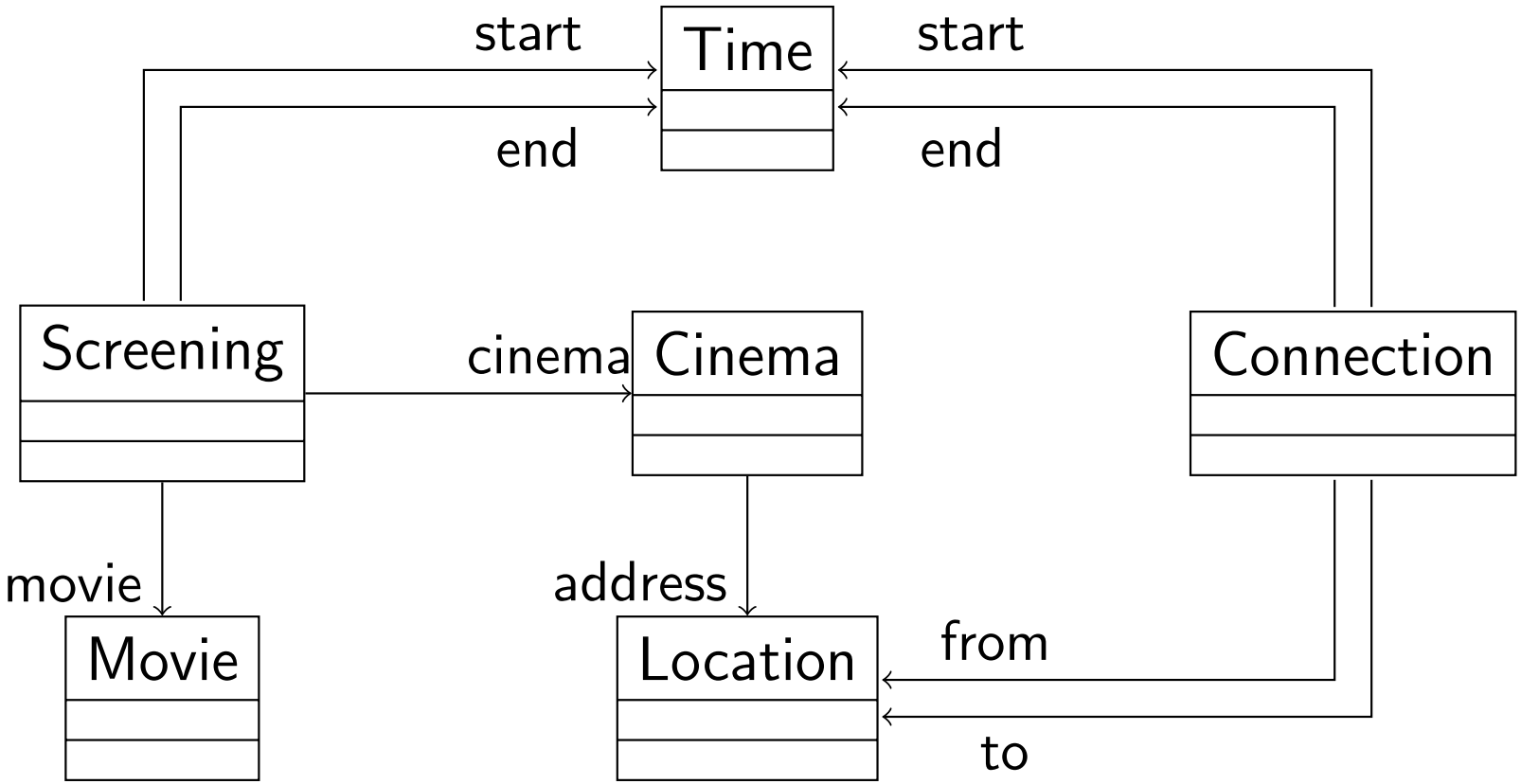
  - Domain models, e.g. in UML
  - Numerical Models (Newtonian mechanics, Quantum mechanics)

