

A Wiki and SOA Endpoint for Knowledge in Open Vocabulary, Executable English

Adrian Walker

CTO

www.reengineeringllc.com

Presentation for the 4th SOA for E-Government Conference, McLean VA, October 2007

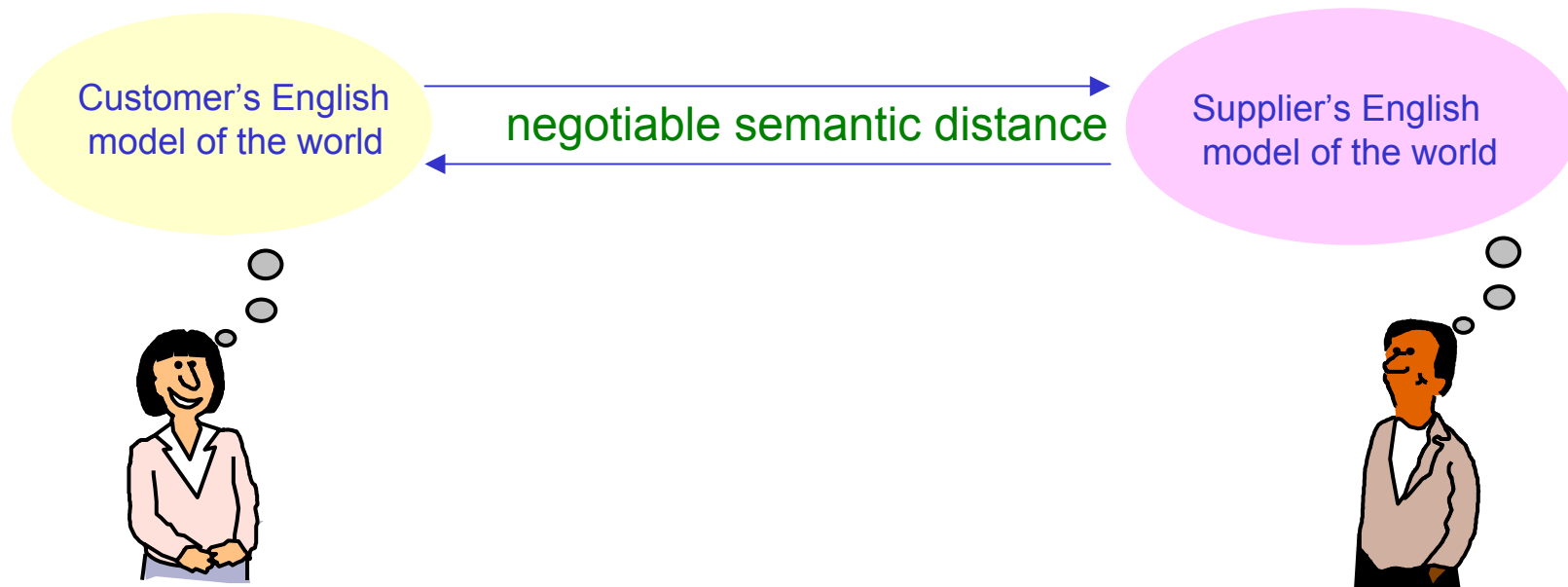
Experience

- Author of over 20 papers, and an addison-wesley book, on knowledge systems and databases
- Assistant professor at Rutgers university
- Manager of principles and applications of logic programming, IBM yorktown research laboratory
- Manager, internet development at eventra
(A manufacturing supply chain company)

