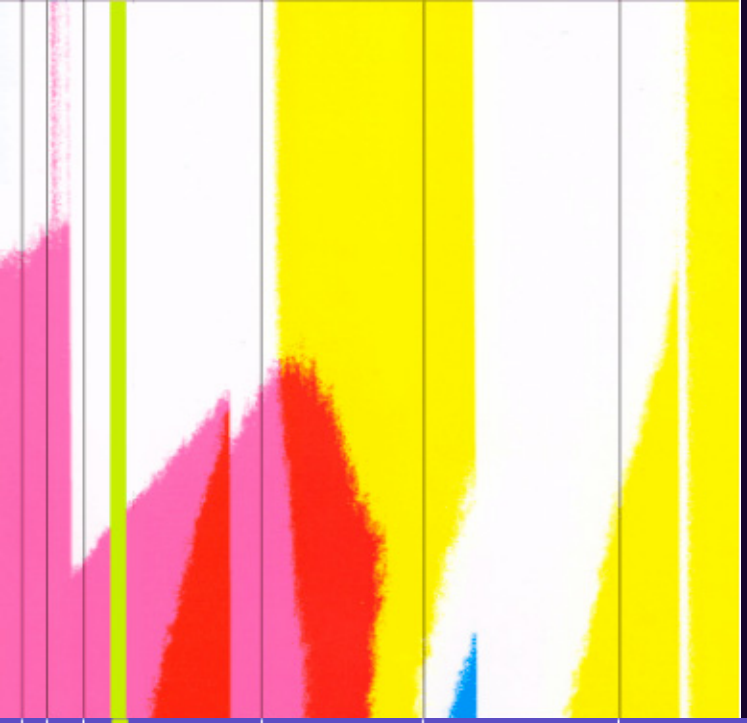


Composing Services in an Open World

SisCom 2008

40 ans la révolution de l'information

INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

INRIA

Albert Benveniste

INRIA-Rennes

Services is about Information and its Control

Information is everywhere

- Data integration
  - Mediation, warehousing or hybrid data integration
  - Web portals, enterprise knowledge, comparative shopping,
  - procurement, business intelligence, …
- Data management for
  - cooperative work
  - ambient computing
  - mobile applications
  - Grid computing
- Electronic something
  - E-commerce, E-government, E-procurement…
  - B2C, B2G, B2B…
- Managing networks, Services, and Information

Information must be Processed and combined with Control

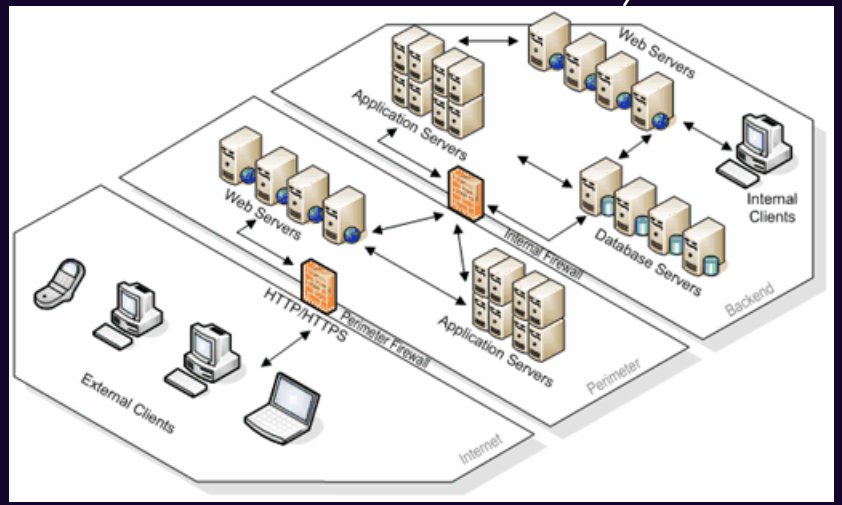
- Management of
  - cooperative work
  - ambient computing
  - mobile applications
  - Grid computing
- Electronic something
  - E-commerce, E-government, E-procurement…
  - B2C, B2G, B2B…
- Managing networks, Services, and Information
- Business Processes

