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# Cooperation and Interconnection of Enterprise Process Services

Karim Baïna

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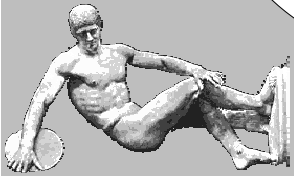
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Submitted on 19 Oct 2006

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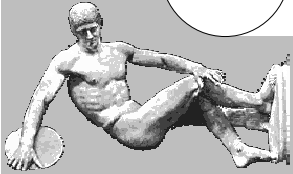
# *Cooperation and Interconnection of Enterprise Process Services*

**K. Baina**

**ECOO Team – LORIA**

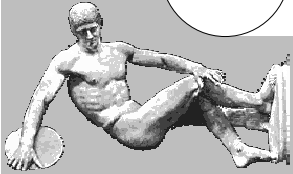
**[www.loria.fr/~baina](http://www.loria.fr/~baina)**

**Nancy Universities,  
INRIA, CNRS  
FRANCE**



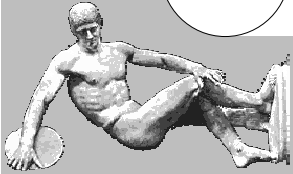
# *Outlines*

- Introduction
- Process Interconnection Related Works
- A Generic Process Service Interconnection Model
- Model implementation in our CSCW plate-form DISCOBOLE
- Conclusion and Perspectives



# *Introduction*

- **Enterprises Need**
  - capitalising existing partnerships :
    - intensify and strength exchanges with strategic partners over the world
  - optimising exchanges (faster/cheaper) by interconnecting applications :
    - Knowledge Databases, Data Warehouses,
    - ERPs, SCMs, Workflows,...

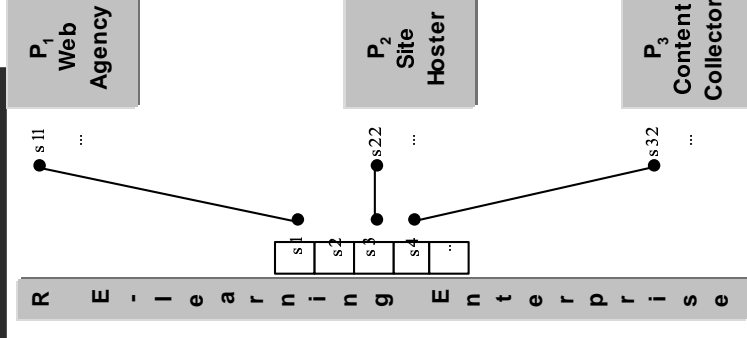


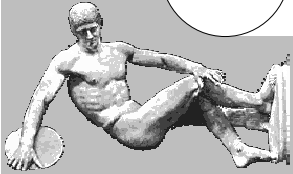
- I. Introduction
- II. State of the art
- III. Model
  - A. Visibility
  - B. Dynamics
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# Introduction

## ● E-learning Partnership Enterprises

- Partnership Actors :
  - R : E-learning enterprise,
  - P1 : Web agency,
  - P2 : Site hoster,
  - P3 : E-learning Content Collector.
- Partnership Purpose :
  - to product e-learning courses.
- Partnership Rule :
  - each actor offer services related to its own business core.