A Cinema Transport Model

An example of a UML domain model:



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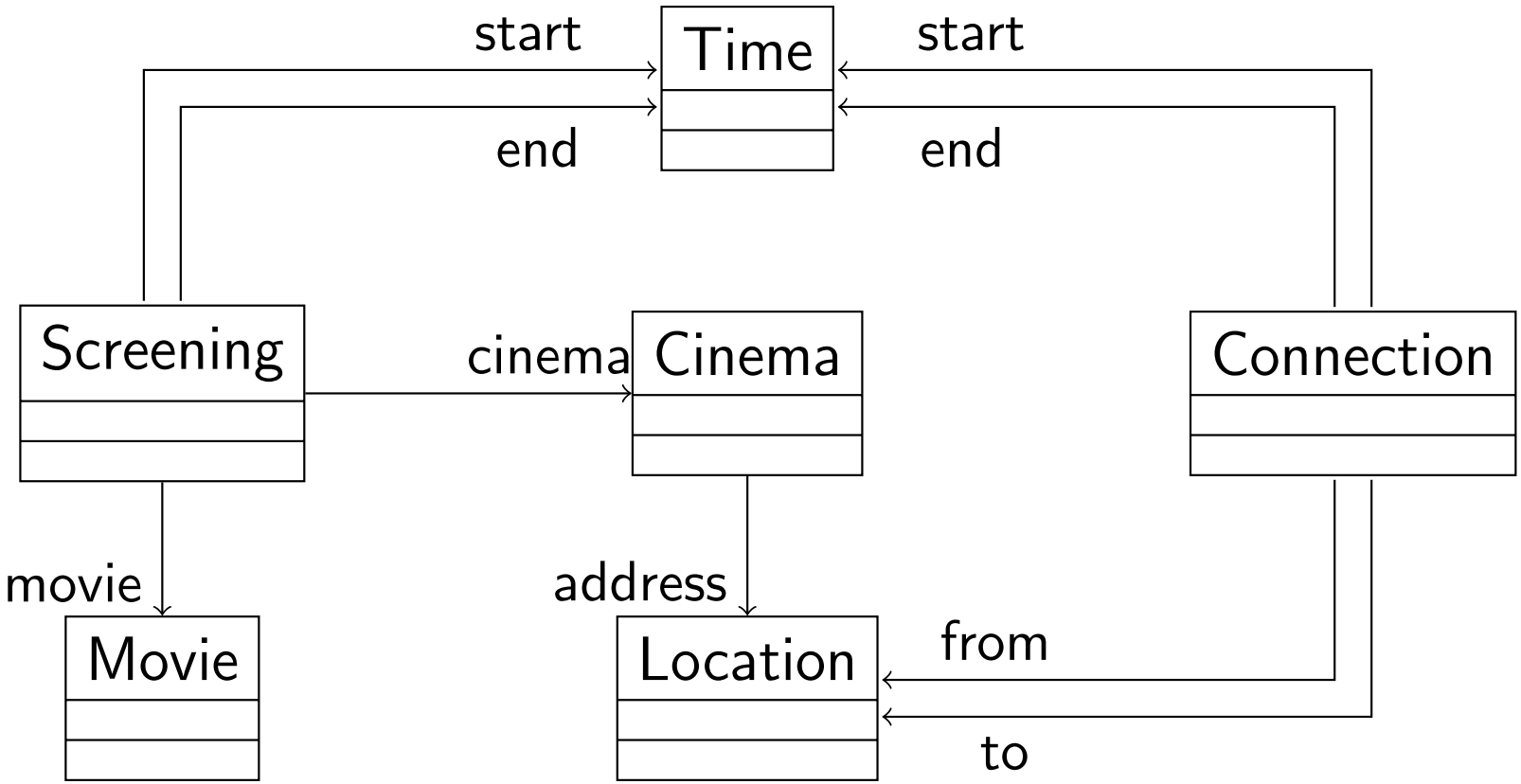