Telecom Services: voice, video, data

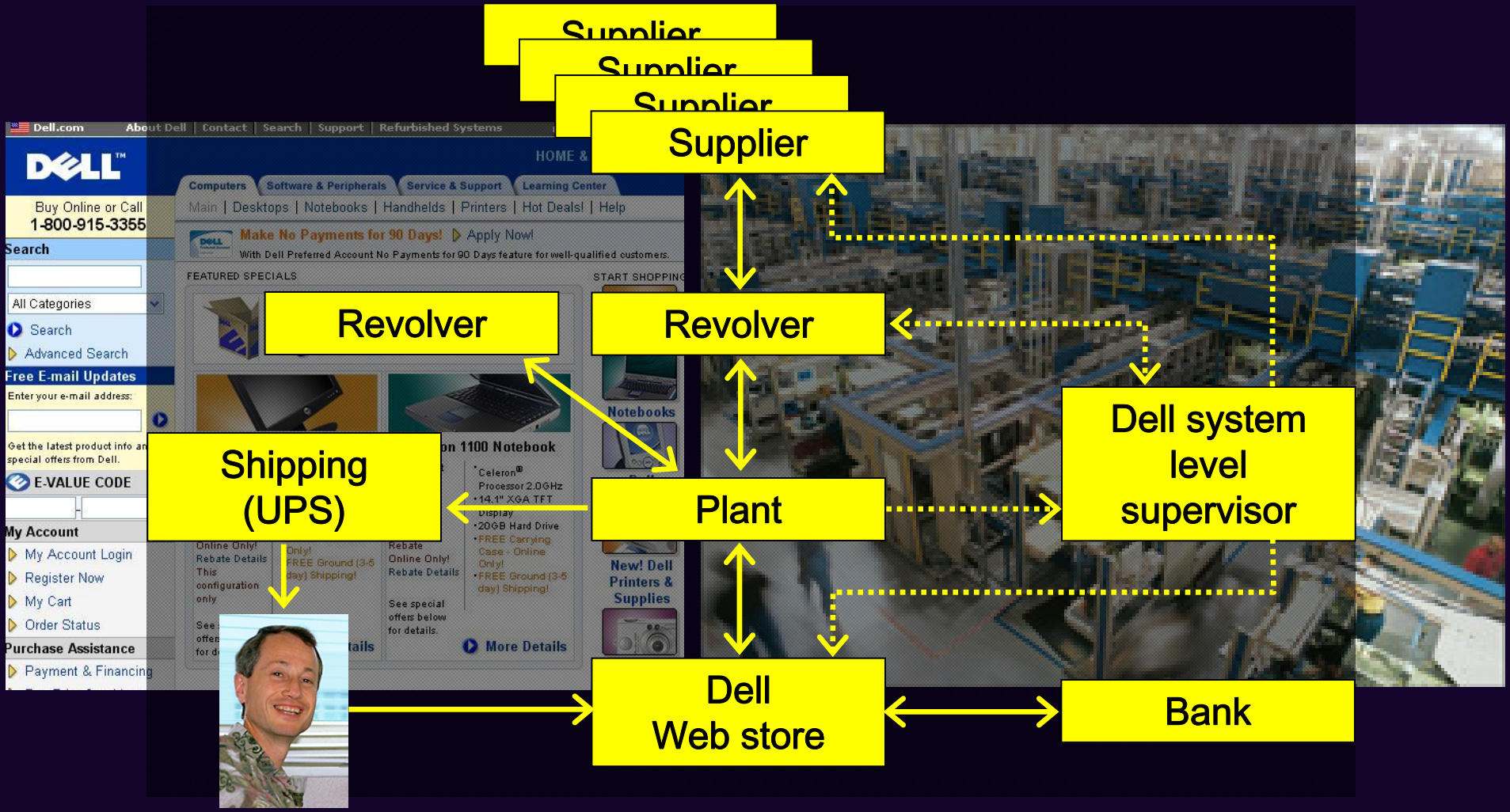
Accounting

Session coordinator

User Profiling



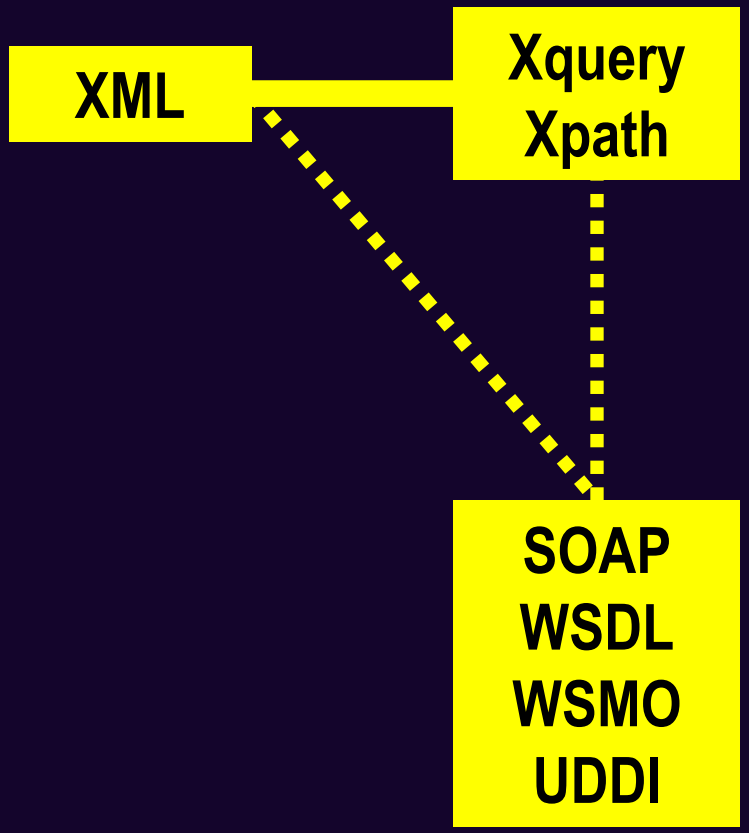
Business Processes: Dell Supply Chain



Infrastructure for Web Services in an open world

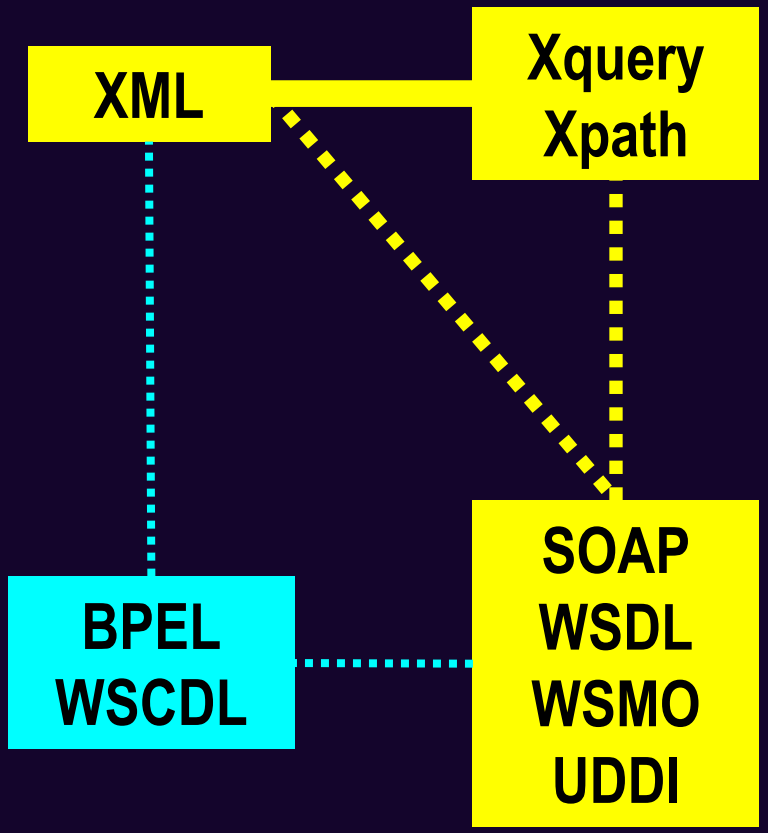
The golden triangle

- Standard for (meta)data exchange
  - **XML, XML Schema…**
  - Extensible Markup Language
  - Labeled ordered trees
- Query languages
  - **XPATH, XQuery…**
- Standards for distributed computing: Web services
  - **SOAP, WSDL, OWL-S, WSMO, UDDI…**
  - Simple Object Access Protocols