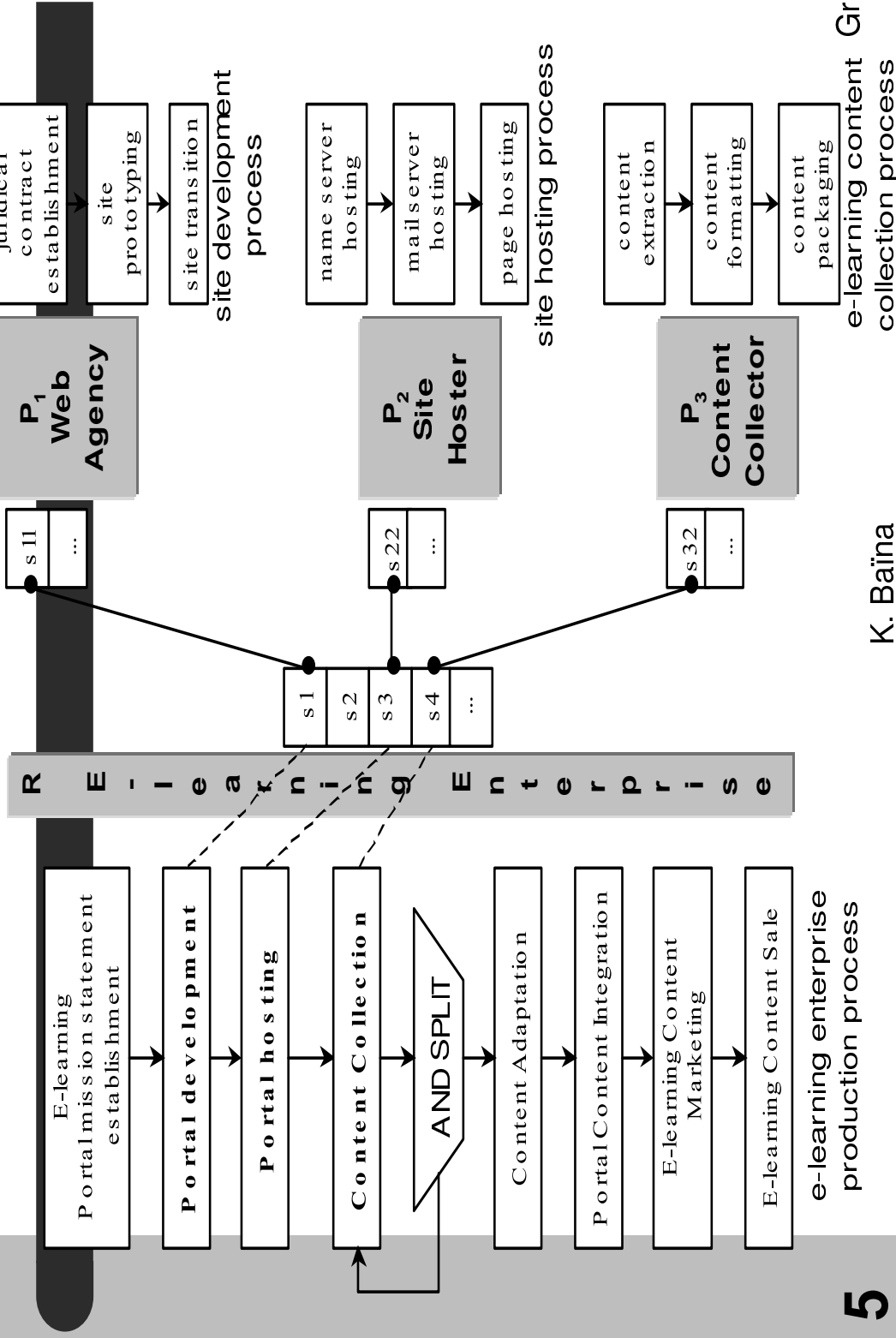




# Cooperation and Interconnection of Enterprise Process Services

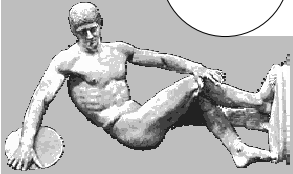
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## Introduction



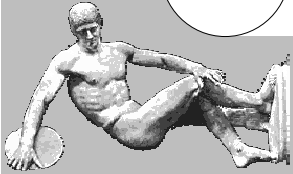
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Graduiererkolleg  
2001 (Rathen)



## *Related Works*

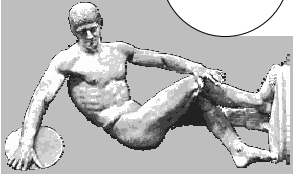
- **Workflow Management Systems :**
  - based on heterogeneous BPDs (Business Process Definition Language)
  - do not deal with inter-enterprise cooperation
  - no process semantics support
    - process instances handled as simple graph objects (node = activity and directed edge = control flow).
  - monolithic
    - process instances depend on the workflow engine (encapsulated black boxes).