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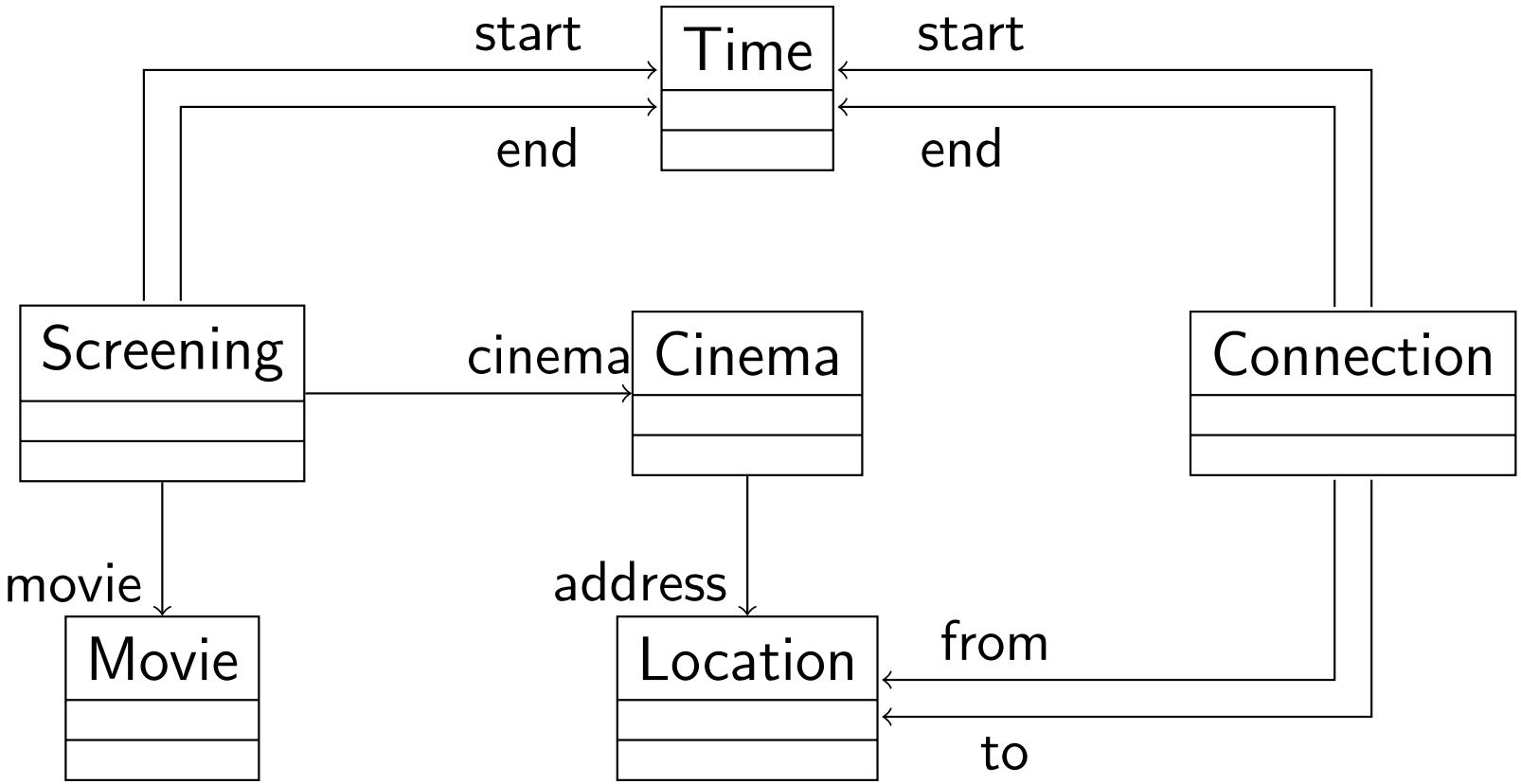

- What is the vocabulary?
- How is it connected?

A Query

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Find s, k, l, c, cStart, cEnd, sStart satisfying this and we have the answer!