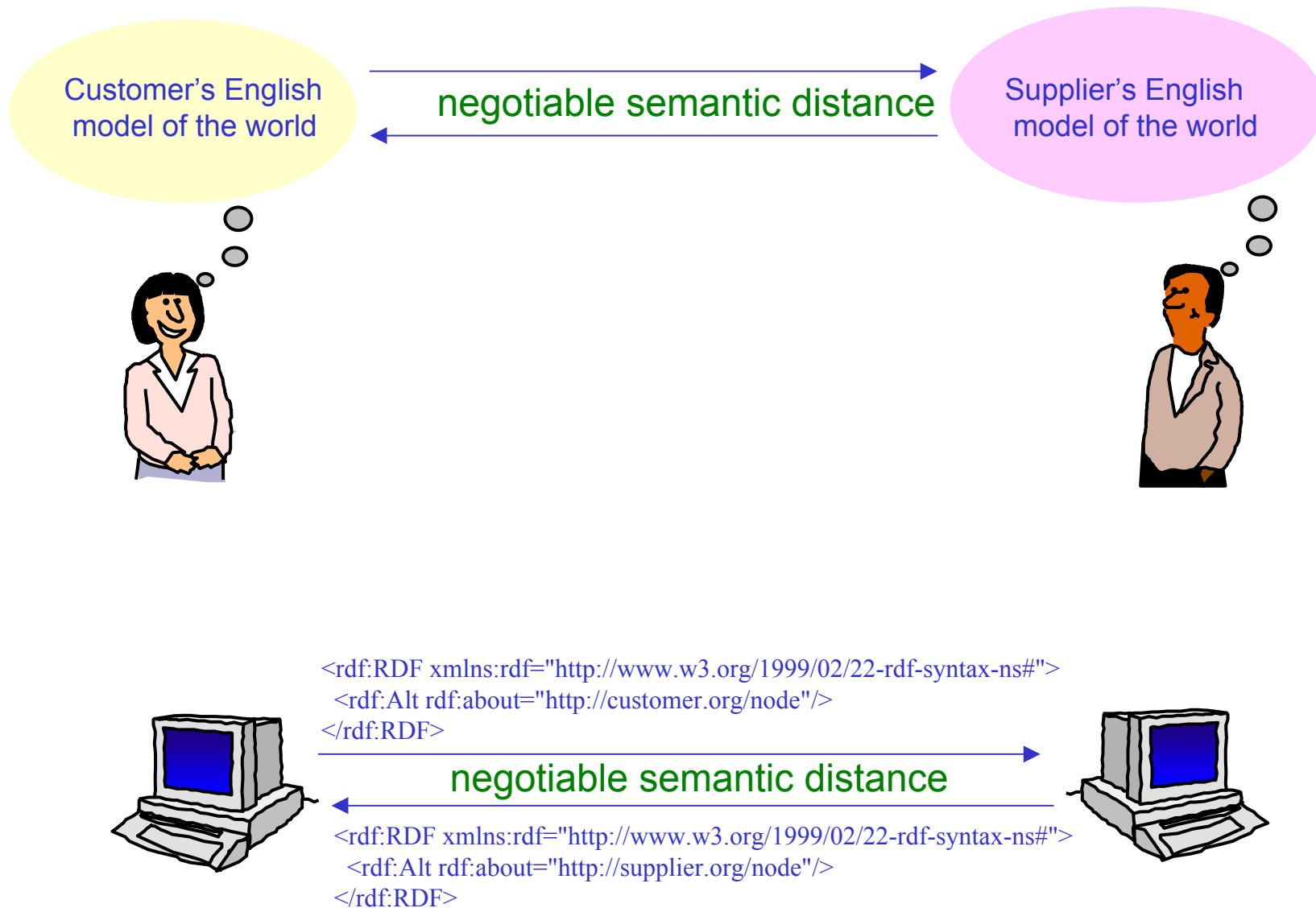
Agenda

- Enabling closer dialog between SOA stakeholders
 - Users, business analysts, enterprise architects, and system engineers
- A wiki for content in open vocabulary, executable English
 - Write applications in English, run them, and get English explanations
- Google indexes and retrieves content in executable English
 - Acts as a kind of registry
- The wiki engine as an SOA knowledge endpoint on the web
- A supply chain example
- Automatic generation of complex, distributed SQL
 - With English explanations of results
- Capturing generated SQL for re-use
- Summary

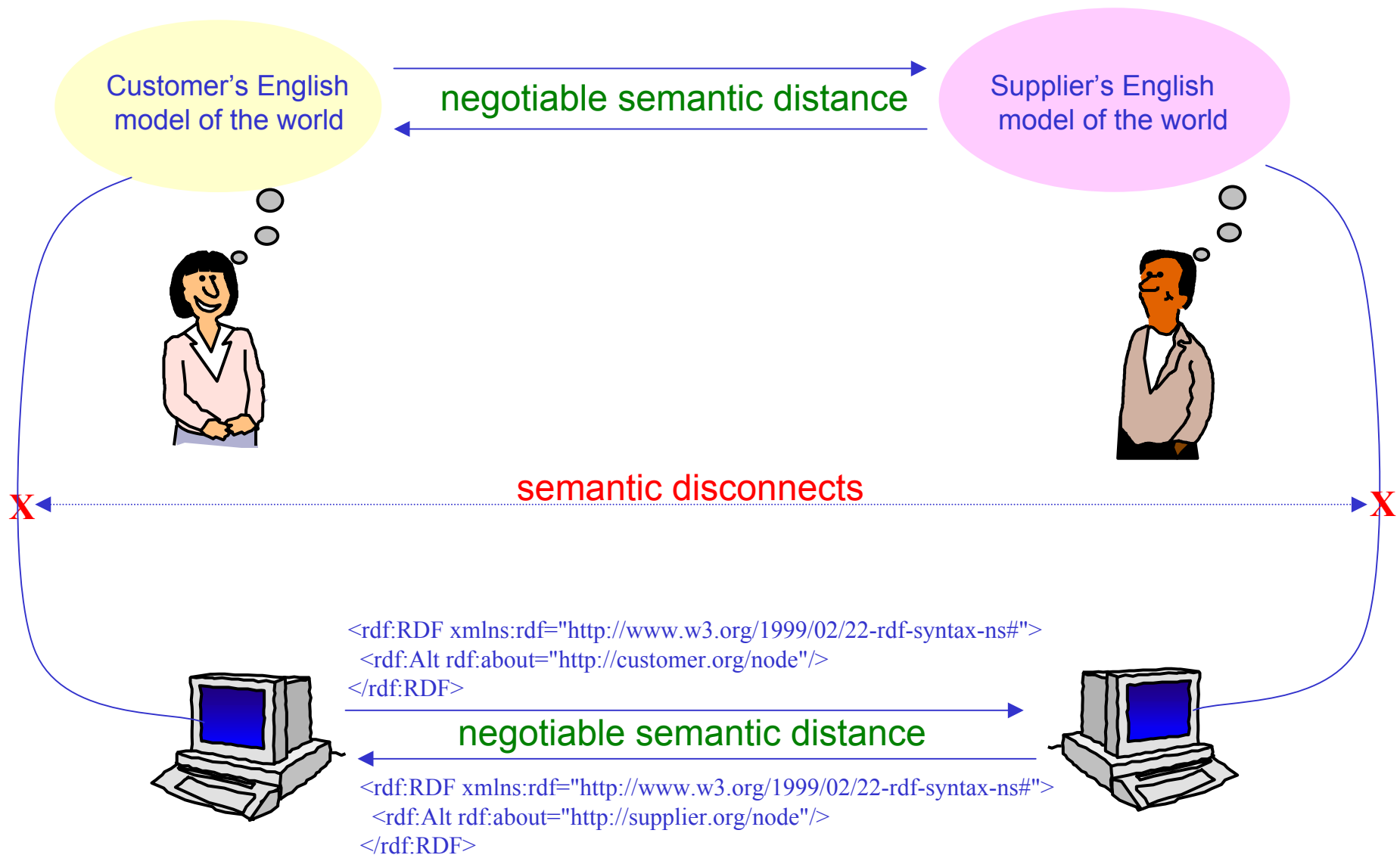
Enabling Closer Dialog Between SOA Stakeholders