## *Related Works*

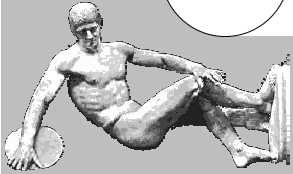
- Workflow Interconnection Models and Solutions
  - Models
    - Data exchange protocols,
    - Message based communication,
    - Synchronisation mechanisms....
  - Web Services
    - SOAP, Biztalk, e-speak, .Net, J2EE,...
  - Normalisations
    - SWAP/WebDav (dead RFC drafts),
    - WfMC I4 (interoperability paradigms, Wf-XML/(HTTP, MIME) I2 mapping),
    - OMG (CORBA services),





# *A generic process service interconnection Model*

- Service centred Approach
  - A process service “design pattern” is as a process adapter/proxy handling :
    - functional process **access points** (Methods, Events, Data),
    - and **rights** on them (Visibility Contract),
    - with a layer of process **semantics** (Profile, Distance, Matching and Neighbourhood operators).
- A two facets based Model
  - **Visibility** : interconnection Privacy/Security/Marketing
  - **Dynamics** : interconnection parameters run time decision

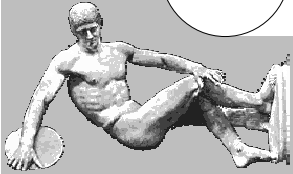


*Cooperation and Interconnection  
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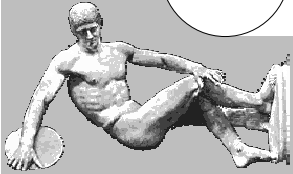
# Visibility

- **Semantic Visibility**
  - handling elements to classify and explore services
- **Functional Visibility**
  - handling Resources of the service



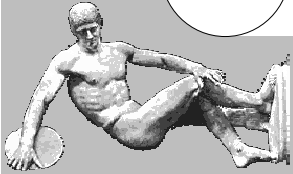
# *Semantic Visibility*

- **Process Service Category,**
- **Process Service Profile with**
  - **Process Service Distance measurements,**
  - **Process Service Matching Predicate,**
  - **Process Service Neighbourhood Computing.**



# *Semantic Visibility*

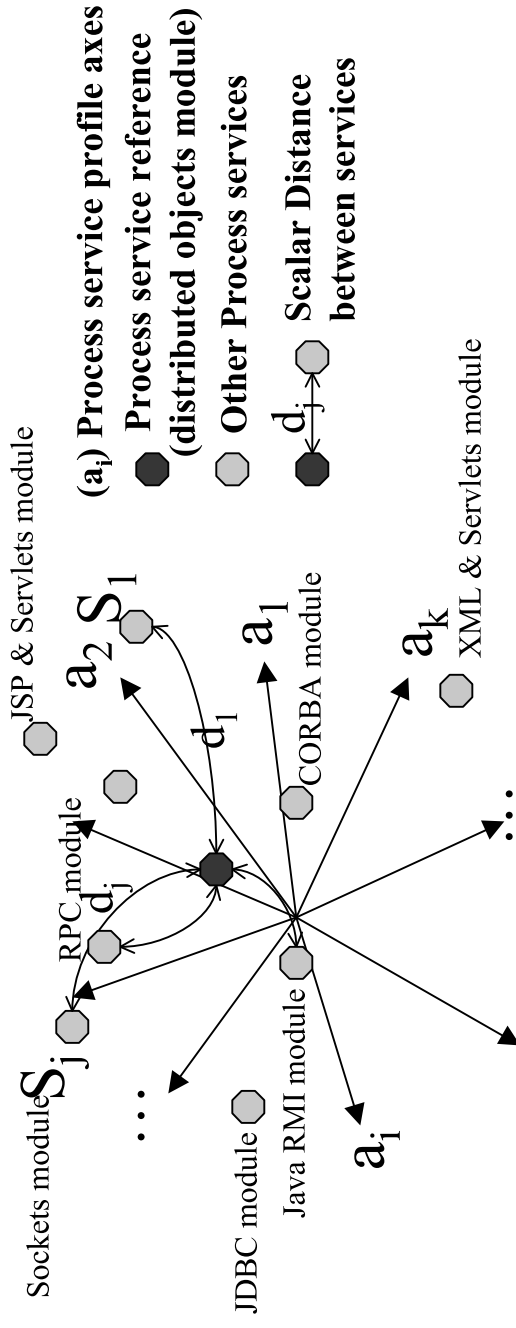
- Process Service Category : an object classification,
- Process Service Profile : a set of significant typed attributes
  - Process Service Distance measurements : a norm operator,
  - Process Service Matching Predicate : an class equivalence operator,
  - Process Service Neighbourhood Computing : a thin class equivalence operator.