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Find s, k, l, c, cStart, cEnd, sStart satisfying this and we have the answer!

- Maybe not the easiest way to ask, but it's a start.
- Models are an important part of a Web of Data!
- Need to connect models from different domains.

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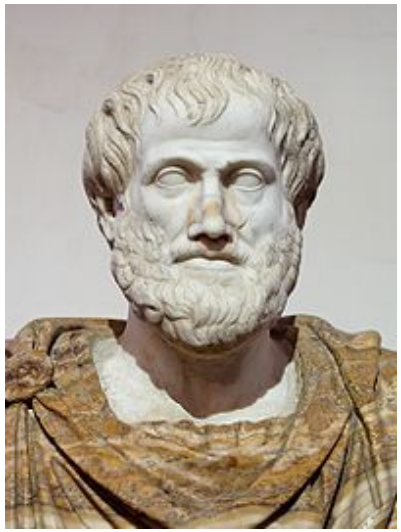
- Abstraction!

Calculating with Knowledge

- Can be traced back to Aristotle (384–322 BC)



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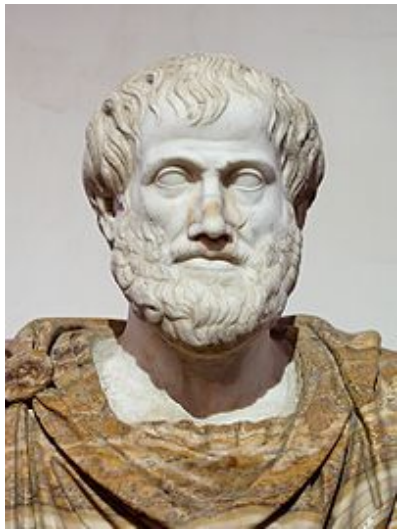

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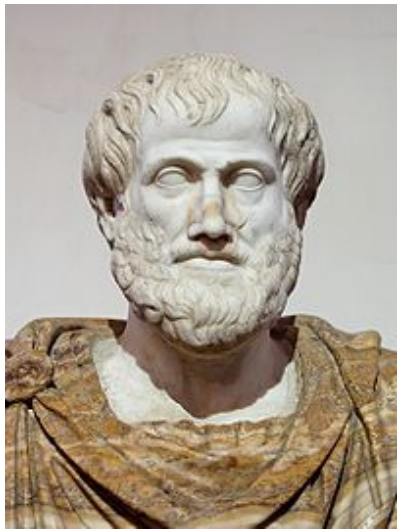

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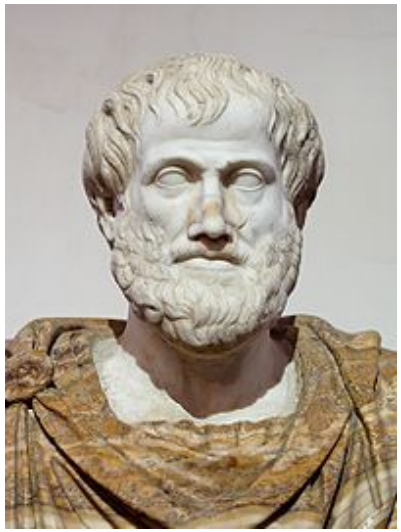

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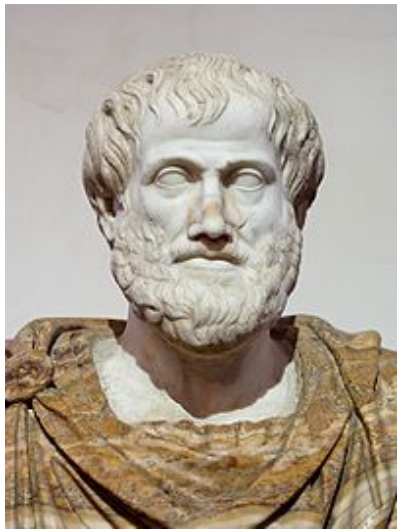