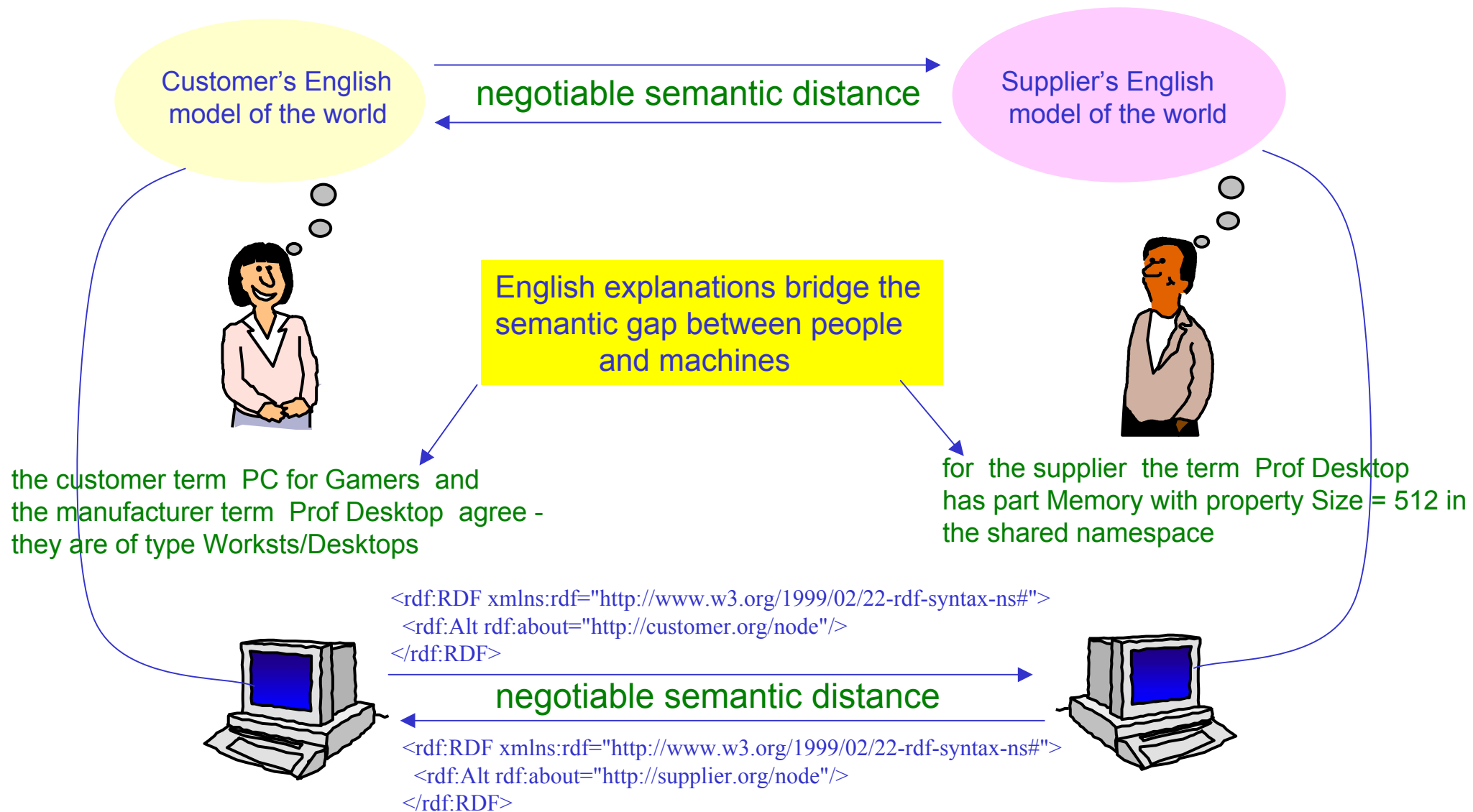
Enabling Closer Dialog Between SOA Stakeholders