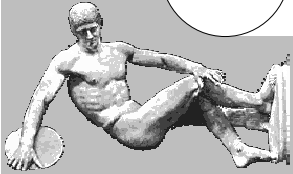
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# Semantic Visibility

- A Category and Profile based Scalar Distance  
(global measure to the whole service profile)



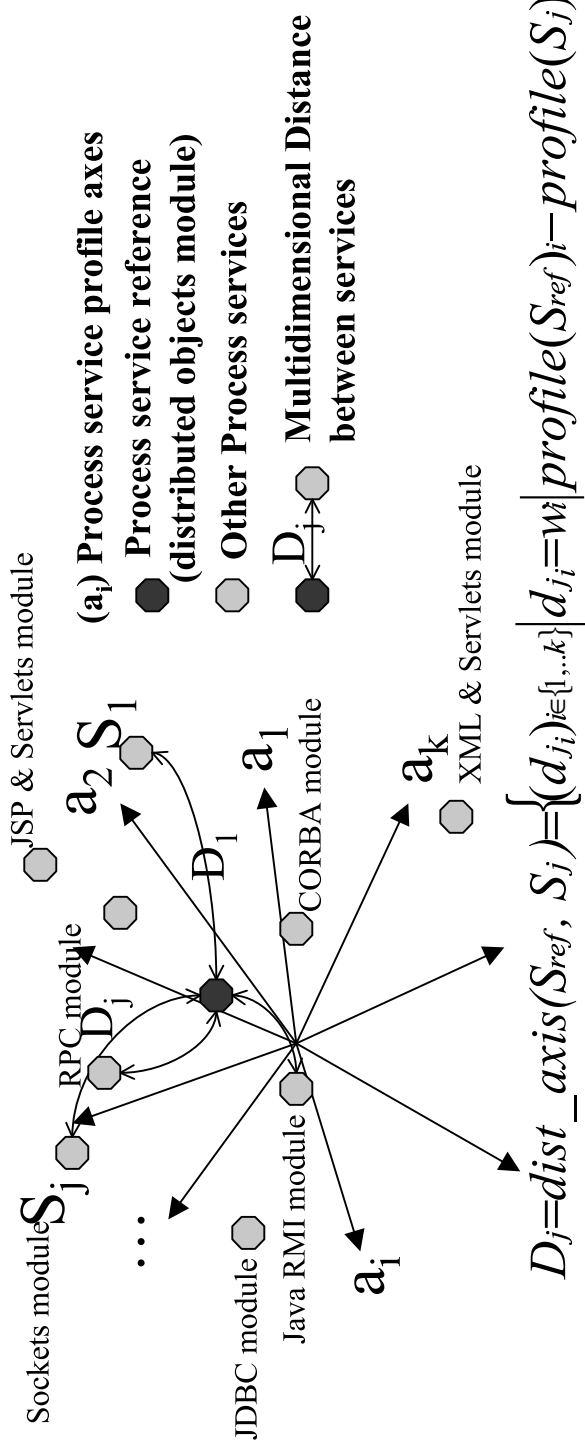
$$d_j = \text{dist}_n(S_{ref}, S_j) = \sqrt[n]{\sum_{i=1}^k w_i |profile(S_{ref})_i - profile(S_j)_i|^n}$$