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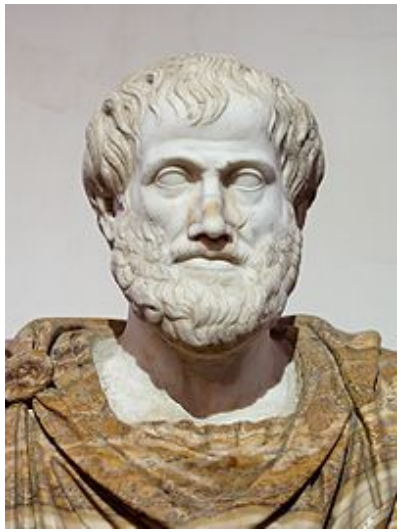

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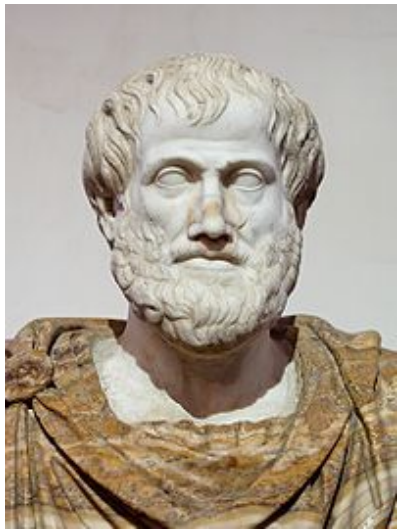

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- The topic of *formal logic* and *computational logic*

Computing with Knowledge About Movies

- Query: find a *fun event* we can reach by public transport

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  7. From 6 and 2: A screening of *X-Men* is fun
  8. From 1, 5, 7: there is a fun event at 19:00

  ...
- Computing with Knowledge is an important part of a Web of Data!

The "Home" of the Semantic Web

See the W3C pages for the Semantic Web effort:

`http://www.w3.org/2001/sw/`

For standards (RDF, OWL, SPARQL, etc.), see:

`http://www.w3.org/2001/sw/wiki/Main_Page`

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- We talk about "semantic technologies" since they make sense independent of the Web

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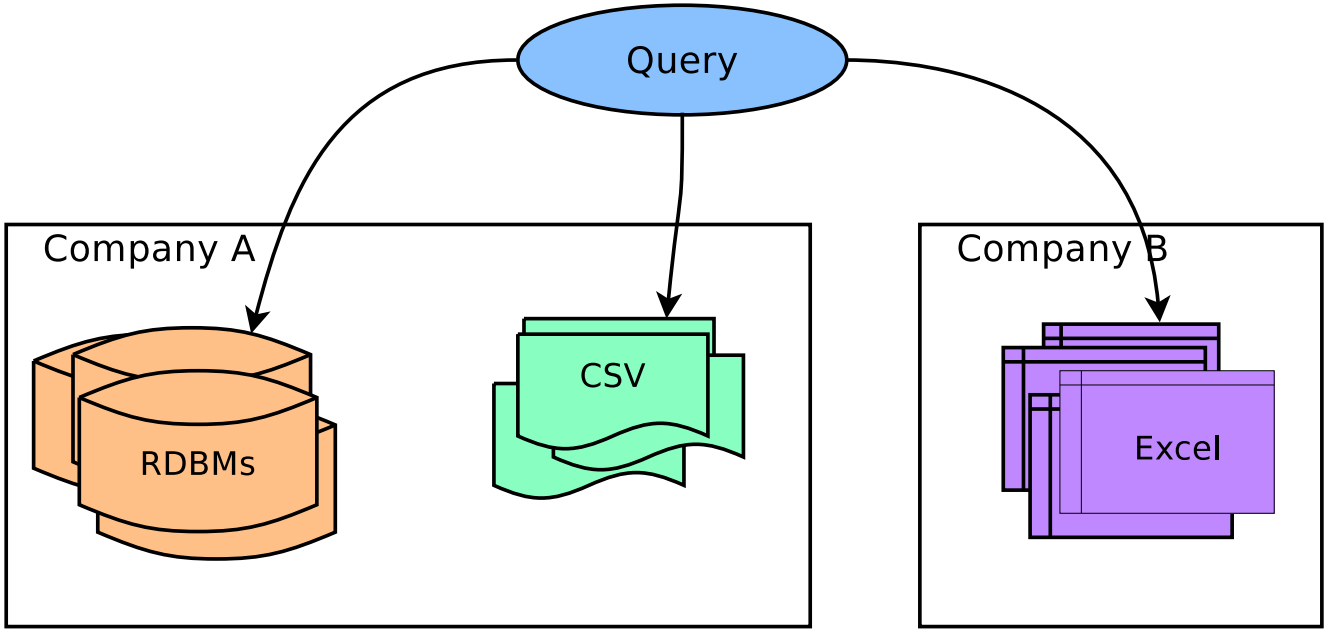

