ACCELERATE DEVELOPMENT | IMPROVE SERVICE | OPTIMISE SALES

ontoprise
know how to use Know-how

Semantics@Work

PING Symposium 16.3.07

1 ontoprise: know how to use Know-how!

Ontoprise is the leading semantic software company. Our goal is to make a company's know-how visible and re-usable.

Founded: 1999
Team: 40 employees
Headquarter: Karlsruhe, Germany

Main Markets:
Engineering
Telecommunication
Service Providers
Software Companies

Track record:
- 8 of the 20 largest German companies
- Strategic Partnership with Oracle and Software AG

Karlsruhe: Location for Semantic Technologies

Basic Research

Application-oriented Research

Application-oriented Research

Know-how Transfer

Realizing new Scenarios

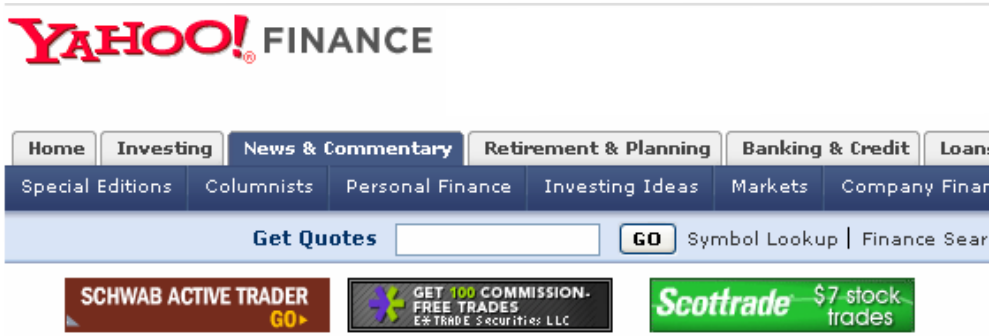
Application-oriented Research

Product Development

Innovative Solutions

2

.... the big boys enter the arena



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Press Release

ontoprise and Oracle Agree on Technology Partnership

Friday May 19, 10:03 am ET

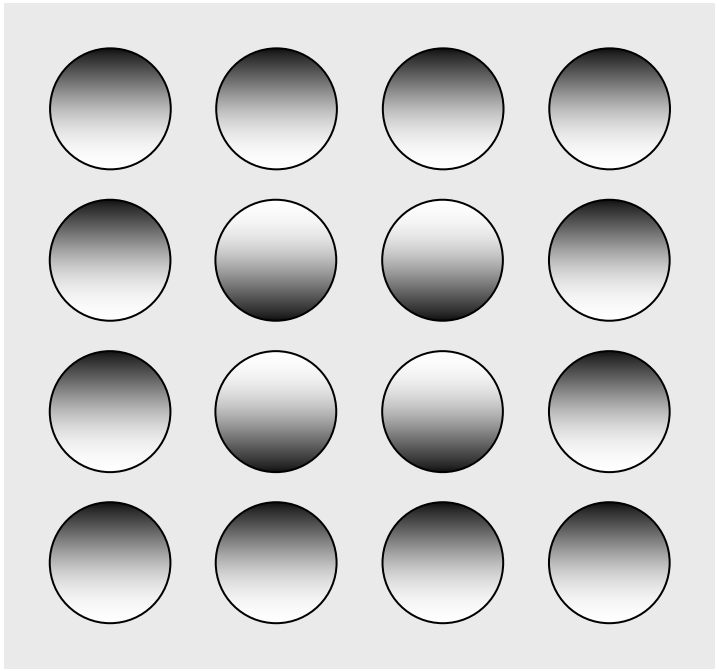
ontoprise to Release the First Commercial Semantic Web Infrastructure Software Based Upon Oracle(R) Fusion Middleware

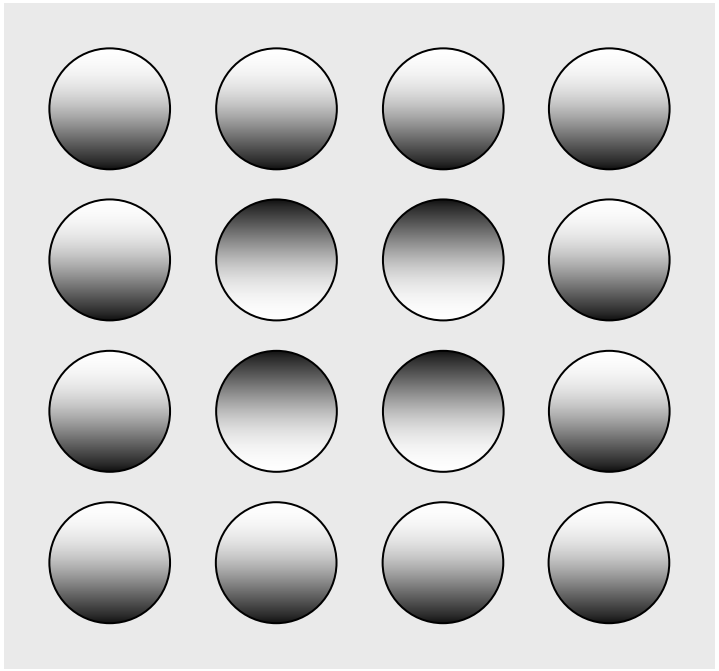
KARLSRUHE, Germany, May 19 /PRNewswire/ -- ontoprise has completed the embedding of the market leading OntoBroker® inference engine with the Oracle Application Server Containers for J2EE (OC4J), a component of Oracle® Fusion Middleware. The resulting solution would combine the best-of-breed semantic and enterprise infrastructure software in order to create new opportunities in complex and data-intense application areas such as the Life Sciences or Automotive industries.

3 …. and they already play the game!

Ontoprise technology embedded


What is it?





Who wants to search within endless result lists?

Queries instead of key words

Which fruit is green and grows in southern France?