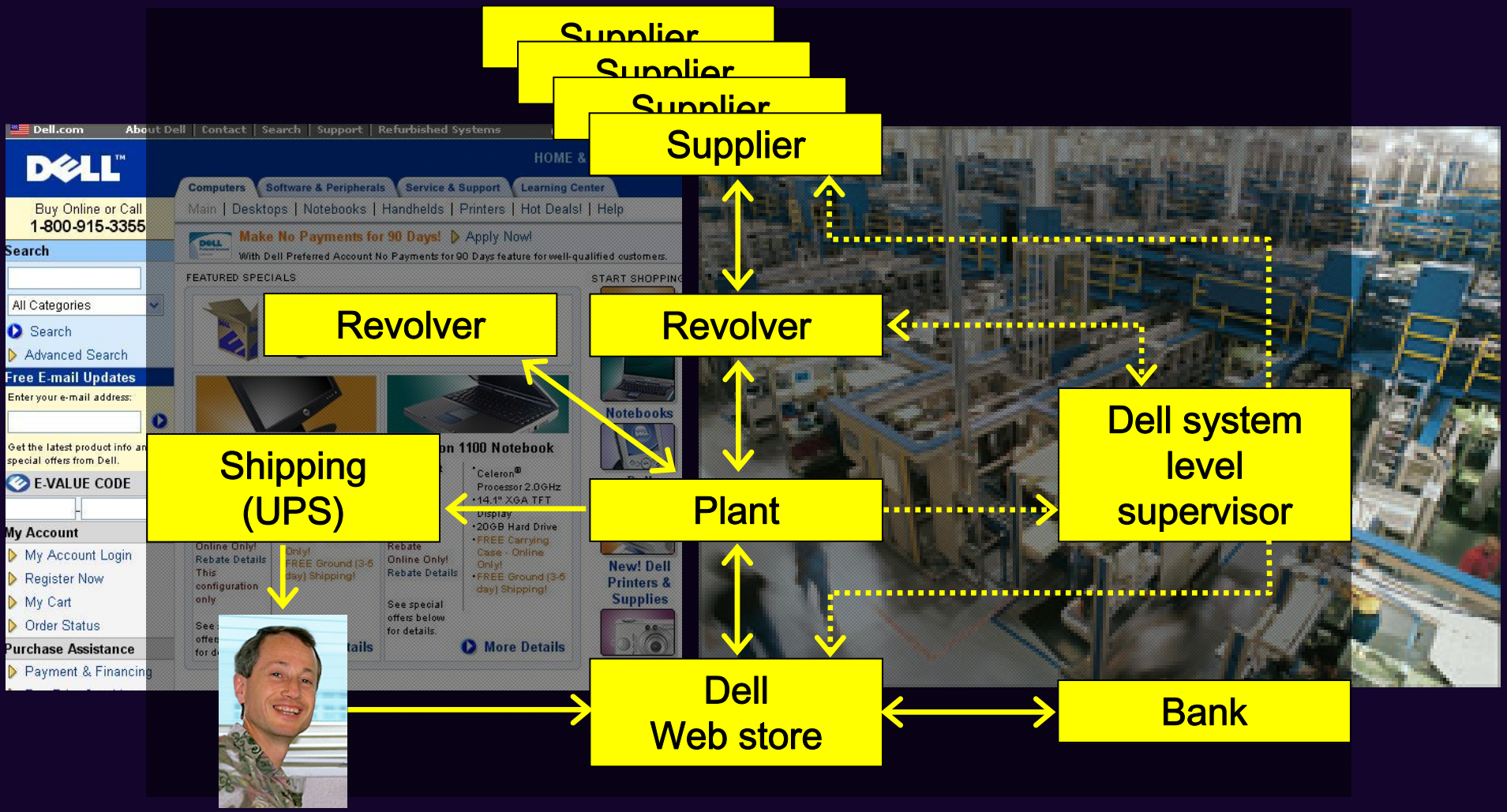


The golden square

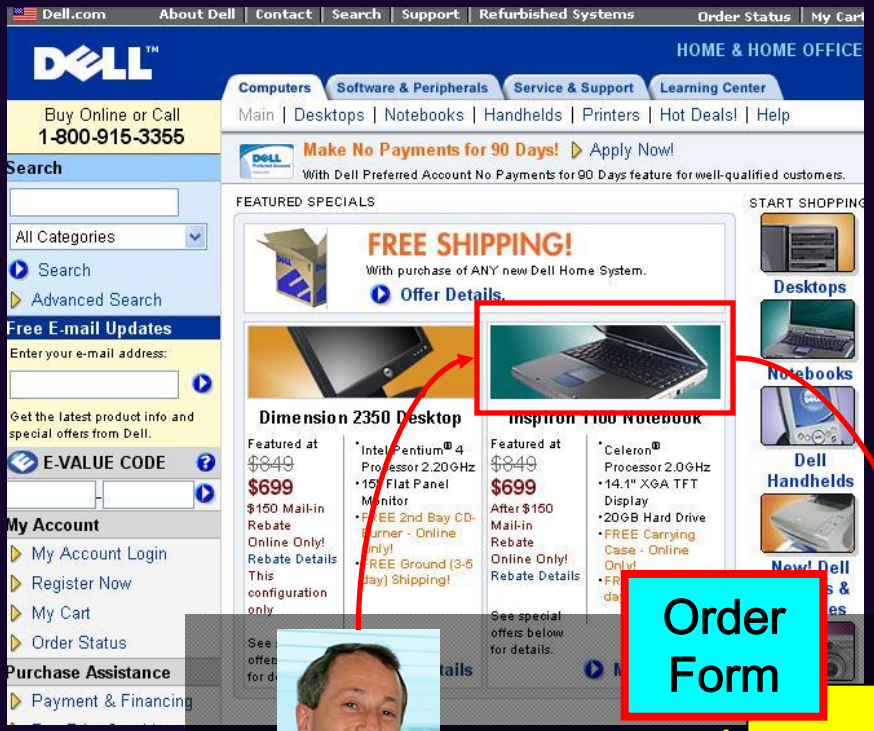
- Standard for (meta)data exchange
  - **XML, XML Schema…**
  - Extensible Markup Language
  - Labeled ordered trees
- Query languages
  - **XPATH, XQuery…**
- Standards for distributed computing: Web services
  - **SOAP, WSDL, OWL-S, WSMO, UDDI…**
  - Simple Object Access Protocols
- Workflow languages
  - BPEL, WSCDL…