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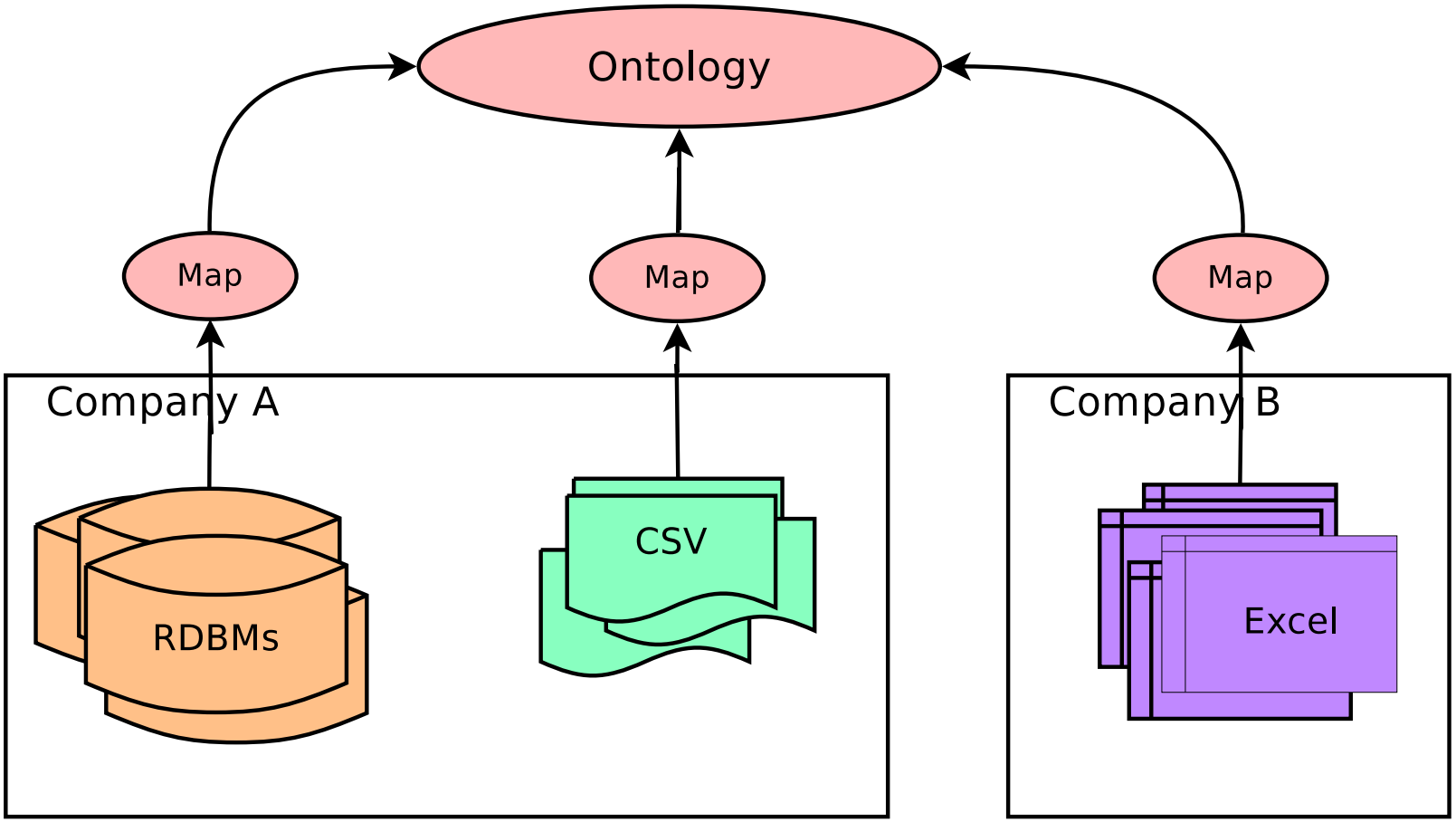
- Access data using queries expressed using the common vocabulary
- Background machinery gives answers as if data had always been stored according to a common data model