ANSWERS instead of document list

Apple,
Osage Orange, …

Create new Knowledge

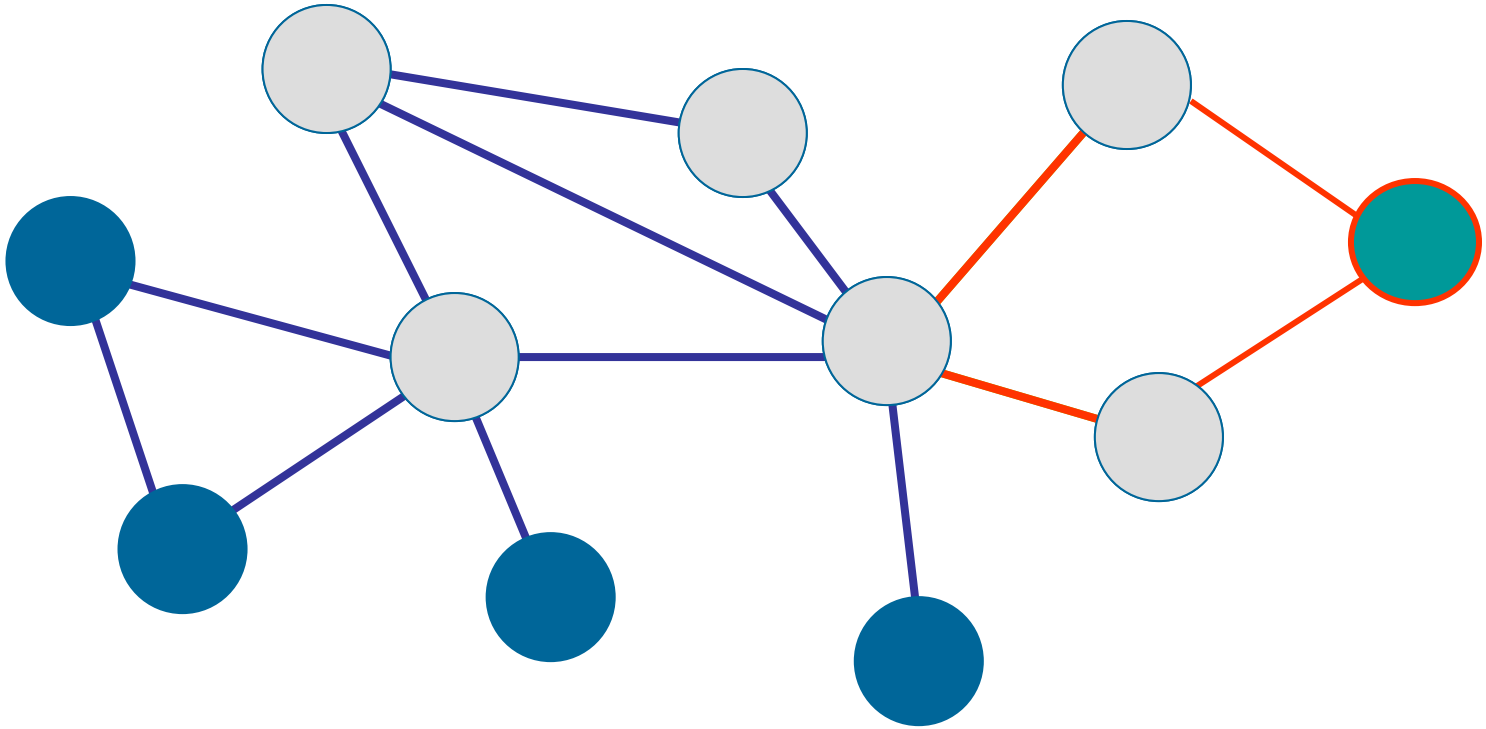
1 & 2 = 3

Tannzäpfle Beer is brewed from **Malt, Hops and Water**

German Purity Law allows only **Malt, Hops and Water** for beer

Tannzäpfle Beer is brewed under **German Purity Law**

Inferencing = Generating new Insights




Oil leackage!


Is it a valid variant?

Requirements met?


Inspection necessary?

Child at risk?

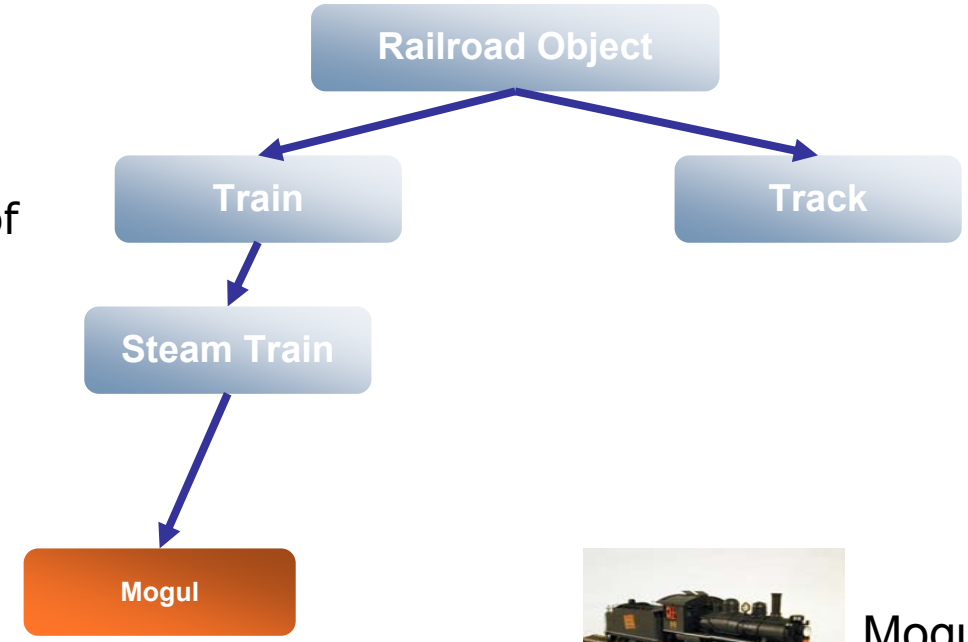
Complicated Decision?

Semantics = All About Meaning

Ontology

„An Ontology is a **shared** conceptualization of a domain [Tom Gruber].“

- social semantics (meaning)



Mogul Trai

Mogul Emperor

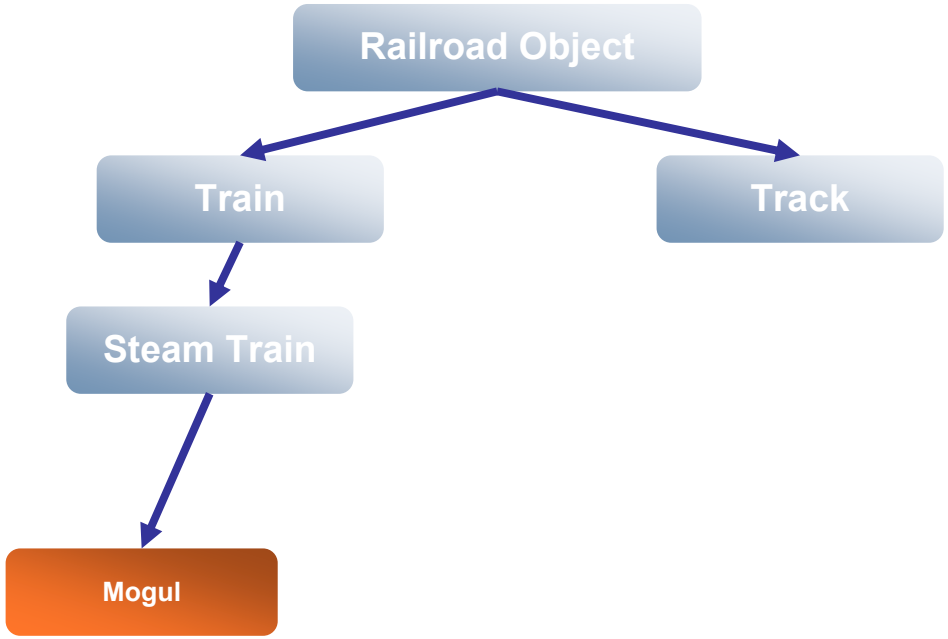
Mogul Ski Race

Semantics = All About Meaning

Ontology

„An Ontology is a formal and defined System of Concepts and Relations between these Concepts used to describe complex domains of knowledge."