Enabling Closer Dialog Between SOA Stakeholders



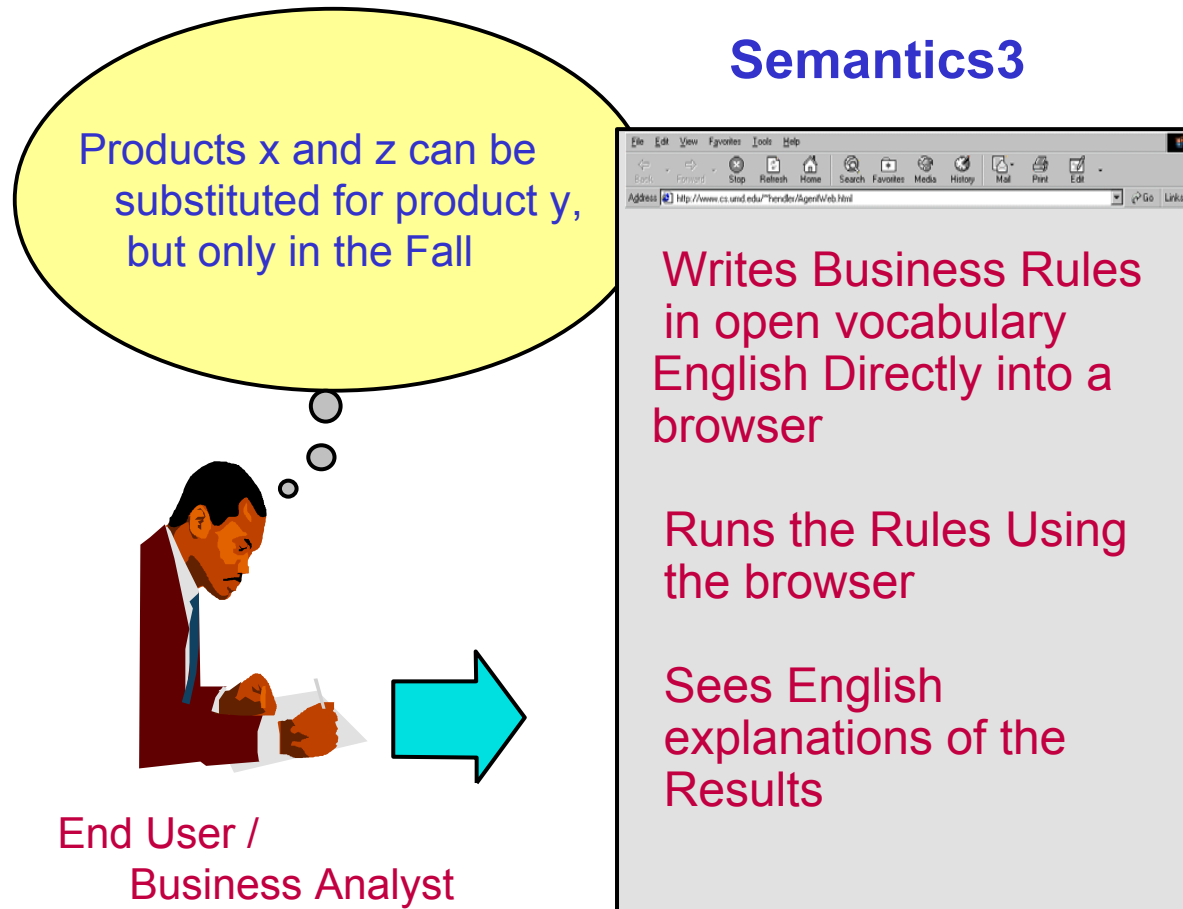
Enabling Closer Dialog Between SOA Stakeholders



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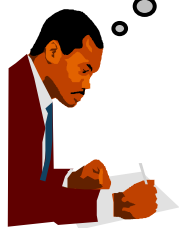
A Wiki for content in open vocabulary, executable English



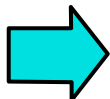
A Wiki for content in open vocabulary, executable English

Semantics3

Products x and z can be substituted for product y, but only in the Fall



End User /
Business
Analyst



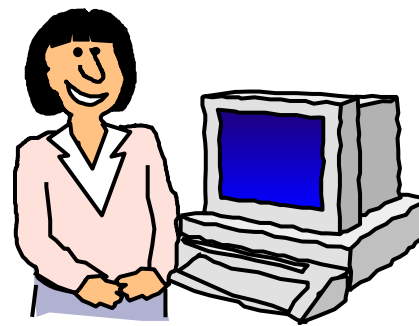
Writes Business Rules
in open vocabulary
English Directly into a
browser

Runs the Rules Using
the browser

Sees English
explanations
of the Results

Semantics2

Theory of
Declarative
Knowledge

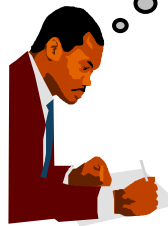


Programmer

A Wiki for content in open vocabulary, executable English

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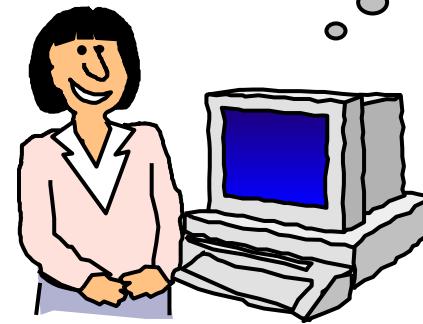
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**Internet
Business
Logic**

Application
Independent

Semantics2

**Theory of
Declarative
Knowledge**

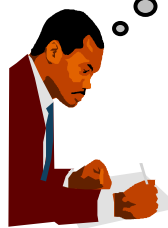


Programmer

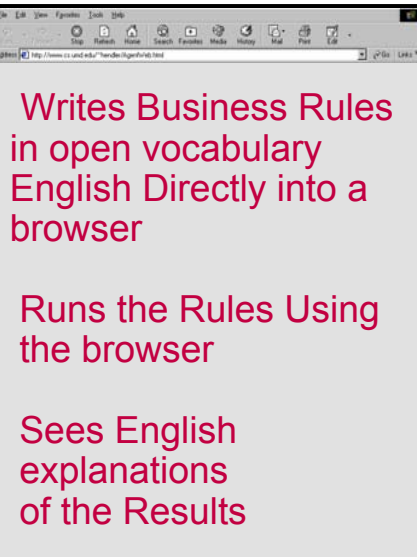
A Wiki for content in open vocabulary, executable English

Semantics3

What proportion of each base product should be used?