Ontology-based data access (cont.)



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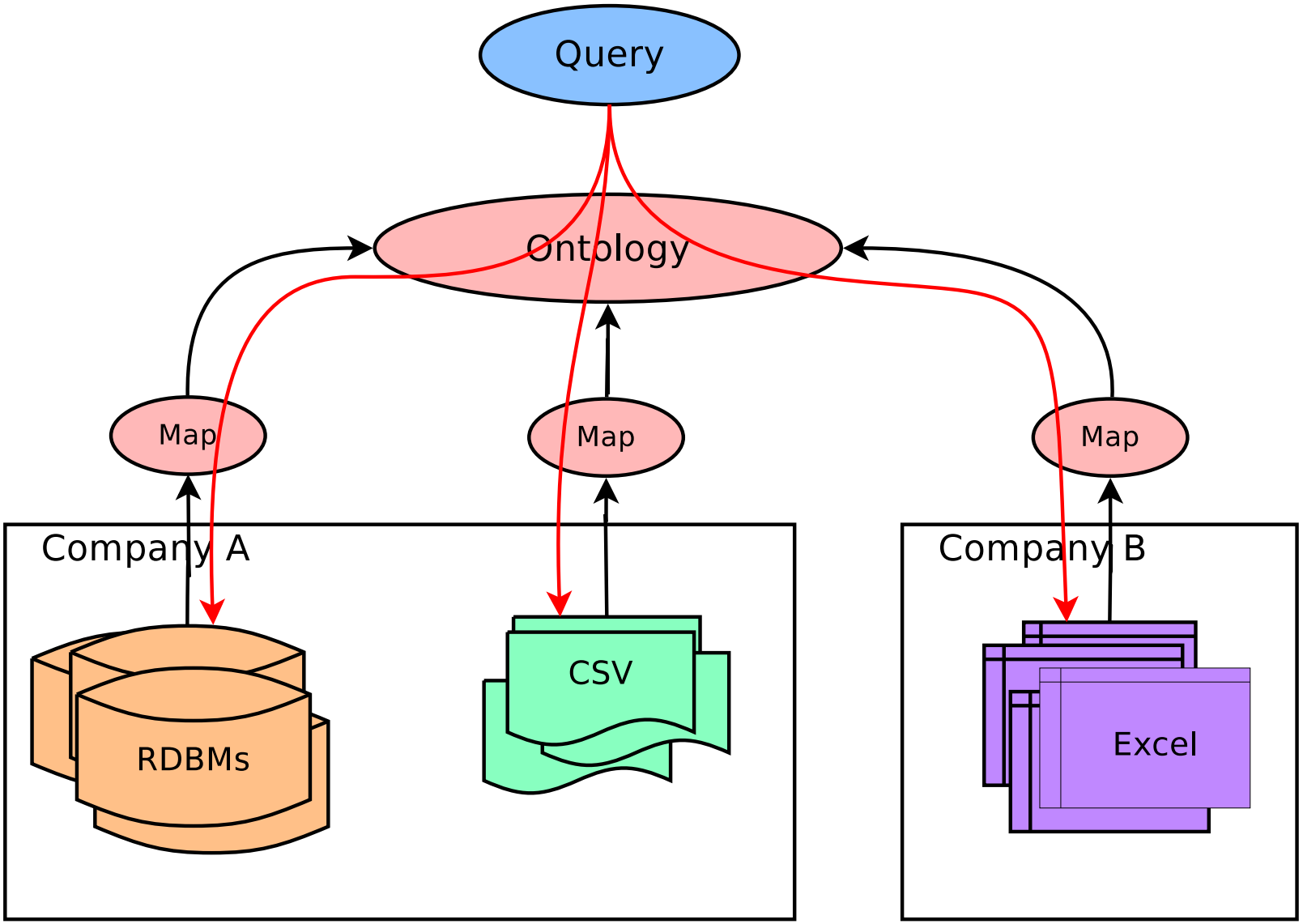