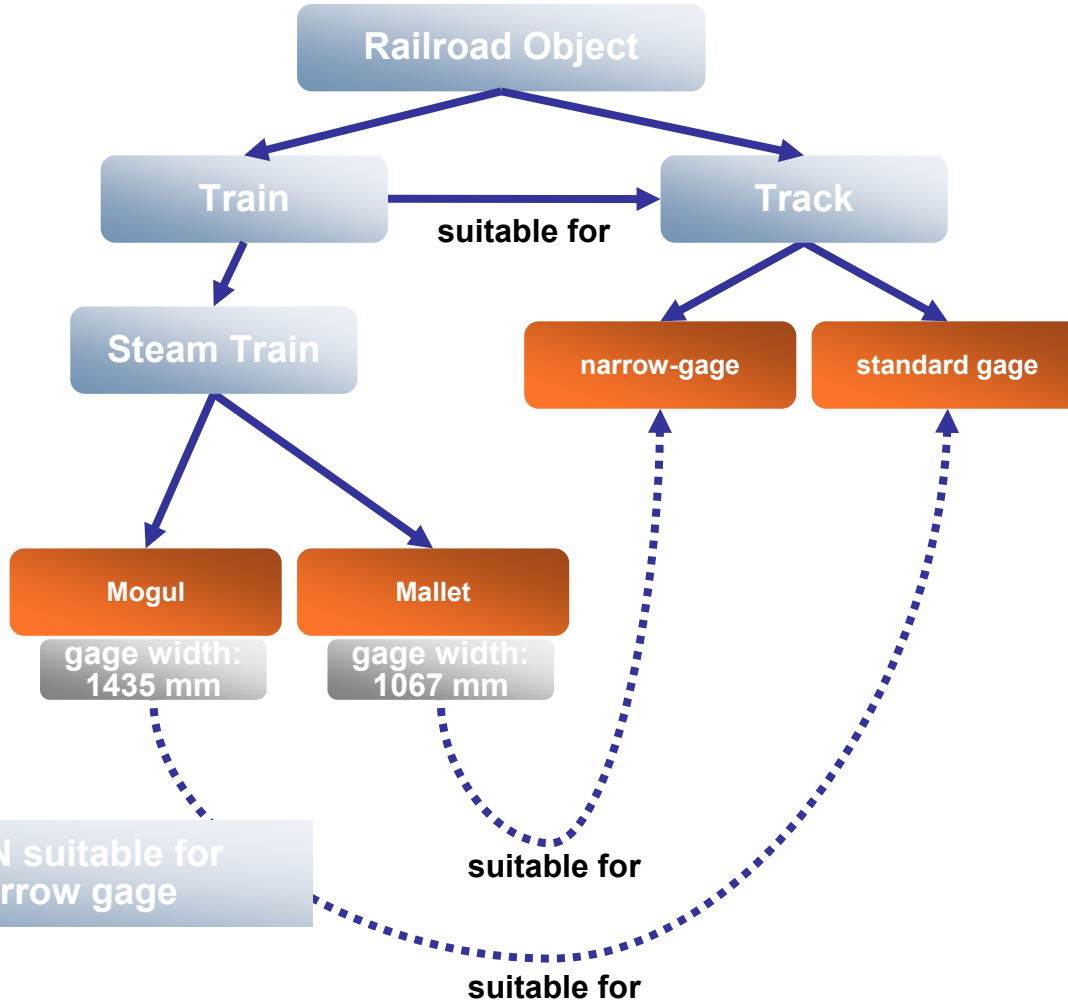
- based on logics
- internal semantics



Parts of an Ontology

Ontology

- Concepts
- Relations / Attributes
- Instances
- Rules



IF gage width = 1435 THEN suitable for standard gage ELSE narrow gage

Shared Knowledge instead of Black Box

- Common Applications are Black Box because most logic is hidden in source code

Shared Knowledge instead of Black Box

- Common Applications are Black Box because most logic is hidden in source code

- Ontology makes the logic transparent and can explain results
- Thus giving business people insight into their application

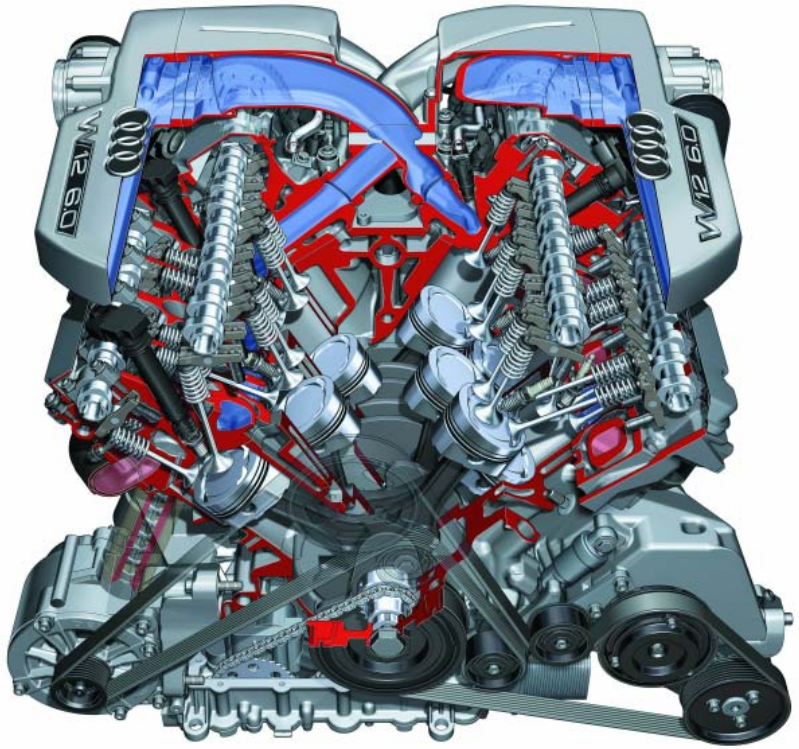
Audi: Semantic Testcar Configuration

Background

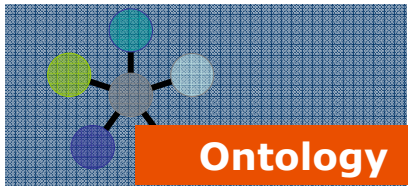
- Complex dependencies decrease the speed of development
- Knowledge is distributed over different departments

Goal

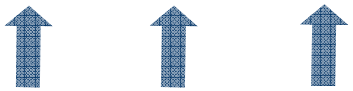
- Design of a Semantic Guide for
  - capturing the dependencies
  - Configuration of components
- Integration into existing order system
- Engineers can concentrate on creative efforts
- Integration of different data sources (RDBs)

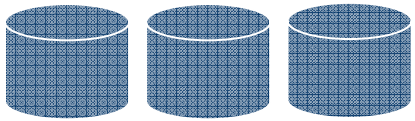


Ontology combines rules, structures and information



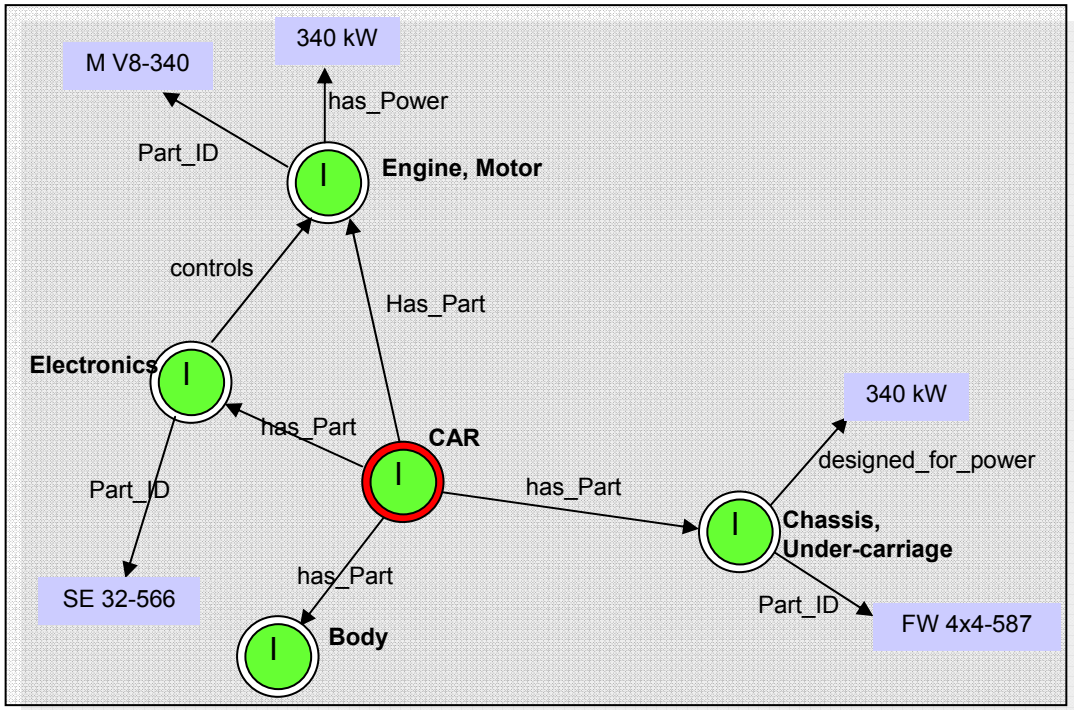
Structures
Dependencies, rules





Mapping of existing information

Ontologies represent the meaning of information



Sample Ontology (Source ontoprise)