End User /
Business
Analyst



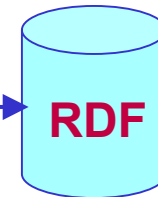
Internet
Business
Logic

Application
Independent

Semantics1



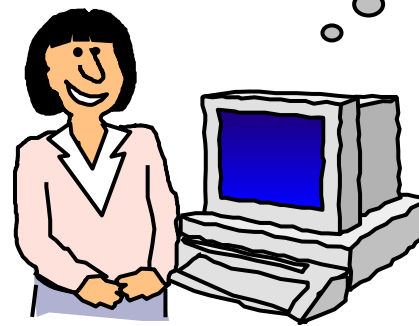
SQL



RDF

Semantics2

Theory of
Declarative
Knowledge



Programmer

A Wiki for content in open vocabulary, executable English

- The vocabulary is open, and so -- to a large extent -- is the syntax
 - *not* yet-another-controlled-English-system
- No dictionary or grammar maintenance is needed
- Strict English semantics is achieved via a trade off
 - if you want two English sentences to mean the same thing, you must say so
 - you must use place holders, such as “some-name” and “a-number”
- But, you are free to write executable English knowledge containing...
 - technical terms or jargon -- Wildcat, Upstream, Mud (oil industry)
 - government acronyms and usage -- SRB, Single Regeneration Budget
 - logical expressions -- (A c,t) [that-C c t => (E c1) [that-C1 c1 t and c partof c1 at t]]
- Although the system is open vocabulary, it can be used to query and manage:
 - controlled vocabularies, taxonomies and ontologies

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Google indexes and retrieves content in executable English

Search: for estimated demand that-id fraction of the order

for estimated demand that-id fraction of the order - Google Search - Mozilla

File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop <http://www.google.com/search?hl=en&q=for+estimated+demand+that-id+fraction+of+the+order+&btnG=Goog> Search

Home Bookmarks Sign in

Google Web Images Groups News Froogle Local more »

for estimated demand that-id fraction of the order Search [Advanced Search](#) [Preferences](#)

Web Results 1 - 10 of about 679 for **for estimated demand that-id fraction of the order** . (0.33 seconds)

Did you mean: [for estimated demand that-is fraction of the order](#)

Scholarly articles for **for estimated demand that-id fraction of the order**

- [Data-Driven and Demand-Driven Computer Architecture](#) - by Treleven - 102 citations
- [Budget constrained frontier measures of fiscal equality ...](#) - by Grosskopf - 48 citations
- [Underinvestment, Debt Financing, and Long-Term Supplier ...](#) - by Subramaniam - 1 citations

[An Oil Industry Supply Chain Example Version 20050524 || You can ...](#)
... in some-month of some-year for **estimated demand that-id** some-fraction of the **order** will be some-product from some-refinery that-quantity * that-fraction ...
www.reengineeringllc.com/demo_agents/Oil-IndustrySupplyChain1.agent - 7k - [Cached](#) - [Similar pages](#)

[\[PDF\] Oil Industry Supply Chain Management Using English Business Rules ...](#)
File Format: PDF/Adobe Acrobat - [View as HTML](#)
for **estimated demand that-id** some-fraction of the **order** will be some-product from some-refinery. that-quantity * that-fraction = some-amount ...
www.reengineeringllc.com/Oil_Industry_Supply_Chain_by_Kowalski_and_Walker.pdf - [Similar pages](#)

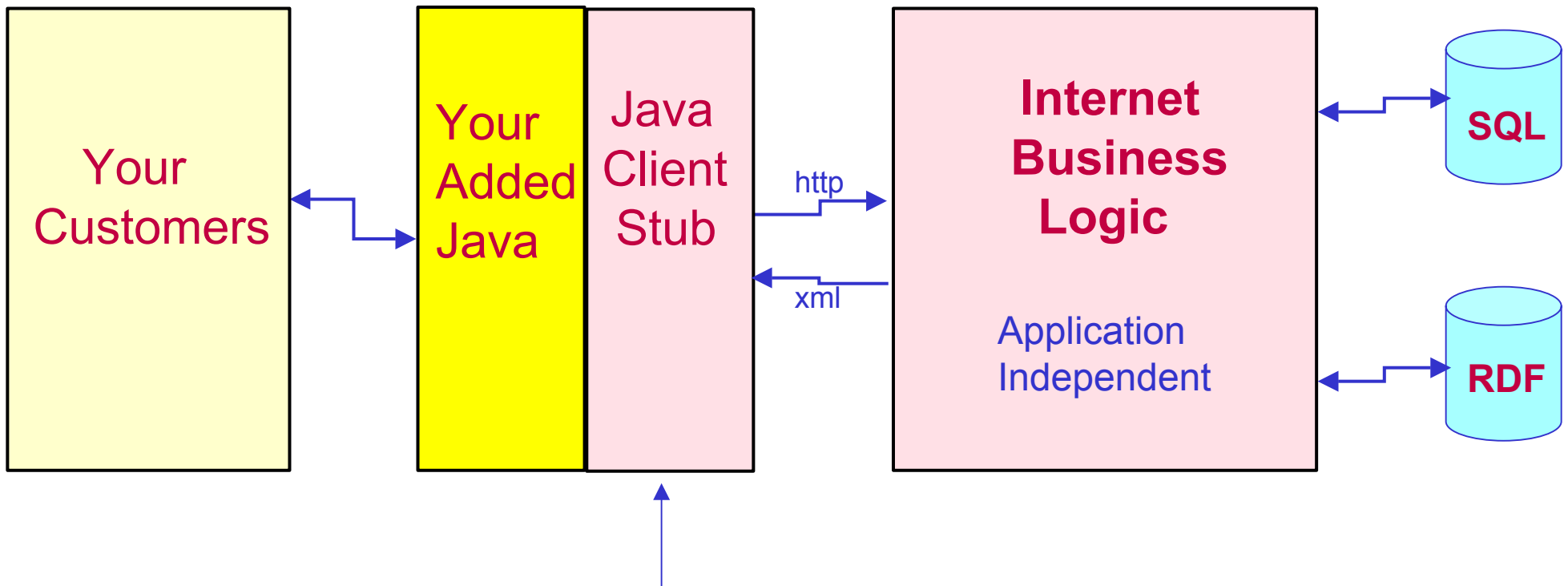
The executable English rules and facts that define the application