Business Processes: Dell Supply Chain



Business Processes: Dell Supply Chain



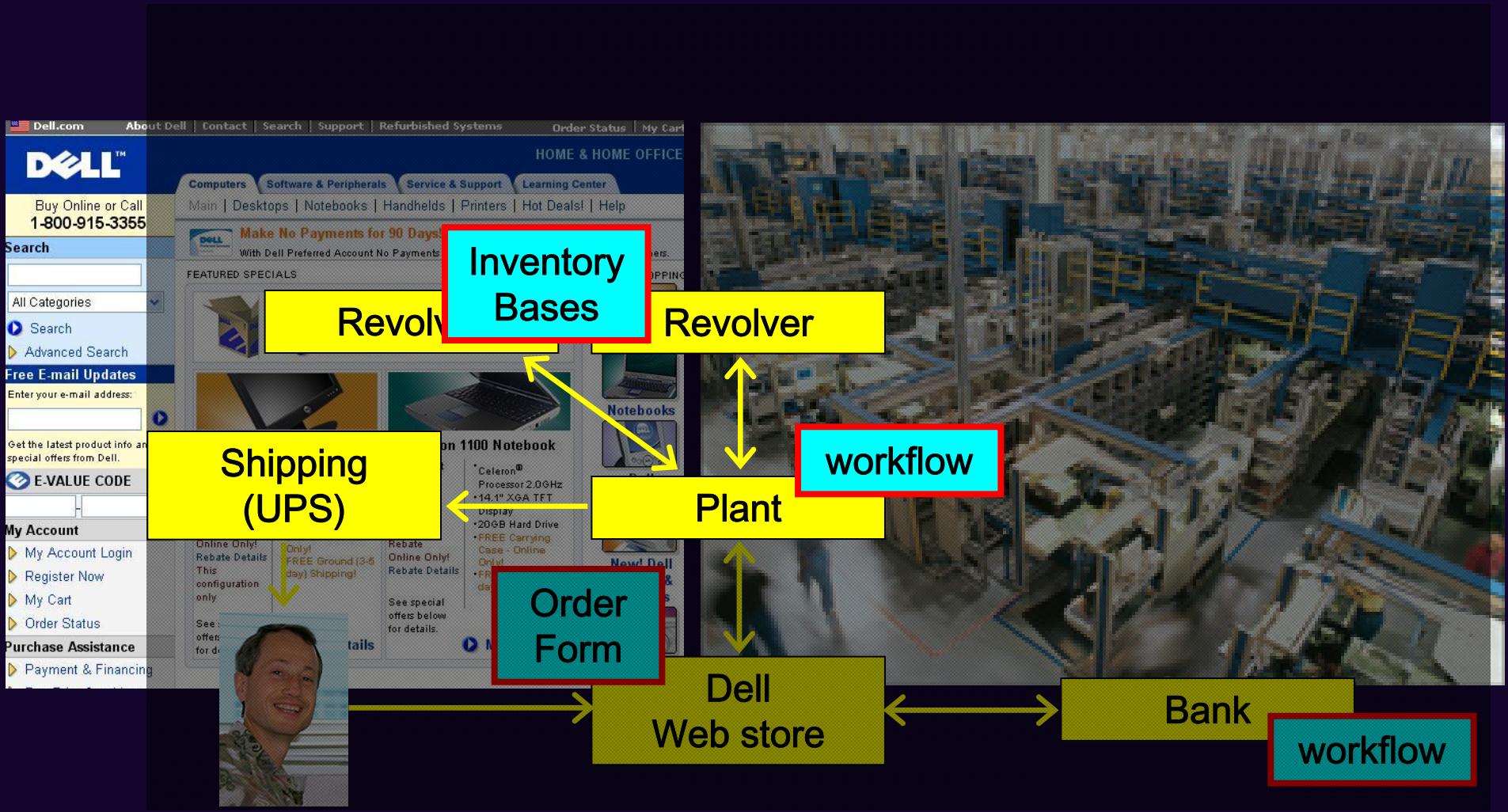
Order Form

Dell Web store

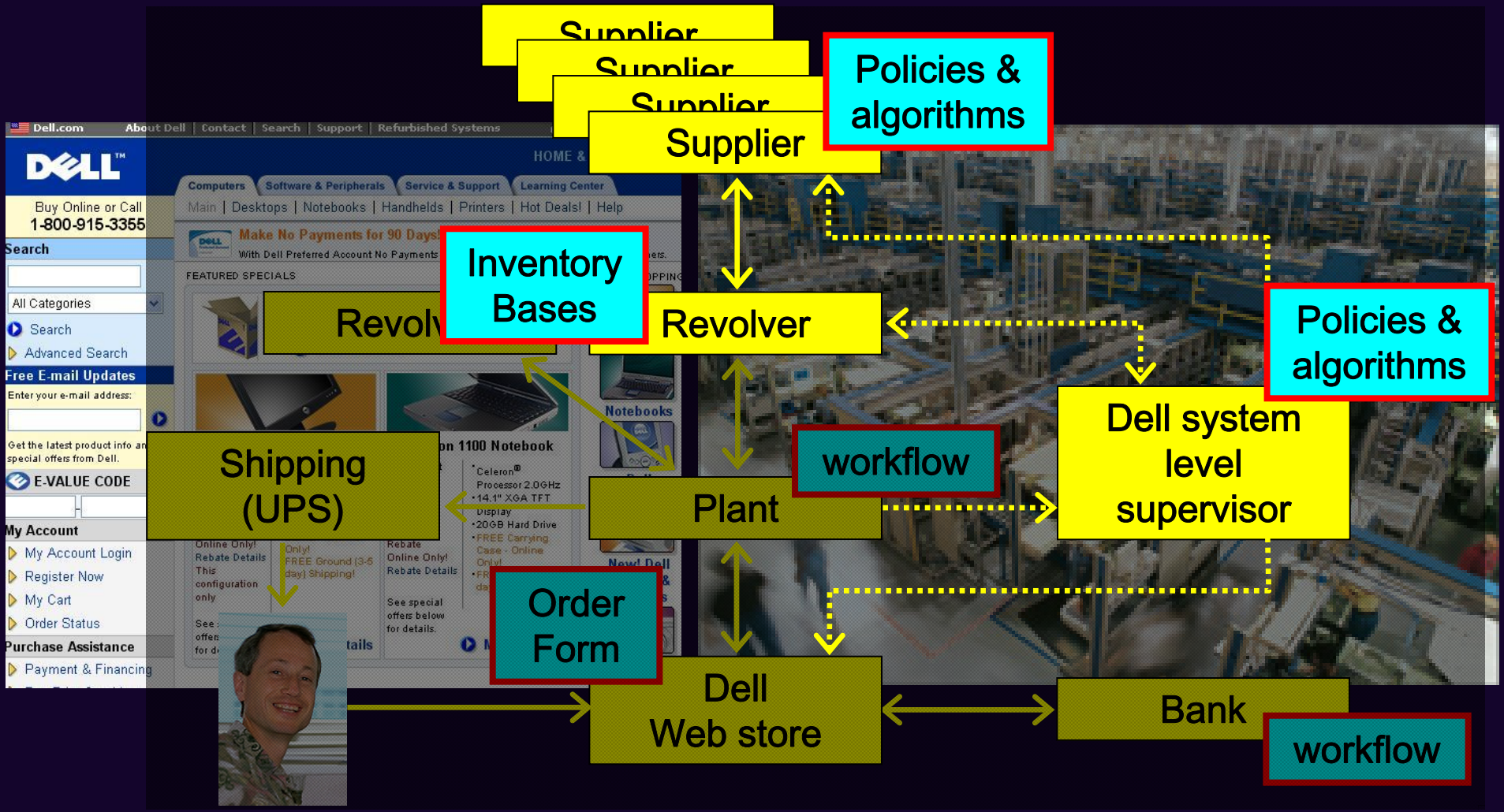
Bank

workflow

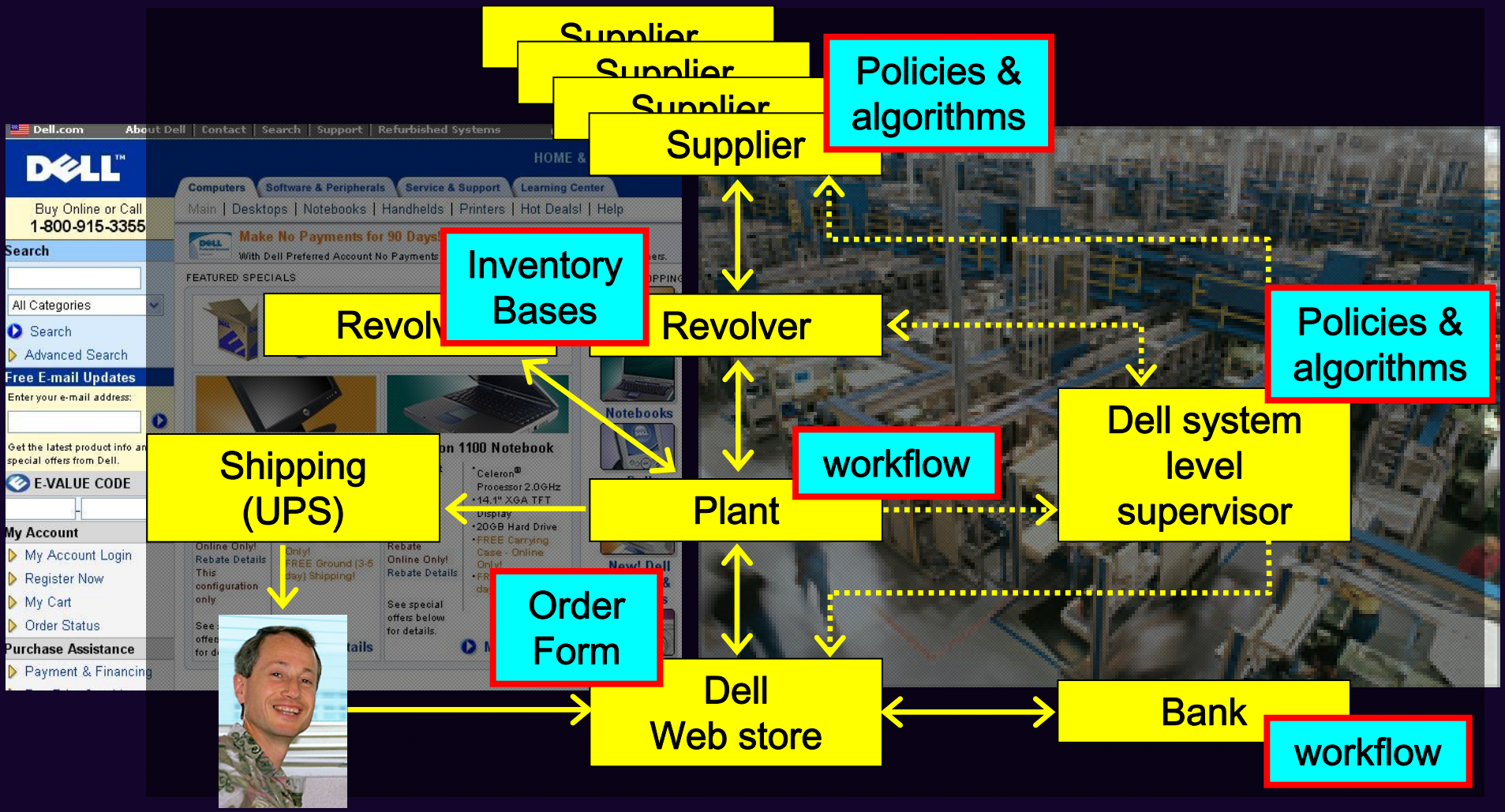
Business Processes: Dell Supply Chain



Business Processes: Dell Supply Chain



Business Processes: Dell Supply Chain



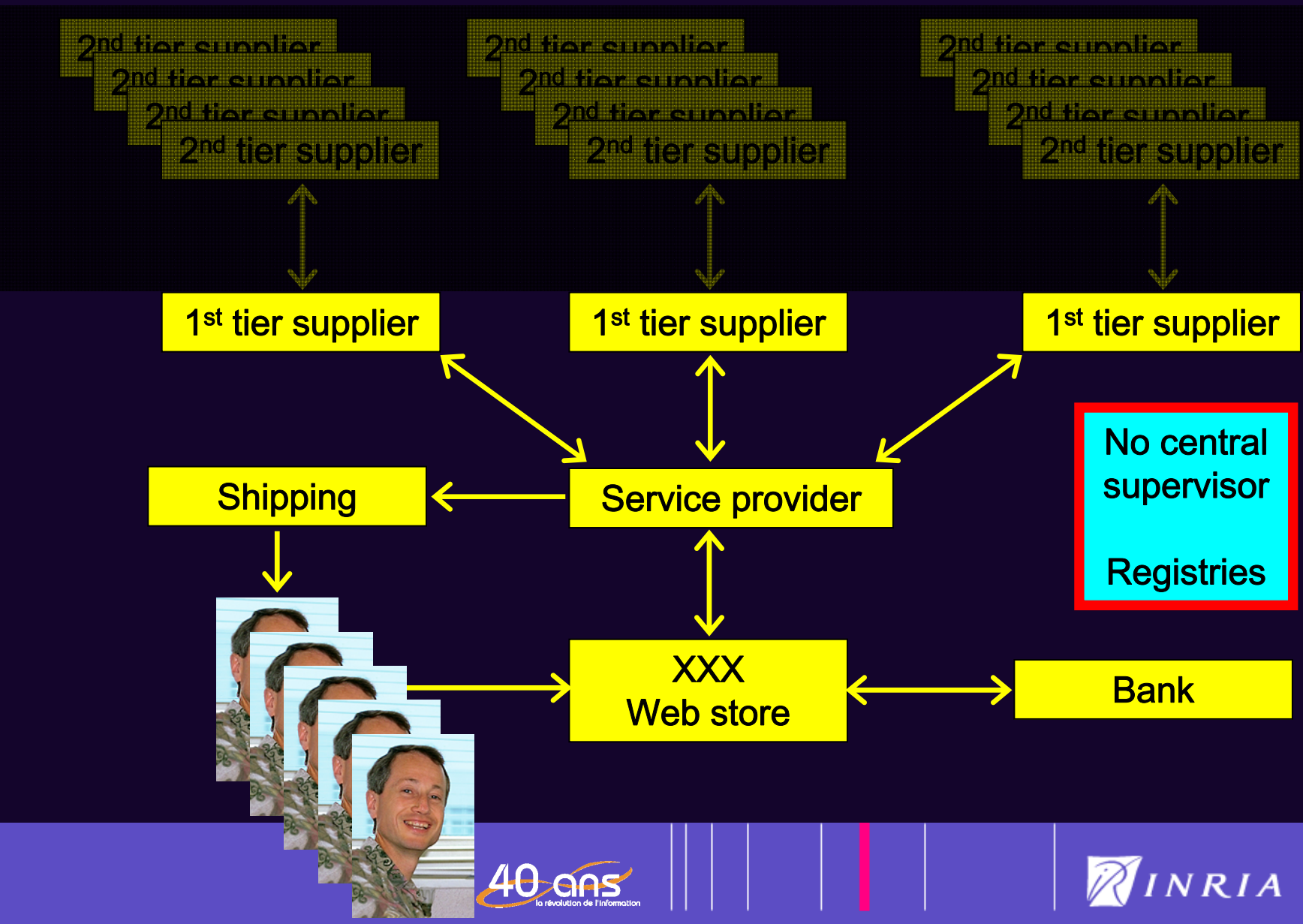
Features

- Documents moving across the system
- Complex workflow
- Distributed and decentralized algorithms
- Safety & Security

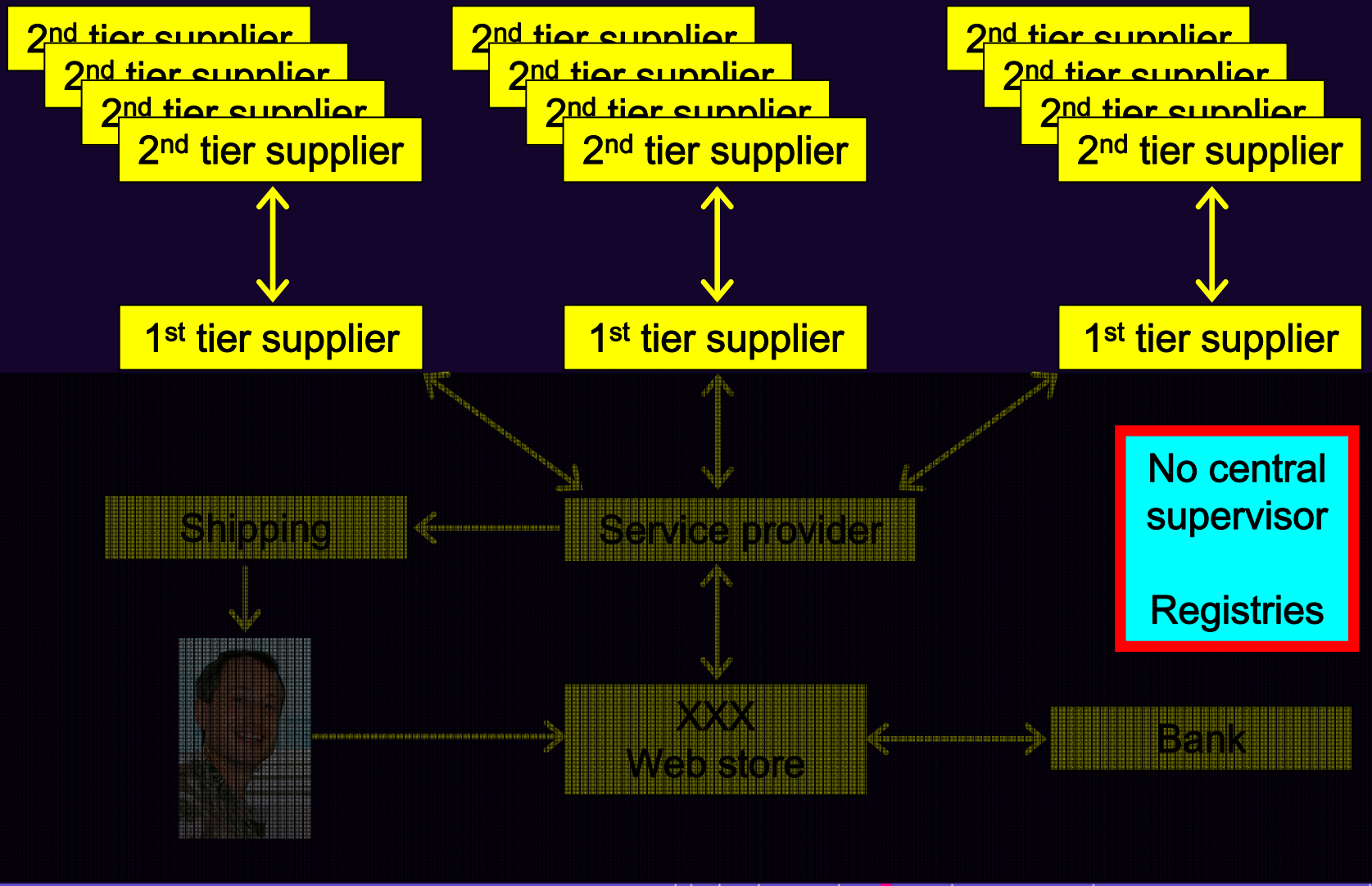
- Extranet (not fully open)
- Performance of service infrastructure not a bottleneck

- Do not keep workflow & data separated
- Workflow & Data as Documents
- It should be possible to analyze the overall system behavior, making sure that no unexpected things can happen
- Decentralization is important, but should not impact correctness

Now, imagine


2nd tier supplier
2nd tier supplier
2nd tier supplier
2nd tier supplier
2nd tier supplier
2nd tier supplier
2nd tier supplier
2nd tier supplier
2nd tier supplier
1st tier supplier
1st tier supplier
1st tier supplier
Shipping
Service provider
No central supervisor
Registries
XXX Web store
Bank

Now, imagine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2nd tier supplier
2nd tier supplier
1st tier supplier
Shipping
Service provider
No central supervisor
Registries
XXX Web store
Bank

Features

- Documents moving across the system
- Complex workflow
- Distributed and decentralized algorithms
- Safety & Security in an Open environment
- Performance matters
- Registries

- Do not keep workflow & data separated
- Workflow & Data as Documents
- It should be possible to analyze the overall system behavior, making sure that no unexpected things can happen
- Decentralization is important, but should not impact correctness
- Monitor & maintain performance
- Contracts: upgrade WSDL, WSMO, to rich interfaces exposing
  - Workflow
  - Performance

Active means intensional

Manon: What's the capital of Brazil?
Dad: Let's look it up in the dictionary!