Represent the <u>meaning</u> of information

-Concepts and hierarchies (Car, has_Part, Engine, Body, …)

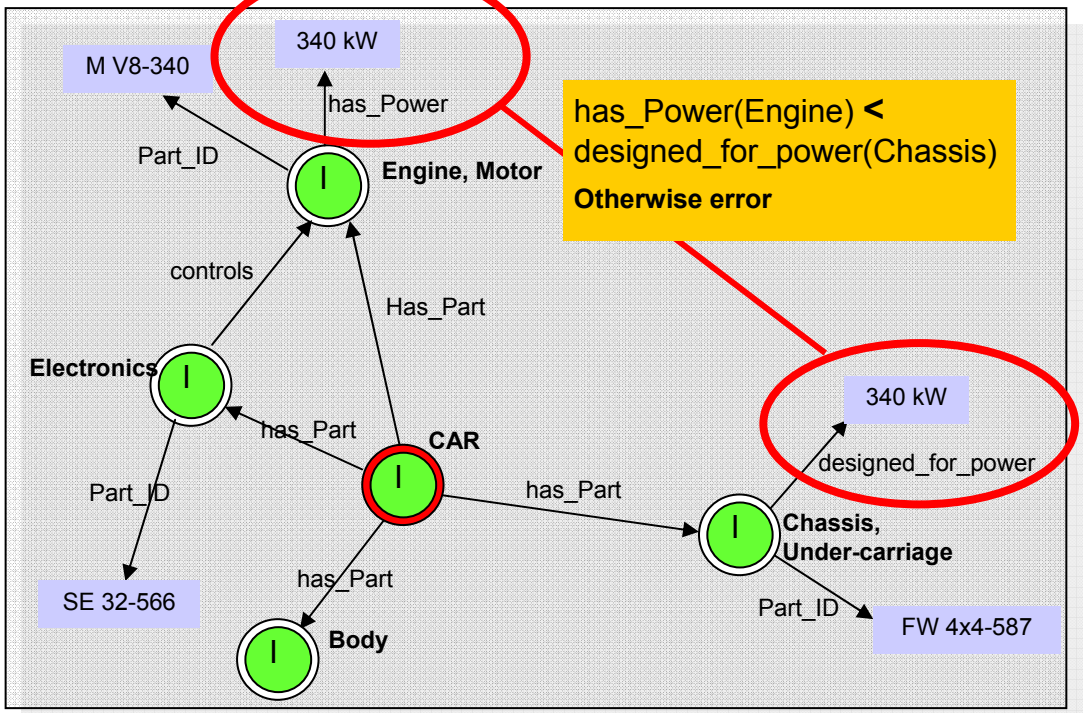
-Synonyms (Engine, Motor)

-Attributes and relations (Part_ID, designed_for_power, controls)

-other

"An ontology is a hierarchically structured set of terms for describing a domain that can be used as a skeletal foundation for a knowledge base." Swartout, Patil, Knight and Russ.

Ontologies represent the logic of information



Sample Ontology (Source ontoprise)

Represent the logic of information

-Rules to define constraints (Chassis has to be designed for the power of the engine)

-Rules for defining any functional, logical, geometrical, chronological dependencies (has_Power influences gearbox and tires)

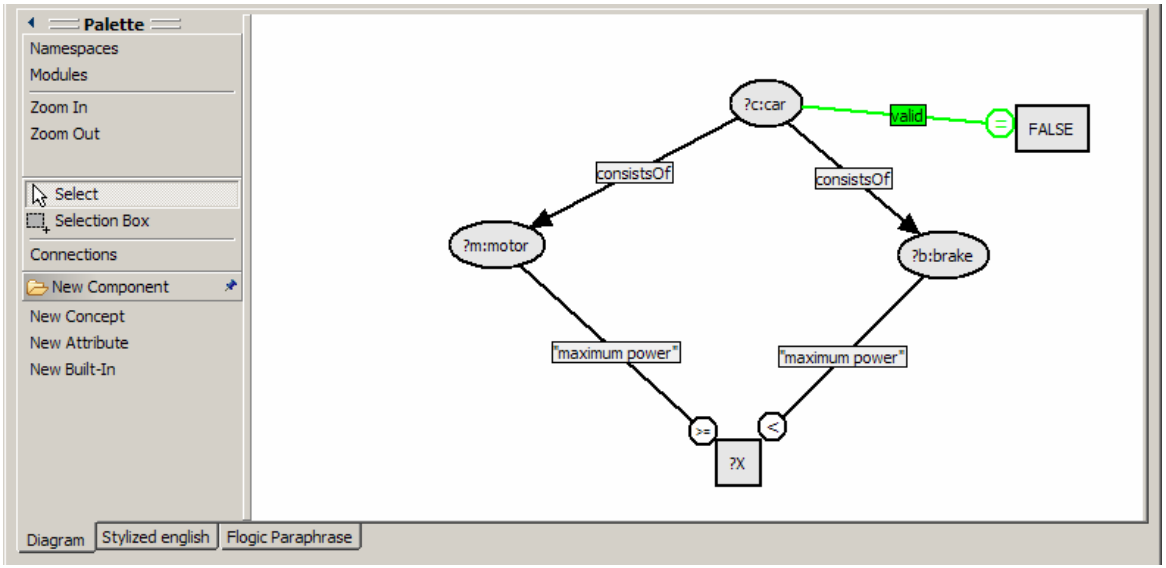
-Rules for information integration (value "Engine has_power" is stored in "PDM p, Table t1"; value "designed_for_power" is stored in "CAT c, Table t2")

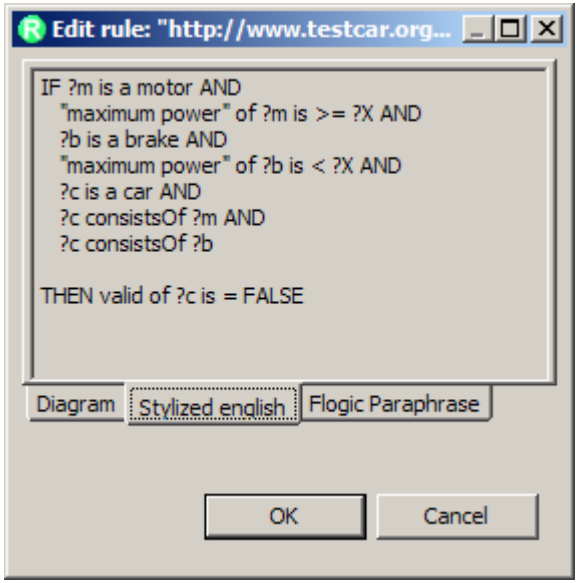
-Rules to define different contexts

"Ontologies are the backbone of semantic technologies. They enable companies to integrate information, make them tangible and re-usable." Prof. Dr. Rudi Studer.