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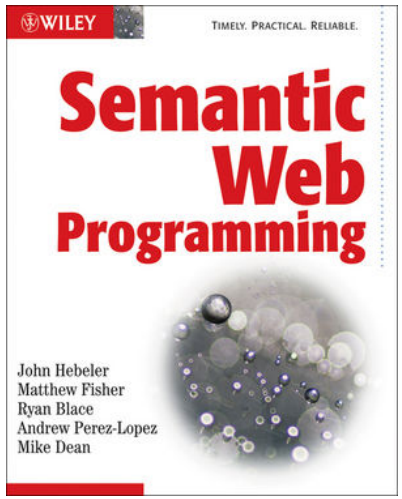
- UiO lecture slides:

  `http://www.uio.no/studier/emner/matnat/ifi/INF3580/v10/undervisningsplan.xml`

Further Reading

- For practical aspects:

  Semantic Web Programming.
  Hebeler, Fisher, Blace, Perez-Lopez.
  Wiley 2009



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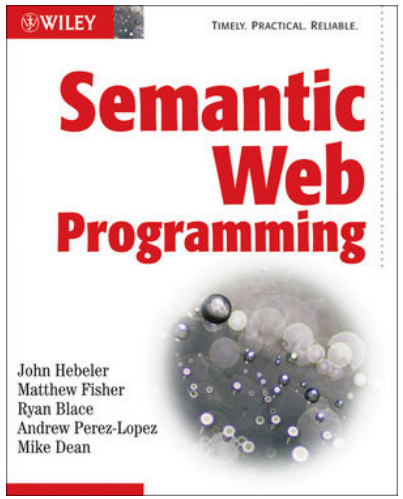
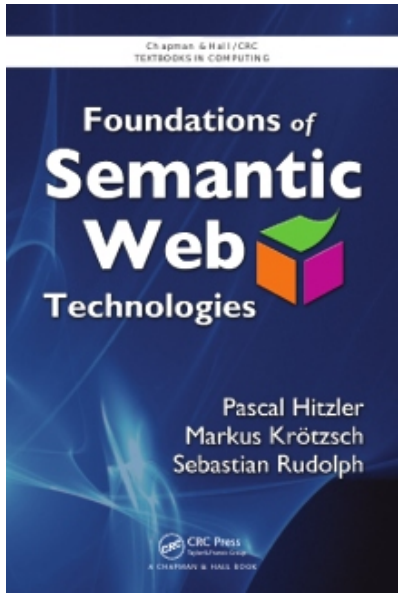


- For theoretical aspects:

  Foundations of Semantic Web Technologies.
  Hitzler, Krötzsch, Rudolph.
  CRC Press 2009



Downloads, Tutorial Web Page

Download and install software needed for the exercises:

- Protégé: ontology editor
- Java runtime environment
- D2R Server: "RDF server"
- D2RQueryEngine: Java program

Go to `http://sws.ifi.uio.no/semdays2011/` for more information.
Also contains:

- Required Software
- Source code
- Exercises
- Solutions