A paper that describes the application

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The Wiki engine as an SOA endpoint on the Web

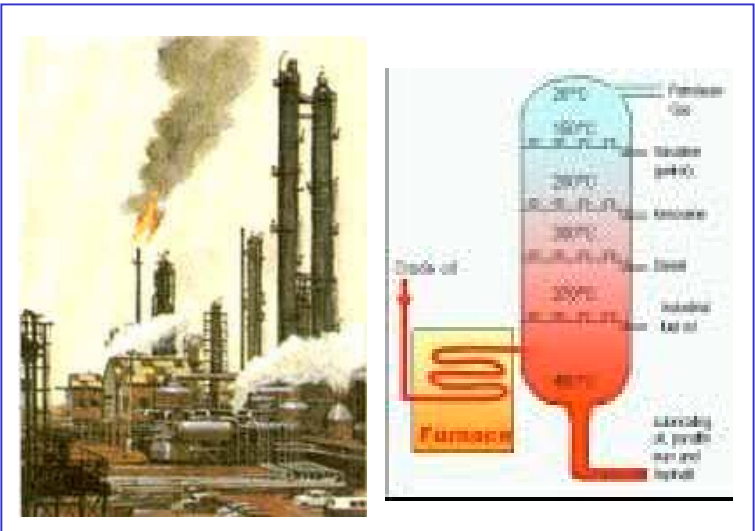


Downloadable from <http://www.reengineeringllc.com/ibClient1.java>

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A supply chain example



Refinery



Terminal Storage



Service Station



Terminal Pickup

A supply chain example

- A customer needs 1000 gallons of product y in October
- Products x and z can be substituted for product y, but only in the Fall
- Combine products x, y and z to fill the order
- Combination depends on:
 - How much of each product is available from each refinery
 - Available transportation from each refinery to the customer area

-- Example based on

“Oil Industry Supply Chain Management Using English Business Rules Over SQL”

by Ted Kowalski and Adrian Walker,

www.reengineeringllc.com/Oil_Industry_Supply_Chain_by_Kowalski_and_Walker.pdf

A supply chain example

Facts:

estimated demand this-id in this-region is for this-quantity gallons of this-finished-product in this-month of this-year

523	NJ	1000	product-y	October	2005
-----	----	------	-----------	---------	------

in this-season an order for this-product1 can be filled with the alternative this-product2

Fall	product-y	product-x
Fall	product-y	product-z

in this-month the refinery this-name has committed to schedule this-amount gallons of this-product

October	Shell Canada One	500	product-y
October	Shell Canada One	300	product-x
October	Shell Canada One	800	product-z
October	Shell Canada One	10000	product-w

we have this-method transportation from refinery this-name to region this-region

truck	Shell Canada One	NJ
rail	Shell Canada One	NJ

A supply chain example

Rules:

estimated demand some-id in some-region is for some-quantity gallons of some-finished-product
in some-month of some-year

for estimated demand that-id some-fraction of the order will be some-product from some-refinery
that-quantity * that-fraction = some-amount

for demand that-id that-region for that-quantity that-finished-product we use that-amount that-product from that-refinery

estimated demand some-id in some-region is for some-quantity gallons of some-finished-product
in some-month of some-year

for demand that-id for that-finished-product refinery some-refinery can supply some-amount gallons of some-product

for demand that-id the refineries have altogether some-total gallons of acceptable base products

that-amount / that-total = some-long-fraction

that-long-fraction rounded to 2 places after the decimal point is some-fraction

for estimated demand that-id that-fraction of the order will be that-product from that-refinery

estimated demand some-id in some-region is for some-amount gallons of some-product in some-month of some-year
sum a-num :

for demand that-id for that-product refinery some-name can supply some-num gallons of some-product1 = a-total

for demand that-id the refineries have altogether that-total gallons of acceptable base products

A supply chain example

An answer table:

for demand this-id this-region for this-quantity this-finished-product we use this-amount this-product from this-refinery

523	NJ	1000	product-y	190.0	product-x	Shell Canada One
523	NJ	1000	product-y	310.0	product-y	Shell Canada One
523	NJ	1000	product-y	500.0	product-z	Shell Canada One

To run or change this example, please point IE6, Netscape7 or Mozilla to the demo Oil-IndustrySupplyChain1 at www.reengineeringllc.com

A supply chain example

An explanation:

estimated demand 523 in NJ is for 1000 gallons of product-y in October of 2005
for estimated demand 523 0.19 of the order will be product-x from Shell Canada One
 $1000 * 0.19 = 190$

for demand 523 NJ for 1000 product-y we use 190 product-x from Shell Canada One

estimated demand 523 in NJ is for 1000 gallons of product-y in October of 2005
for demand 523 for product-y refinery Shell Canada One can supply 300 gallons of product-x
for demand 523 the refineries have altogether 1600 gallons of acceptable base products
 $300 / 1600 = 0.1875$
0.1875 rounded to 2 places after the decimal point is 0.19

for estimated demand 523 0.19 of the order will be product-x from Shell Canada One

estimated demand 523 in NJ is for 1000 gallons of product-y in October of 2005

sum eg-amount :

for demand 523 for product-y refinery eg-refinery can supply eg-amount gallons of eg-product1 = 1600

for demand 523 the refineries have altogether 1600 gallons of acceptable base products

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Automatic generation of complex, distributed SQL

Rules for finding SQL data on the Internet:

A data table

we have this-method transportation from refinery this-name to region this-region

truck	Shell Canada One	NJ
rail	Shell Canada One	NJ

A rule that says how to find the table on the internet

url:www.example.com dbms:9i dbname:ibldb tablename:T1 port:1521 id:anonymous password:oracle

we have this-method transportation from refinery this-name to region this-region

To run or change this example, please point IE6, Netscape7 or Mozilla to the demo Oil-IndustrySupplyChain1 at www.reengineeringllc.com