Relationships/Constraints

Example Rule: *The maximum power of the motor must not exceed the one of the brakes: Pmotor < Pbrakes*



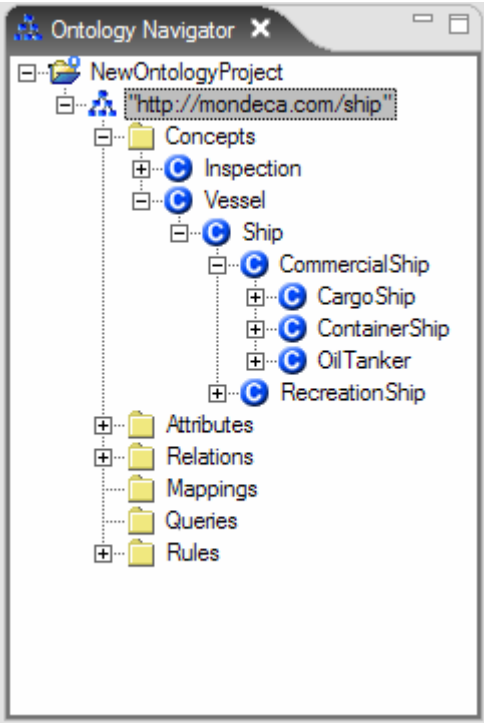



```
FORALL c, entity21, X, b, entity22, m
    c["http://www.testcar.org"#valid->>FALSE]@"http://www.testcar.org"#""
    <-
    m:"http://www.testcar.org"#motor@"http://www.testcar.org"#"" AND
    m["http://www.testcar.org"#"maximum power"->>entity21]@"http://www.testcar.org"#"" AND greaterorequal(entity21, X) AND
    b:"http://www.testcar.org"#brake@"http://www.testcar.org"#"" AND
    b["http://www.testcar.org"#"maximum power"->>entity22]@"http://www.testcar.org"#"" AND less(entity22, X) AND
    c:"http://www.testcar.org"#car@"http://www.testcar.org"#"" AND
    c["http://www.testcar.org"#consistsOf->>m]@"http://www.testcar.org"#"" AND
    c["http://www.testcar.org"#consistsOf->>b]@"http://www.testcar.org"#"".
```

The partner MONDECA pilot project with `*client*´ on Administration of Ships

The Client is a company with a large number of Ships to manage

In the range of 7000 Ships in different categories



Details of the ships are proportionately large and administrating the ships for shipping, logistics, security, maintenance etc. any purpose for that matter is a relatively complex system.

The Ontology – is important

- Classification of ship
  - -Type
  - -Subclasses
  - -Purpose

 # bulk carriers
* * tankers*
* o chemical*
* o crude oil*
* o gas carriers*
* o LNG, LPG*
* o product*

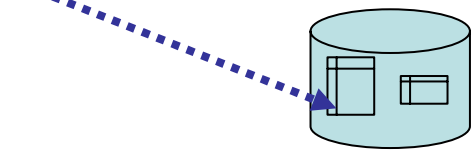
- Partonomy

 # Electrical Equipment and Power Supply
 # Communications Systems and Equipment
 # Security
* * Fire Fighting*
* * Detection*
* * Insulation*
 # Water Treatment
* * Desalination*
* * Sanitation*
* * Waste Water*

- Classification of Inspections

Example – take the case of a system controlling Ship Maintainance

Currently we have Experts who has the *`know-how` to use and integrate a huge number of regulations .*



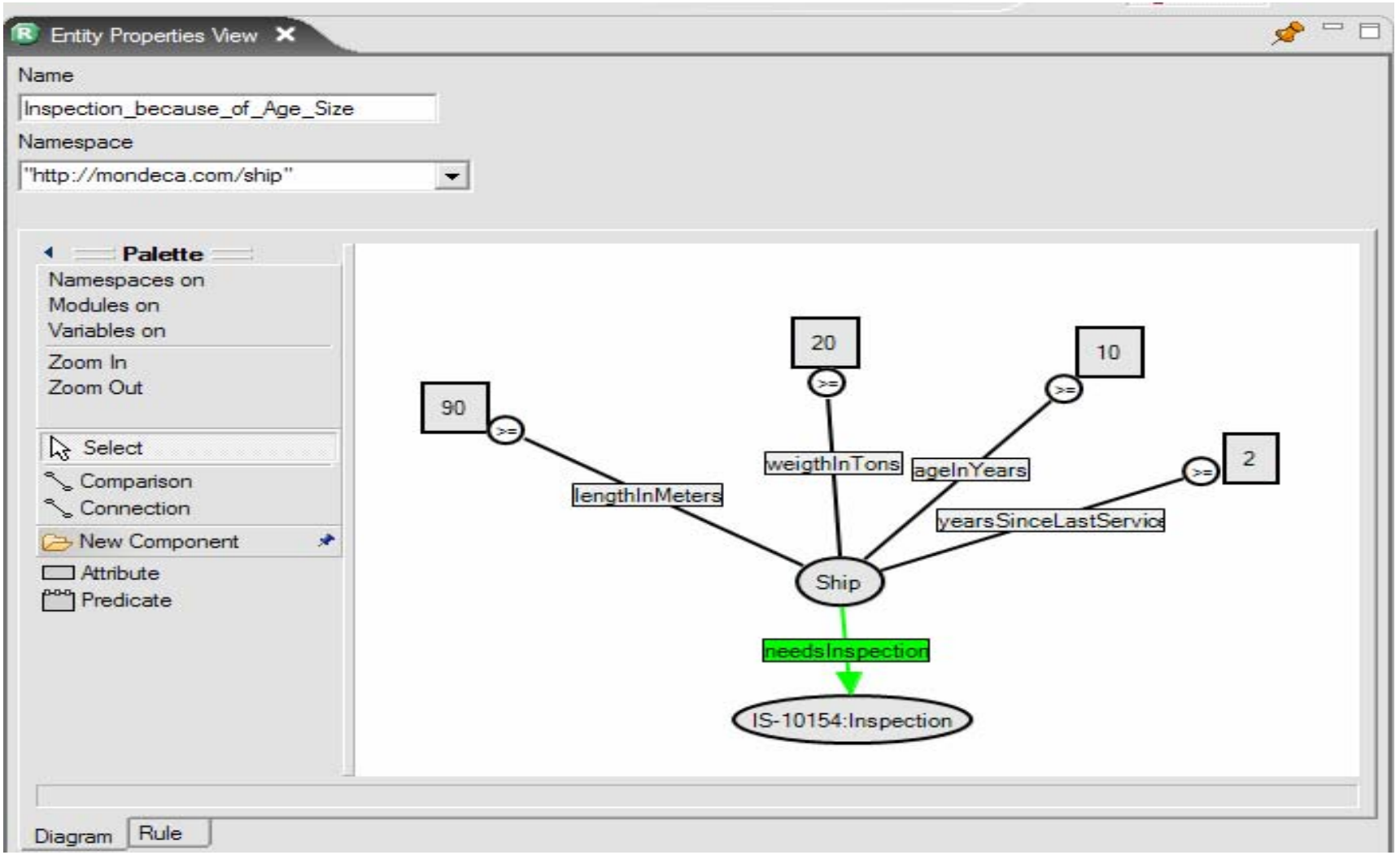
- **Its is relevent to extract the regulations for the maintainance so that the experts can concentrate on more productive work than just already known maintainance issues.**

- **A typical case would be**

  If the ship is more than 90m long
  And If the ship weighs more than 20 tons
  And If the ship is more than 10 years old
  And If the ship has not been Serviced for last 2 years

  Then

  Inspection `IS-10154`applies.


Entity Properties View
Name
Inspection_because_of_Age_Size
Namespace
"http://mondeca.com/ship"
Palette
Namespaces on
Modules on
Variables on
Zoom In
Zoom Out
Select
Comparison
Connection
New Component
Attribute
Predicate
20
10
90
2
>=
weigthInTons
ageInYears
lengthInMeters
yearsSinceLastService
Ship
needsInspection
IS-10154:Inspection
Diagram
Rule