- Exchange of knowledge
  - "If you give him a fish, he can eat today. If you teach him to fish he can eat forever."
- Distributed computing

Active means dynamic

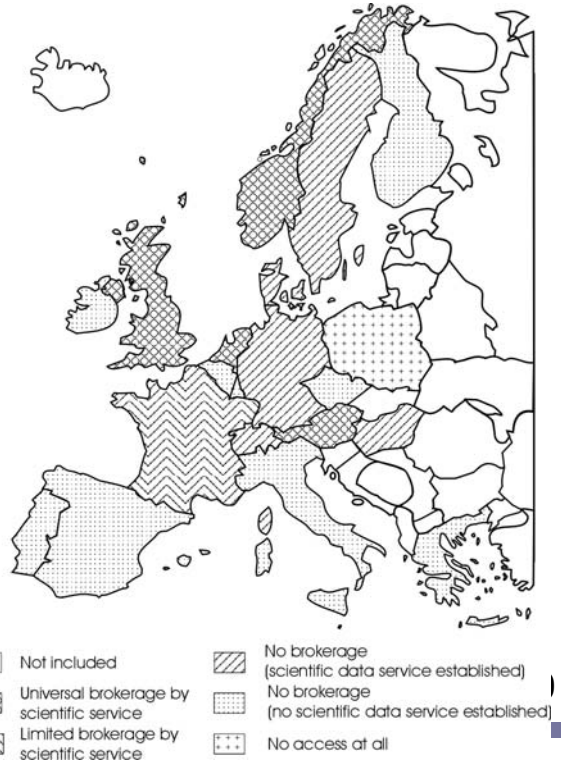
Manon: How do I get a cheap ticket to Galapagos?
Dad: Let's place a subscription on LastMinute.com!

- Dynamic information
- With a subscription, I don't need to ask LastMinute.com every day

Active means flexible

Manon: What are the countries in the EC?
Dad: France, Germany, Holland, Belgium, and hum… I am missing some; look in Google !

- We can answer even if we did not finish computing the answer
- We can give the means to complete the answer



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Dimension 2350 Desktop

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~~$849~~
$699
$150 Mail-in Rebate
Online Only!
Rebate Details
This configuration only

See special offers below for details.

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- 15" Flat Panel Monitor
- FREE 2nd Bay CD-Burner - Online Only!
- FREE Ground (3-5 day) Shipping!

More Details

Inspiron 1100 Notebook

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~~$849~~
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After $150 Mail-in Rebate
Online Only!
Rebate Details

See special offers below for details.

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- 20GB Hard Drive
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- FREE Ground (3-5 day) Shipping!

More Details

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PASSWD:
login
cancel

Message Page (MP)

Message
back

state update

Customer Page(CP)

laptop
desktop

DB

Laptop Search (LSP)

RAM:
CPU:
SCREEN:
submit

Desktop Search (DSP)

RAM:
CPU:
submit

Matching products

Product Index (PIP)

Details
buy

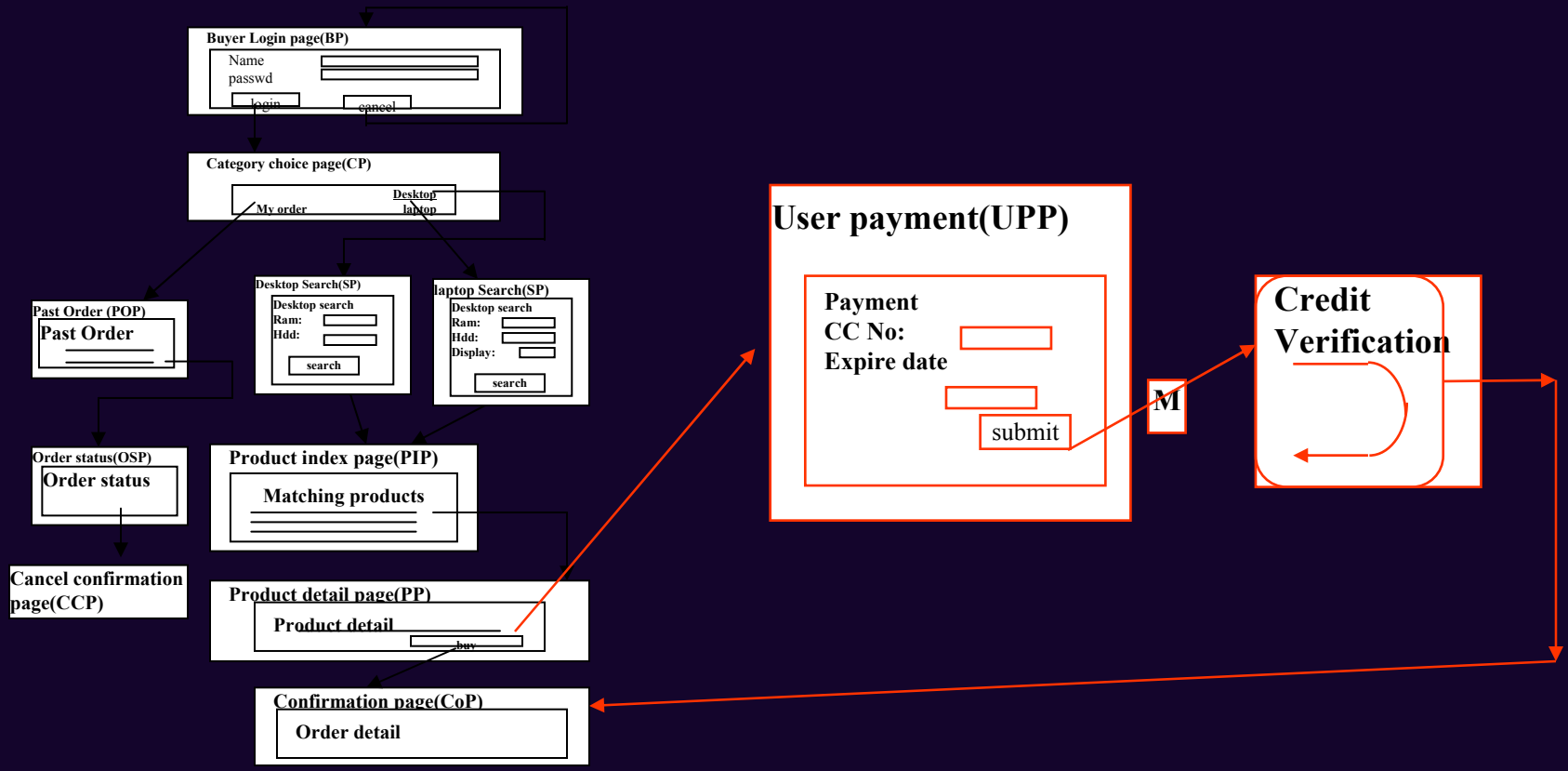
Product Detail (PDP)