Automatic generation of complex, distributed SQL

A SQL query generated automatically from the supply chain knowledge:

```
select distinct x6,T2.PRODUCT,T1.NAME,T2.AMOUNT,x5 from
T6 tt1,T6 tt2,T5,T4,T3,T2,T1,T6,
(select x3 x6,T6.FINISHED_PRODUCT x7,T6.ID x8,tt1.ID x9,tt2.ID x10,sum(x4) x5 from
T6,T6 tt1,T6 tt2,
((select T6.ID x3,T3.PRODUCT1,T1.NAME,T2.AMOUNT x4,T2.PRODUCT from
T1,T2,T3,T4,T5,T6,T6 tt1,T6 tt2 where
T1.NAME=T2.NAME and T1.REGION=T6.REGION and T2.MONTH1=T4.MONTH1 and
T2.MONTH1=T6.MONTH1 and T2.PRODUCT=T3.PRODUCT2 and T4.MONTH1=T6.MONTH1 and
T3.PRODUCT1=T6.FINISHED_PRODUCT and T3.SEASON=T4.SEASON and T3.SEASON=T5.SEASON and
T4.SEASON=T5.SEASON and T6.ID=tt1.ID and T6.ID=tt2.ID and tt1.ID=tt2.ID)
union
(select T6.ID x3,T2.PRODUCT,T1.NAME,T2.AMOUNT x4,T2.PRODUCT from
T1,T2,T3,T4,T5,T6,T6 tt1,T6 tt2 where
T1.NAME=T2.NAME and T1.REGION=T6.REGION and T2.MONTH1=T6.MONTH1 and
T2.PRODUCT=T6.FINISHED_PRODUCT and T6.ID=tt1.ID and T6.ID=tt2.ID and tt1.ID=tt2.ID)
) group by T6.FINISHED_PRODUCT,T6.ID,tt1.ID,tt2.ID,x3) where
T6.ID=tt2.ID and tt1.ID=T6.ID and T6.FINISHED_PRODUCT=x7 and T6.ID=x8 and tt1.ID=x8 and
tt2.ID=x8 and T1.NAME=T2.NAME and T1.REGION=tt2.REGION and T2.MONTH1=T4.MONTH1 and
T2.MONTH1=tt2.MONTH1 and T2.PRODUCT=T3.PRODUCT2 and
T3.PRODUCT1=tt1.FINISHED_PRODUCT and T3.PRODUCT1=tt2.FINISHED_PRODUCT and
T3.SEASON=T4.SEASON and T3.SEASON=T5.SEASON and T4.MONTH1=tt2.MONTH1 and
T4.SEASON=T5.SEASON and T6.ID=x6 and tt1.FINISHED_PRODUCT=tt2.FINISHED_PRODUCT and
tt1.ID=tt2.ID and tt1.ID=x6 and tt2.ID=x6
order by x6,T2.PRODUCT,T1.NAME,T2.AMOUNT,x5;
```

Automatic generation of complex, distributed SQL

- It would be difficult to
 - write the SQL query reliably by hand
 - manually reconcile it with the business knowledge specified in the rules.
- Yet this is a simple example!

- How do we know that the automatically generated SQL yields results that are correct with respect to the business rules ?
- We can get step-by-step business level English explanations
 - same as in the non-SQL case

Automatic generation of complex, distributed SQL

- Could a programmer write more readable SQL by hand ?
- Yes, but we would need to add comments in English to help people to reconcile the hand-written query with the business knowledge
- By their nature, the comments would not be used during machine processing
 - Correctness of the hand written-SQL would rely on lengthy, and error prone manual verification
- Comments are sometimes not kept up to date with the code!

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Capturing generated SQL for re-use

Oil-IndustrySupplyChain1MySql1 Answer (3 rows found)

[Printer friendly version](#)

[Help](#)

[Go to the Question Menu](#)

	for demand	this-id	this-region	for this-quantity	this-finished-product	we use this-amount	this-product	from this-refinery
<input checked="" type="radio"/>		523	NJ	1000	product-y	190.0	product-x	Shell Canada One
<input type="radio"/>		523	NJ	1000	product-y	310.0	product-y	Shell Canada One
<input type="radio"/>		523	NJ	1000	product-y	500.0	product-z	Shell Canada One