Semantic Information Integration

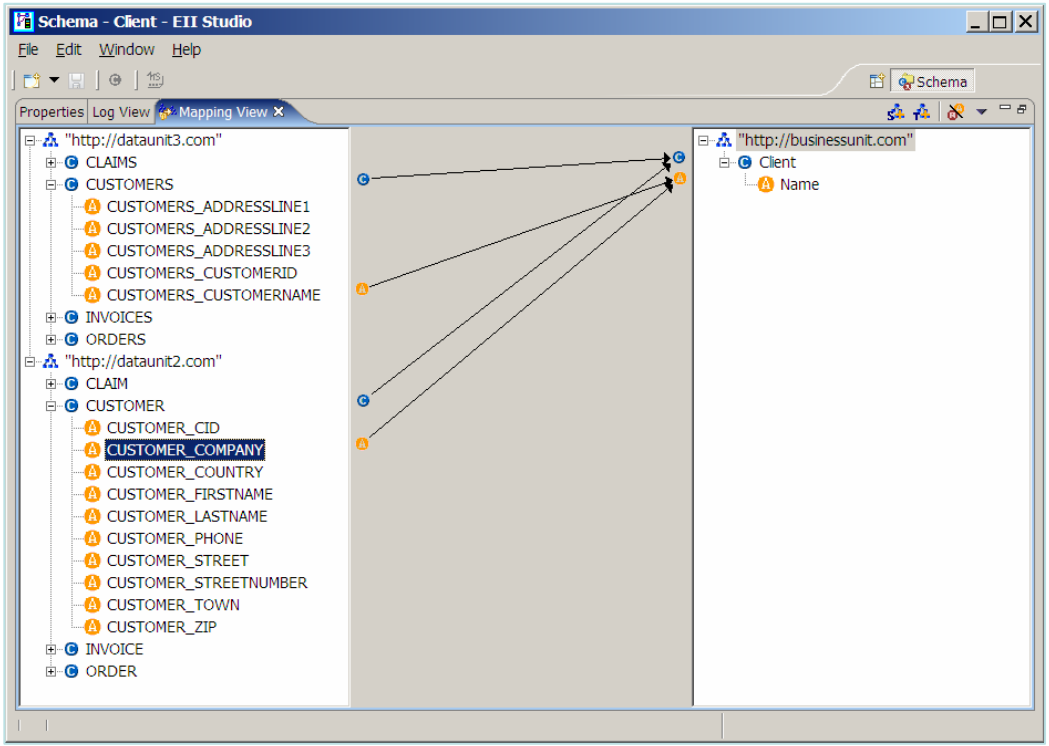
It is generally estimated that for each $1 spent for an application, companies spend on average $5 to $9 for the integration.

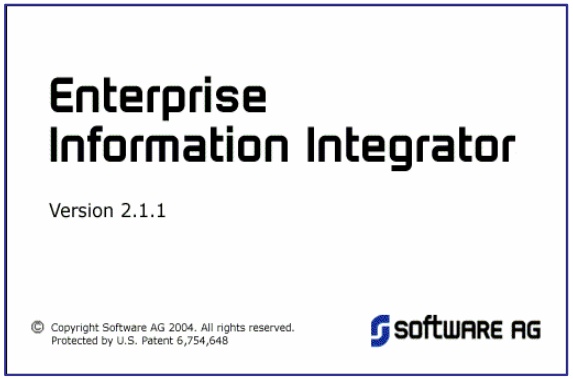
© IBM, Nelson Mattos

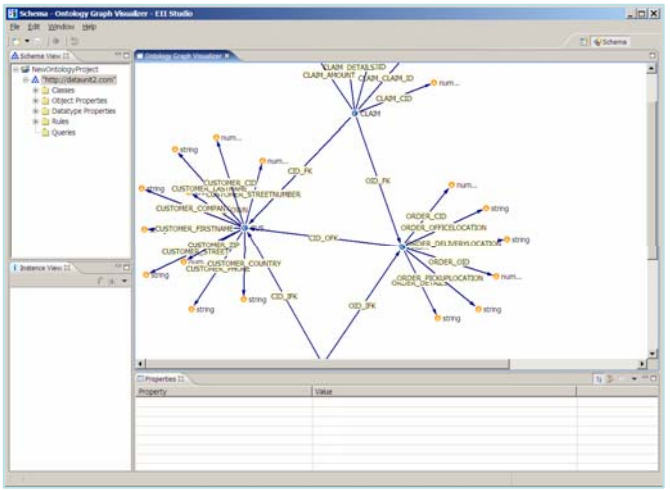
What is the **problem** of information integration?

- **structural heterogeneity** – different application systems store their data in different structures
- **semantic heterogeneity** – intended meaning of information items is different in the various application systems
- **inconsistency and redundancy problems** – data in different application systems might be partially inconsistent or redundant