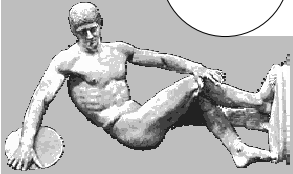


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# Semantic Visibility

- A Category and Profile based Multidimensional Distance (detailing measures by profile axes)

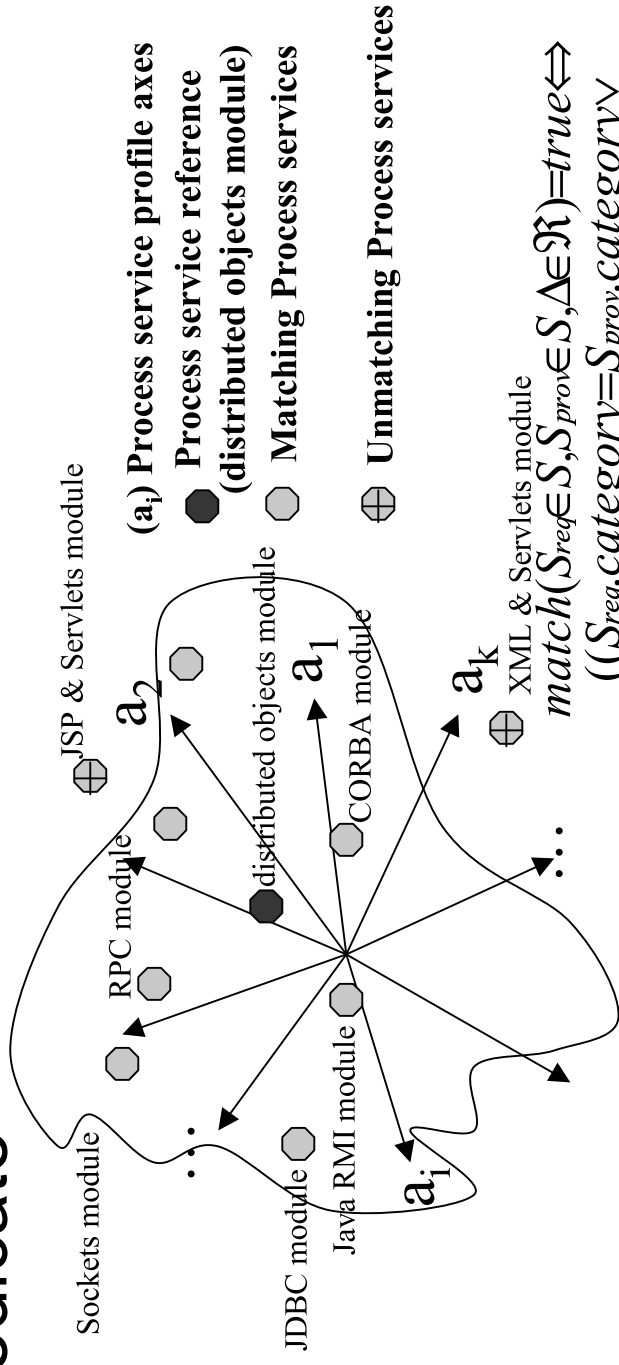




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# Semantic Visibility

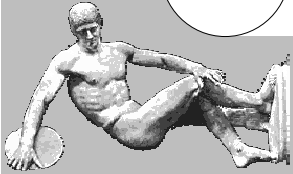
- A Category and Distance based Matching predicate



$$\begin{aligned}
 & match(S_{req} \in S, S_{prov} \in S, \Delta \in \mathcal{R}) = true \Leftrightarrow \\
 & ((S_{req}.category = S_{prov}.category) \vee \\
 & S_{req}.category_{sub\_type\_of} S_{prov}.category) \wedge \\
 & dist(S_{req}, S_{prov}) \leq \Delta
 \end{aligned}$$