i=0&j=14&question=for+demand+%3Ca+href%3D%22javascript%3AshowRestrictWindow%28%2C0%29%22%3B%3E%3C%21%21%3Esome-id%3C%2F%21%21%3E%3C%2Fa%3E+%3Ca+href%31

```
select distinct x7 , mysql.T2.PRODUCT , mysql.T1.NAME , mysql.T2.AMOUNT , x6 from mysql.T6 tt1 , mysql.T2 , mysql.T1 , mysql.T6 tt2 , ( select x3 x7 , sum ( x4 ) x6 from ( (select mysql.T6.ID x3 , mysql.T3.PRODUCT1 , mysql.T1.NAME , mysql.T2.AMOUNT x4 , mysql.T2.PRODUCT from mysql.T6 , mysql.T5 , mysql.T4 , mysql.T3 , mysql.T1 , mysql.T2 , mysql.T6 tt1 , mysql.T6 tt2 where mysql.T1.NAME = mysql.T2.NAME and mysql.T1.REGION = mysql.T6.REGION and mysql.T2.MONTH1 = mysql.T4.MONTH1 and mysql.T2.MONTH1 = mysql.T6.MONTH1 and mysql.T2.PRODUCT = mysql.T3.PRODUCT2 and mysql.T4.MONTH1 = mysql.T6.MONTH1 and mysql.T3.PRODUCT1 = mysql.T6.FINISHED_PRODUCT and mysql.T3.PRODUCT1 = tt2.FINISHED_PRODUCT and mysql.T3.SEASON = mysql.T4.SEASON and mysql.T3.SEASON = mysql.T5.SEASON and mysql.T4.SEASON = mysql.T5.SEASON and mysql.T6.FINISHED_PRODUCT = tt2.FINISHED_PRODUCT and mysql.T6.ID = tt1.ID and mysql.T6.ID = tt2.ID and tt1.ID = tt2.ID ) union (select mysql.T6.ID x3 , mysql.T2.PRODUCT , mysql.T1.NAME , mysql.T2.AMOUNT x4 , mysql.T2.PRODUCT from mysql.T6 , mysql.T1 , mysql.T2 , mysql.T6 tt1 , mysql.T6 tt2 where mysql.T1.NAME = mysql.T2.NAME and mysql.T1.REGION = mysql.T6.REGION and mysql.T2.MONTH1 = mysql.T6.MONTH1 and mysql.T2.PRODUCT = mysql.T6.FINISHED_PRODUCT and mysql.T2.PRODUCT = tt2.FINISHED_PRODUCT and mysql.T6.FINISHED_PRODUCT = tt2.FINISHED_PRODUCT and mysql.T6.ID = tt1.ID and mysql.T6.ID = tt2.ID and tt1.ID = tt2.ID ) ) y5 group by x3 ) y8 where tt1.ID = tt2.ID and tt2.ID = tt1.ID and mysql.T1.NAME = mysql.T2.NAME and mysql.T1.REGION = tt1.REGION and mysql.T2.MONTH1 = tt1.MONTH1 and mysql.T2.PRODUCT = tt1.FINISHED_PRODUCT and tt1.ID = x7 and tt2.ID = x7 order by x7 , mysql.T2.PRODUCT , mysql.T1.NAME , mysql.T2.AMOUNT , x6 ;select distinct x7 , mysql.T2.PRODUCT , mysql.T1.NAME , mysql.T2.AMOUNT , x6 from mysql.T6 tt1 , mysql.T5 , mysql.T4 , mysql.T3 , mysql.T2 , mysql.T1 , mysql.T6 tt2 , ( select x3 x7 , sum ( x4 ) x6 from ( (select mysql.T6.ID x3 , mysql.T3.PRODUCT1 , mysql.T1.NAME , mysql.T2.AMOUNT x4 , mysql.T2.PRODUCT from mysql.T6 , mysql.T1 , mysql.T2 , mysql.T3 , mysql.T4 , mysql.T5 , mysql.T6 tt1 , mysql.T6 tt2 where mysql.T1.NAME = mysql.T2.NAME and mysql.T1.REGION = mysql.T6.REGION and mysql.T2.MONTH1 = mysql.T4.MONTH1 and mysql.T2.MONTH1 = mysql.T6.MONTH1 and mysql.T2.PRODUCT = mysql.T3.PRODUCT2 and mysql.T4.MONTH1 = mysql.T6.MONTH1 and mysql.T3.PRODUCT1 = mysql.T6.FINISHED_PRODUCT and mysql.T3.PRODUCT1 = tt2.FINISHED_PRODUCT and mysql.T3.SEASON = mysql.T4.SEASON and mysql.T3.SEASON = mysql.T5.SEASON and mysql.T4.SEASON = mysql.T5.SEASON and mysql.T6.FINISHED_PRODUCT = tt2.FINISHED_PRODUCT and mysql.T6.ID = tt1.ID and mysql.T6.ID = tt2.ID and tt1.ID = tt2.ID ) union (select mysql.T6.ID x3 , mysql.T2.PRODUCT , mysql.T1.NAME , mysql.T2.AMOUNT x4 , mysql.T2.PRODUCT from mysql.T6 , mysql.T1 , mysql.T2 , mysql.T3 , mysql.T4 , mysql.T5 , mysql.T6 tt1 , mysql.T6 tt2 where mysql.T1.NAME = mysql.T2.NAME and mysql.T1.REGION = mysql.T6.REGION and mysql.T2.MONTH1 = mysql.T6.MONTH1 and mysql.T2.PRODUCT = mysql.T6.FINISHED_PRODUCT and mysql.T2.PRODUCT = tt2.FINISHED_PRODUCT and mysql.T6.FINISHED_PRODUCT = tt2.FINISHED_PRODUCT and mysql.T6.ID = tt1.ID and mysql.T6.ID = tt2.ID and tt1.ID = tt2.ID ) ) y5 group by x3 ) y8 where tt1.ID = tt2.ID and tt2.ID = tt1.ID and mysql.T1.NAME = mysql.T2.NAME and mysql.T1.REGION = tt1.REGION and mysql.T2.MONTH1 = mysql.T4.MONTH1 and
```

Please see FAQ #4 at www.reengineeringllc.com/internet_business_logic_FAQs.html

Summary

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Links

1. Semantics2 -- what a reasoner should do:

Backchain iteration: towards a practical inference method that is simple enough to be proved
Terminating, sound and complete. Journal of automated reasoning, 11:1-22

2. The English inferencing examples

Oil-industrysupplychain1

Oil-industrysupplychain1mysql1

(And many other examples provided) can be run, changed, and re-run as follows:

1. Point internet explorer 6, netscape 7, firefox or mozilla to www.Reengineeringllc.Com
2. Click on [internet](#) [business](#) [logic](#)
3. Click on the go button
4. Click on the help button to see how to navigate through the pages
5. Select *oil-industrysupplychain1*

3. You are cordially invited to write and run your own examples. Shared use of the system is free

4. You can download the java client stub from <http://www.Reengineeringllc.Com/ibclient1.Java>