Software AG's Enterprise Information Integrator v.2.2





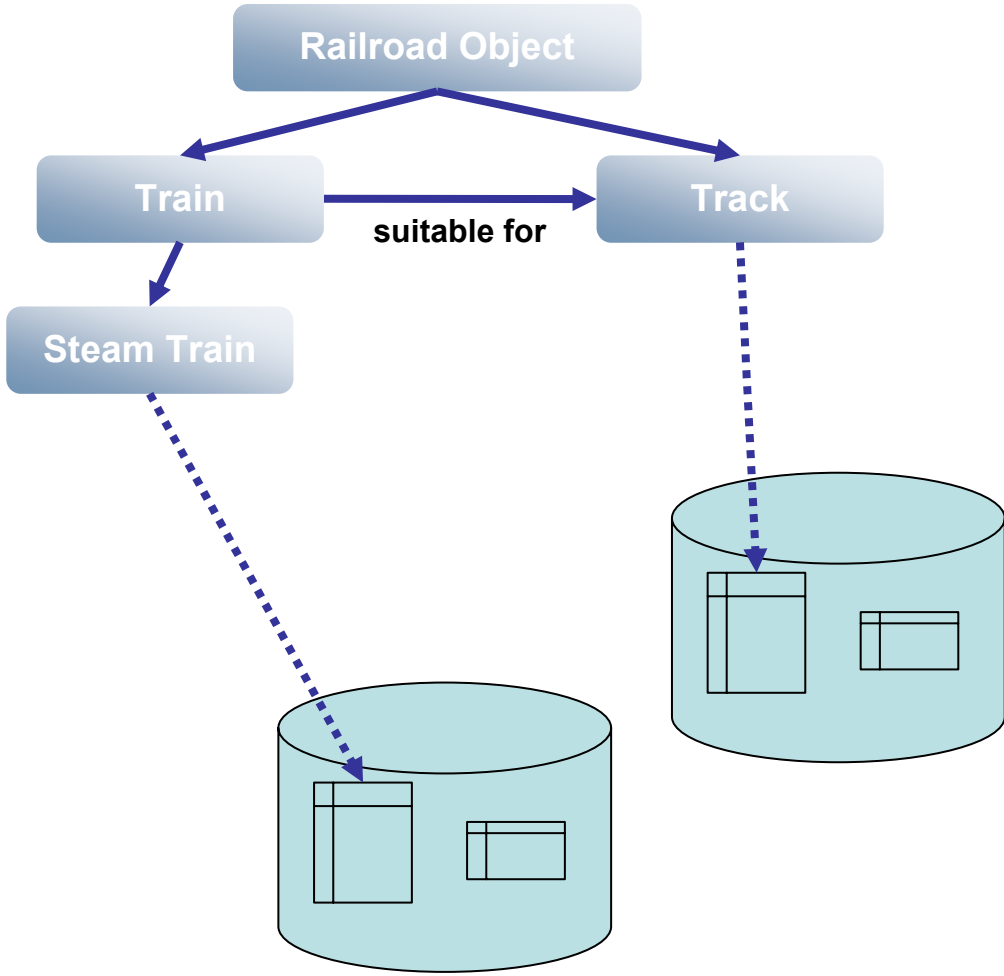


source: Software AG

Parts of an Ontology

Ontology

- Single View
- Business Agility
- Increased Productivity



Chemistry: OntoBroker passes Advanced Placement Test

PROJECT HALO

VULCAN

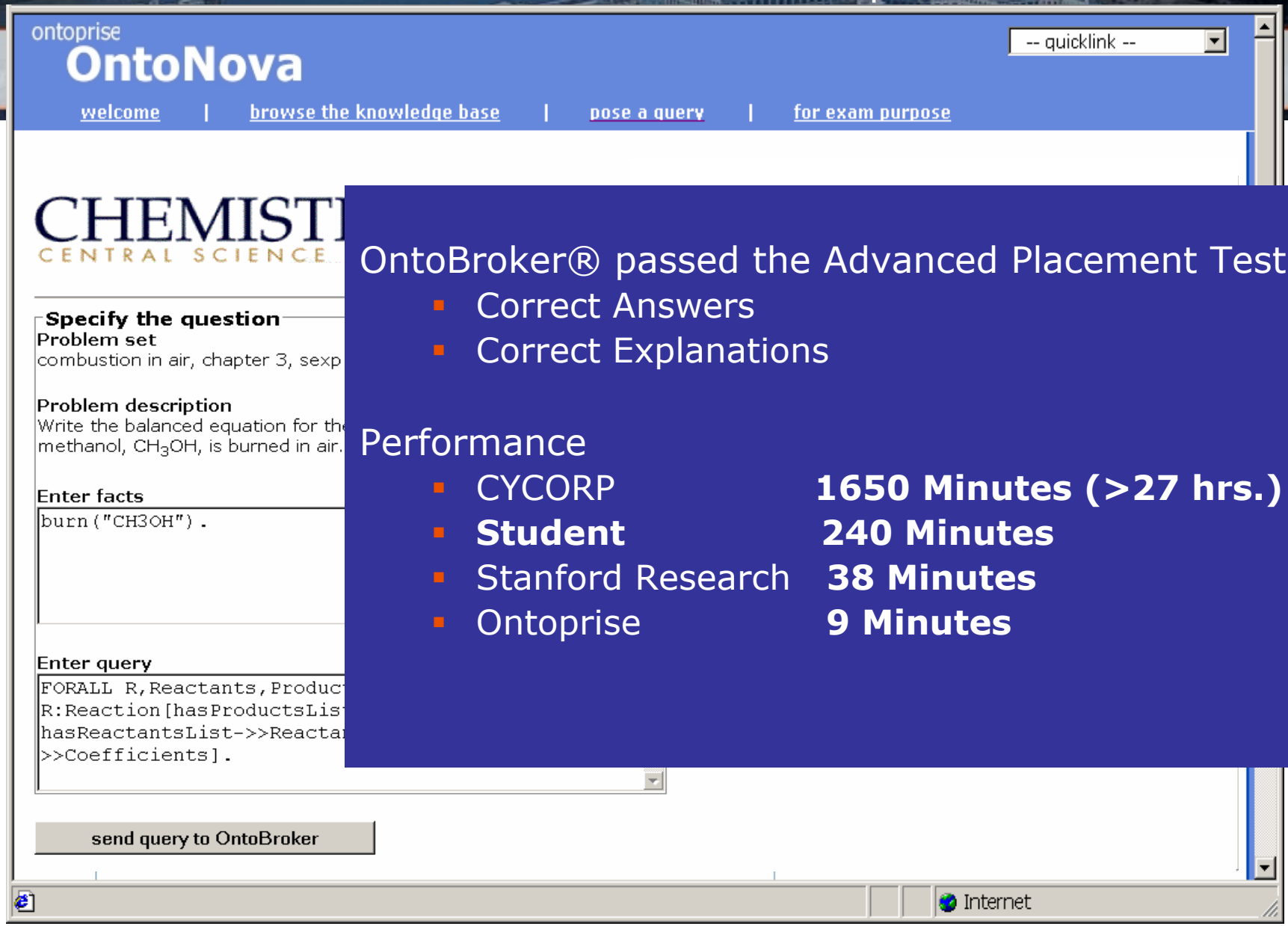
Background

- Development of a Digital Aristoteles
- Phase 1 successfully closed in 2003
- Phase 2 since January 2004

Functions

- Capturing of extensive set of chemical knowledge
- System passed the „Advanced Placement Test"
- Query is answered and answer is explained

CHEMISTRY
CENTRAL SCIENCE LIVE



OntoBroker® passed the Advanced Placement Test!

- Correct Answers
- Correct Explanations

Performance

CYCORP	**1650 Minutes (>27 hrs.)**
Student	**240 Minutes**
Stanford Research	**38 Minutes**
Ontoprise	**9 Minutes**

Syllbus question no. 10 question

$HSO_4^- + H_2O <=> H_3O^+ + SO_4^{2-}$

In the equilibrium represented above, the species that acts as bases include which of the following?