Confirmation
print

Confirmation (CoP)

output

Compositions of Web services



Examples of Desirable Properties

Semantic properties

- "no product is delivered before payment in the right amount is received"
- "no user can cancel an order that has already been shipped"

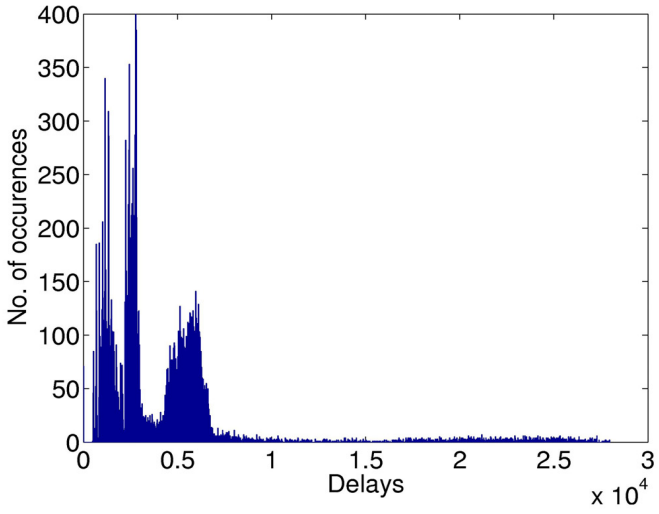
Basic soundness of specification

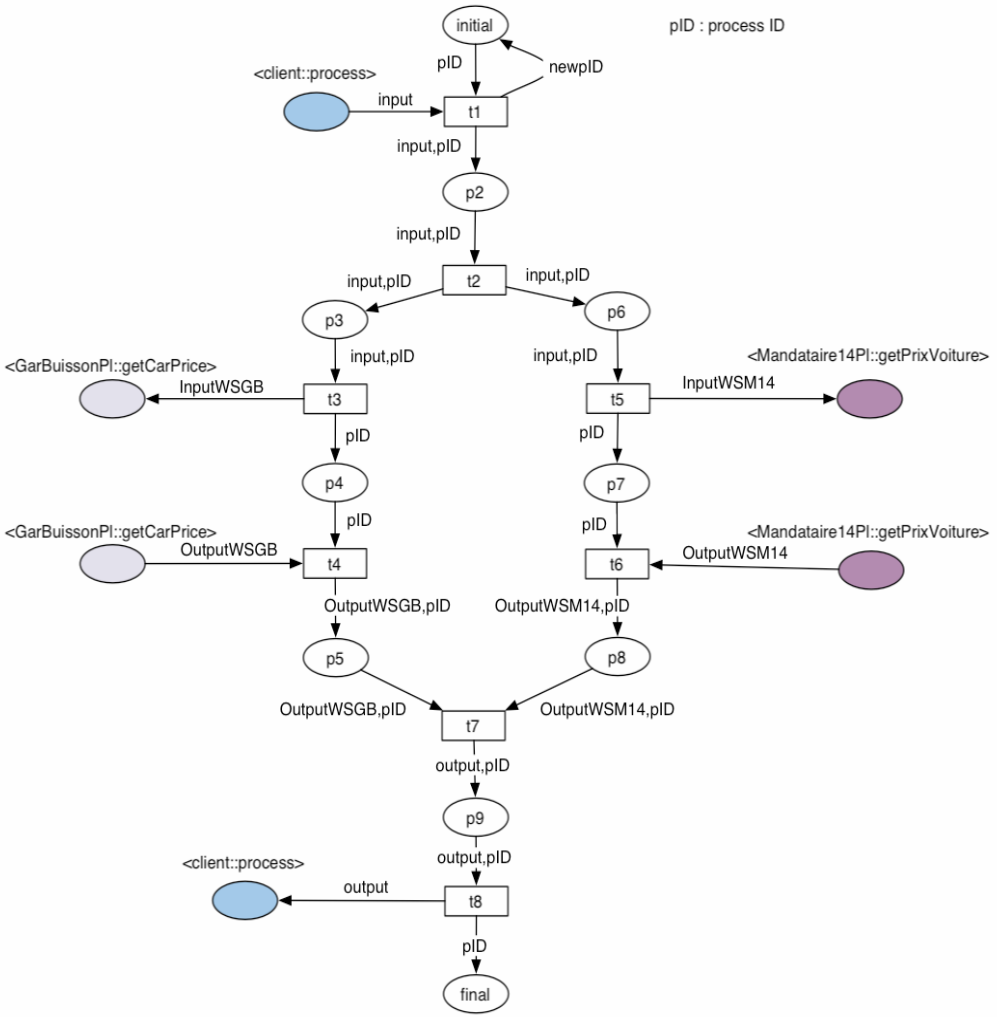
- "conditions guarding transition to next Web page are mutually exclusive"

Navigational properties

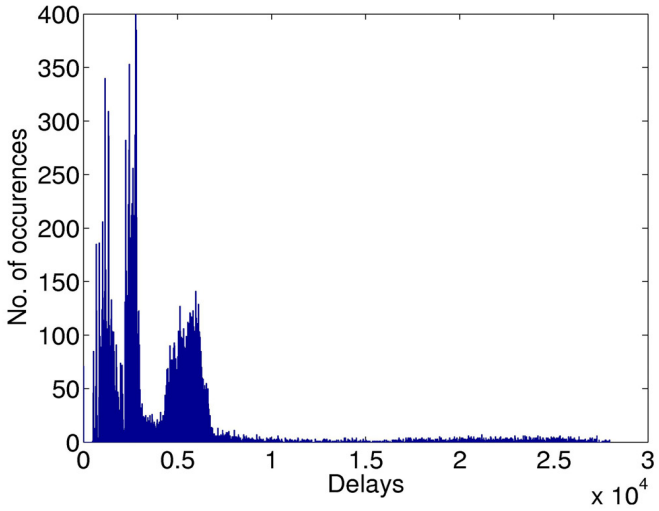
- "the shopping cart page is reachable from any page"

QoS composition & monitoring for Web services orchestrations





QoS composition & monitoring for Web services orchestrations



Function composition

QoS composition

Contract composition

Monitoring

Reconfiguration

Soft contracts: probabilistic

(today, only simple hard contracts are composed in a crude way)

Lots of research needed

- Infrastructures: SoA and beyond, document based
- Decentralization & Contracts
- Data and their contents: semantics
- Correctness of unsupervised behavior
- Monitoring and statistics
- Self-reconfiguration, self-deployment
- Adapting domain specific algorithms to such infrastructures

Google France 2047

Intelligence out of my brain?

I'm working hard at achieving this

So I (and everyone?) can retire…