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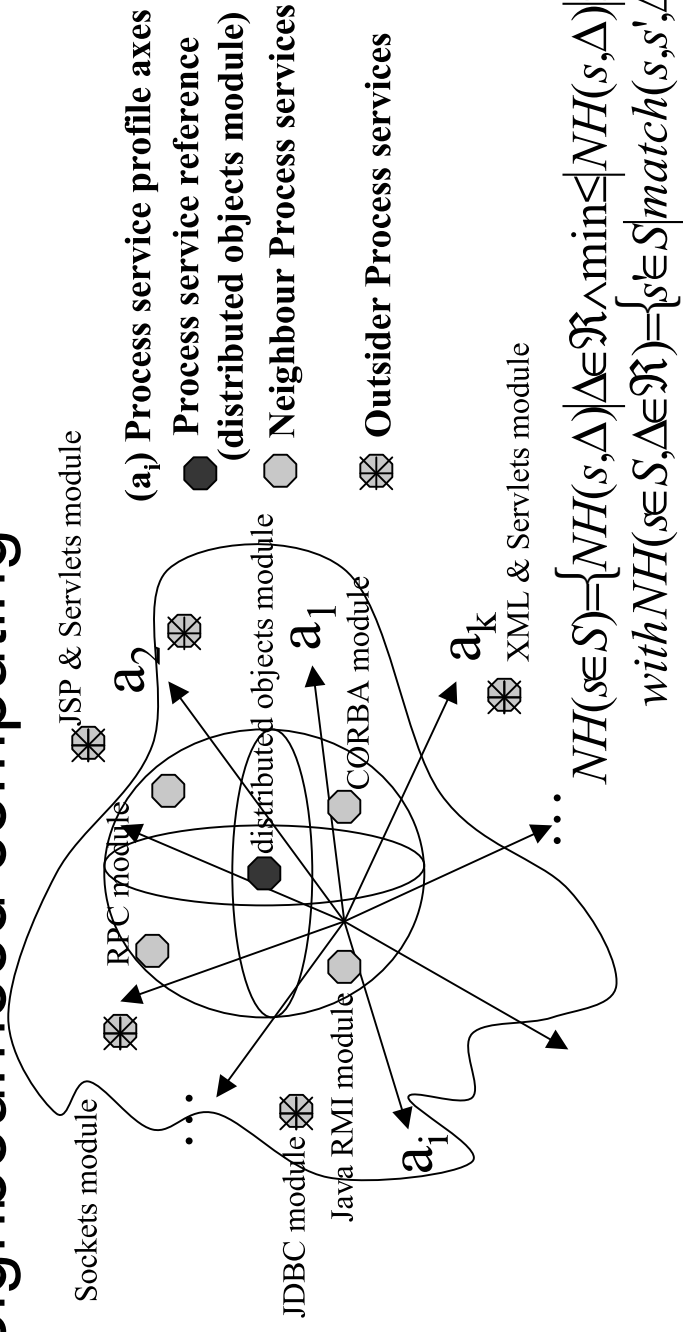
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2001 (Rathen)



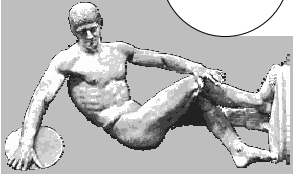
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# Semantic Visibility