I. HSO_4^-

II. H_2O

III. SO_4^{2-}

a) II only

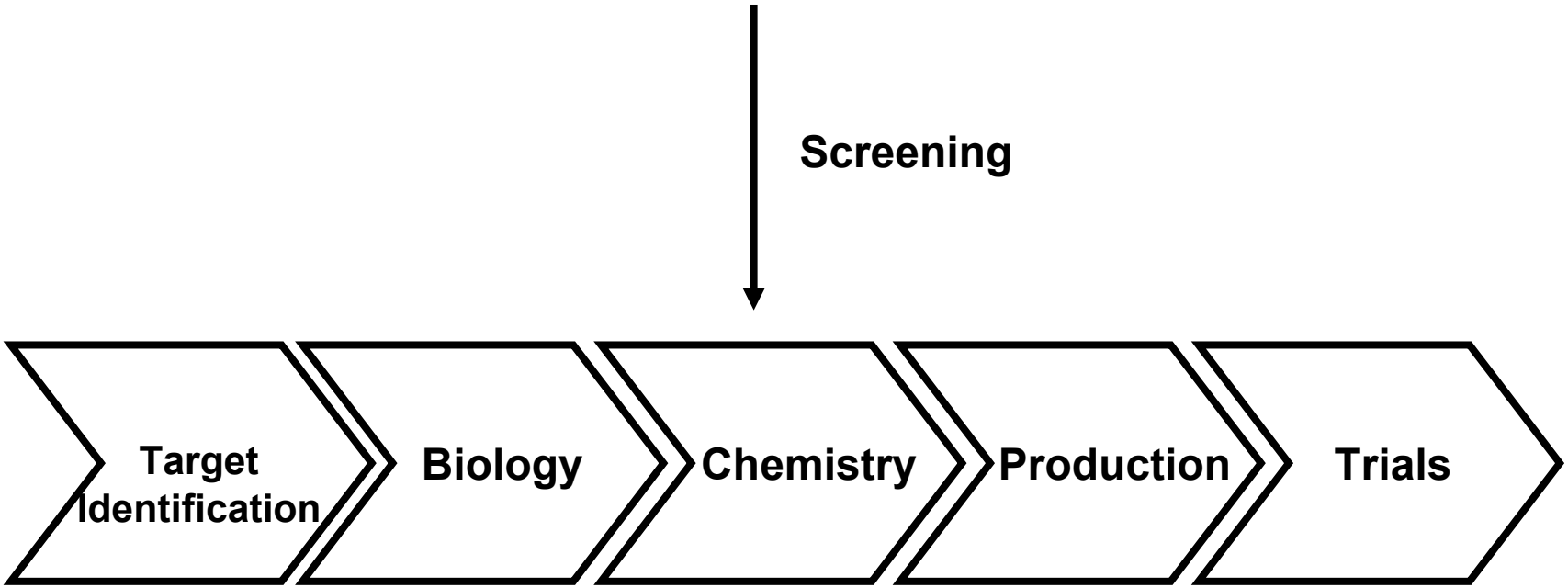
b) III only

c) I and II

d) I and III

e) II and III

Pharma / Lifescience



Acetyl CoA

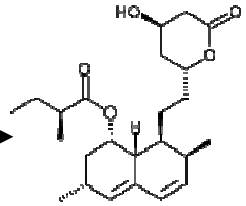
HMG -CoA

HMG-CoA reductase

rate-determining enzyme for the entire pathway

Simvastatin

Lovastatin
Pravastatin



Mevalonate

Mevalonate pyrophosphate

Isopenteryl pyrophosphate

Dimethylallyl pyrophosphate

Geranyl pyrophosphate

Isopentenyl Transfer RNA

Farnesyl pyrophosphate

Squalene

Desmosterol

Ubiquinone

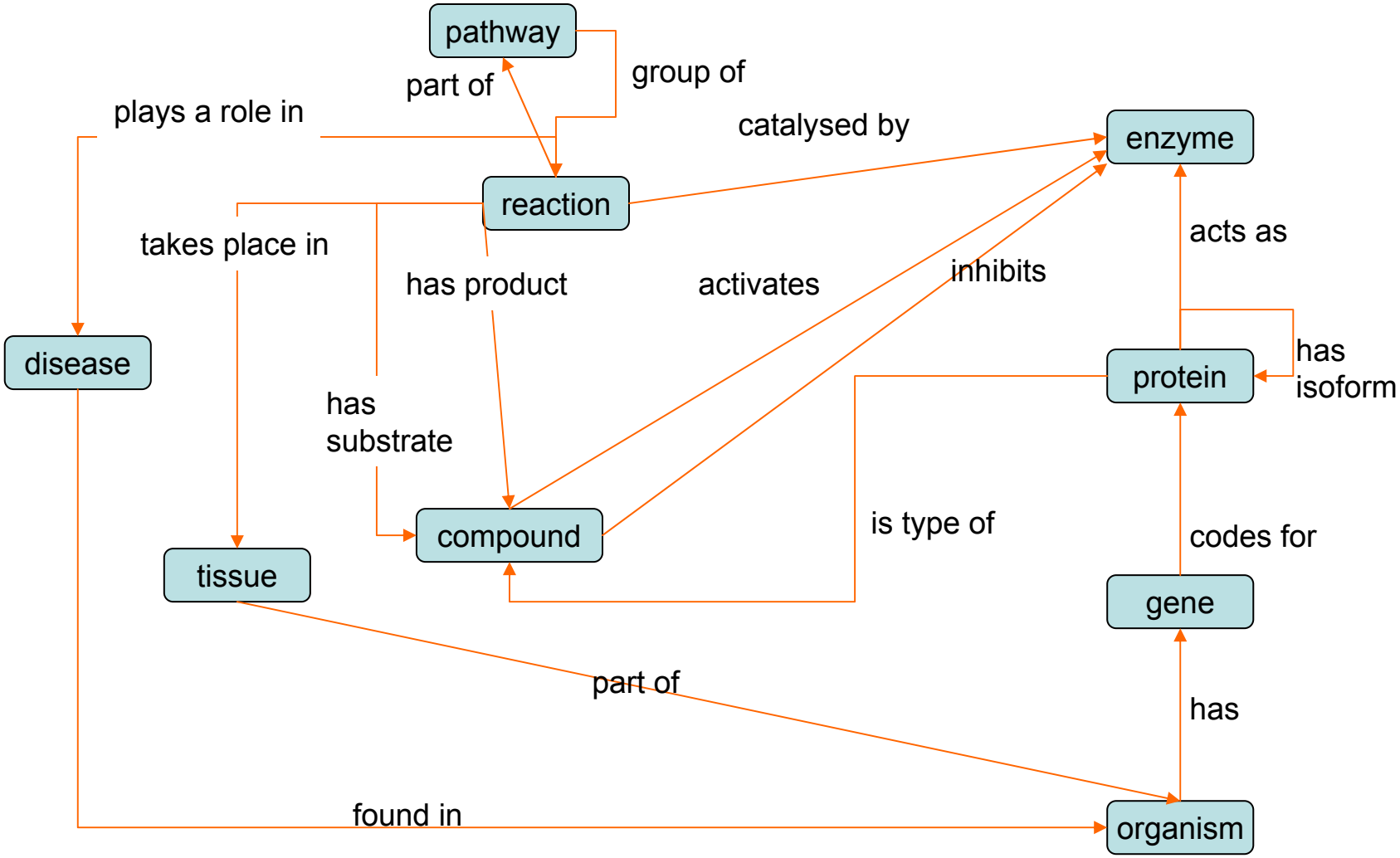
Cholesterol

Dolichol

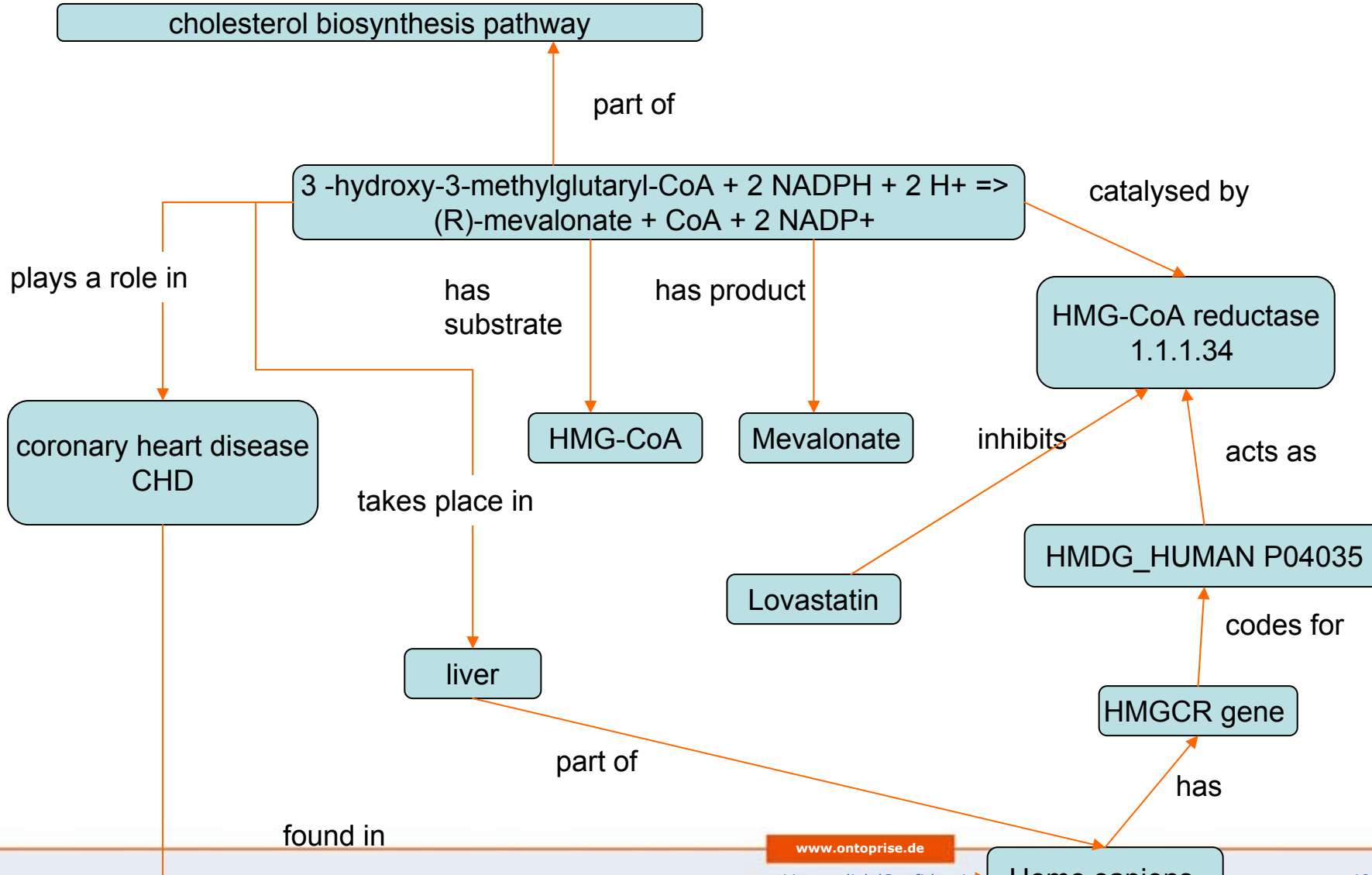
The cholesterol biosynthesi

pathway (simplified versior

Pathway ontology



Pathway ontology: cholesterol biosynthesis



Thank you!

Jürgen Angele, angele@ontoprise.de