- A Matching and Distance based Neighbourhood computing

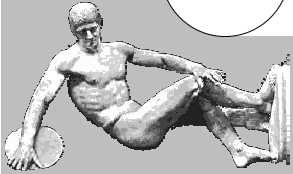






# *Functional Visibility*

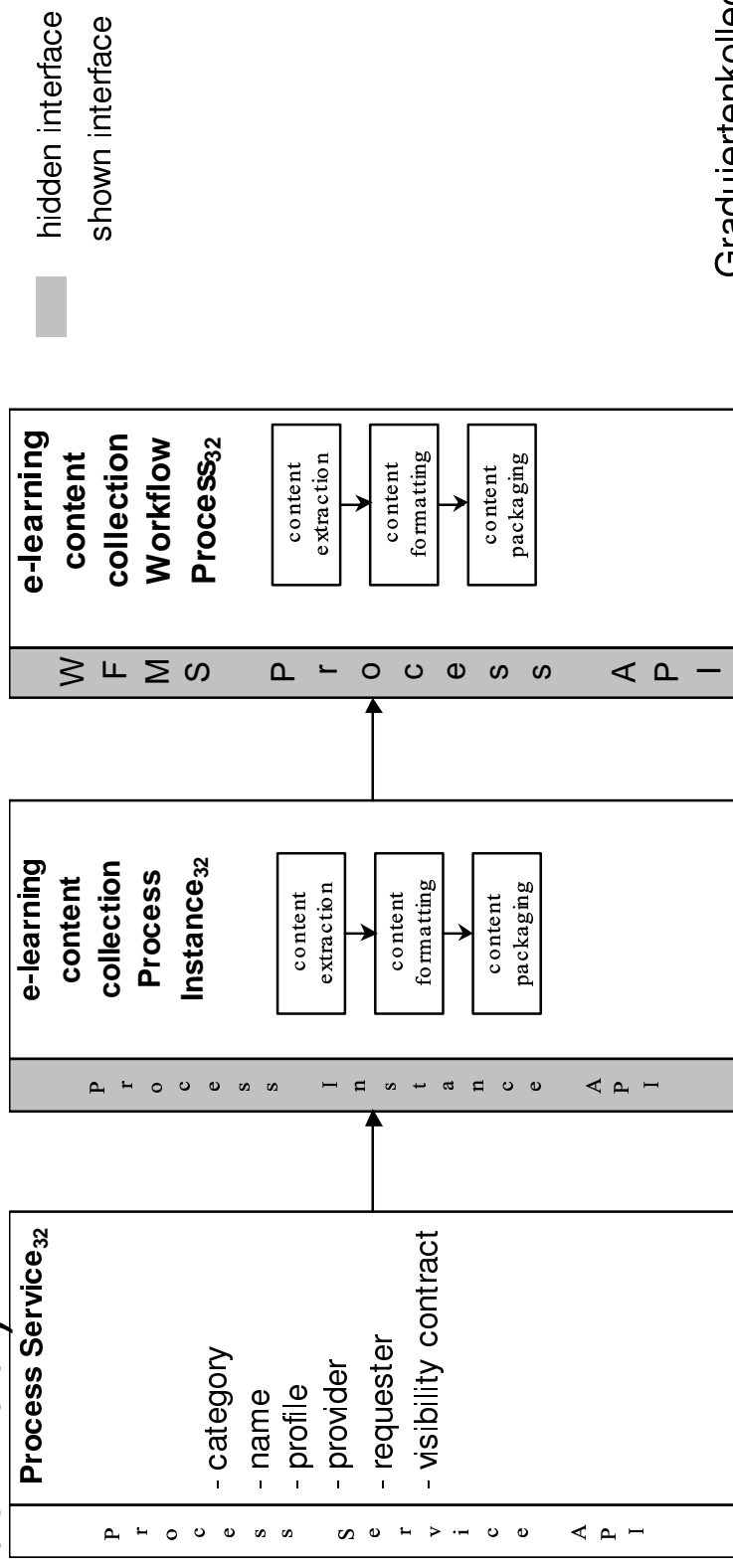
- **Process Service API**
  - Process Service Events,
  - Process Service Methods,
- **Process Service API visibility contract**
- **Process Service Data spaces (in progress).**



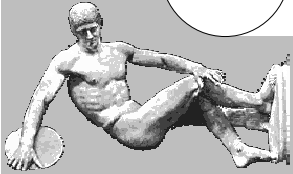
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# Functional Visibility

- Process Service API (Methods, Events and API visibility)

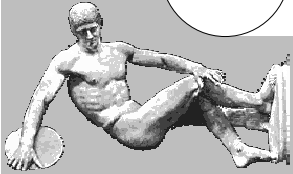


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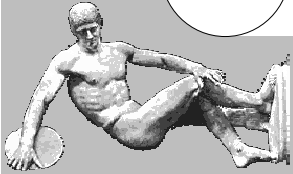
# *Dynamics*

- **Co-Decision Problems :**
  - previously unknown interconnection parameters
    - partners to be interconnected,
    - concrete process services to be exchanged,
    - communication protocol to be adopted,
    - interconnection exchange rendezvous, etc.



# *Dynamics*

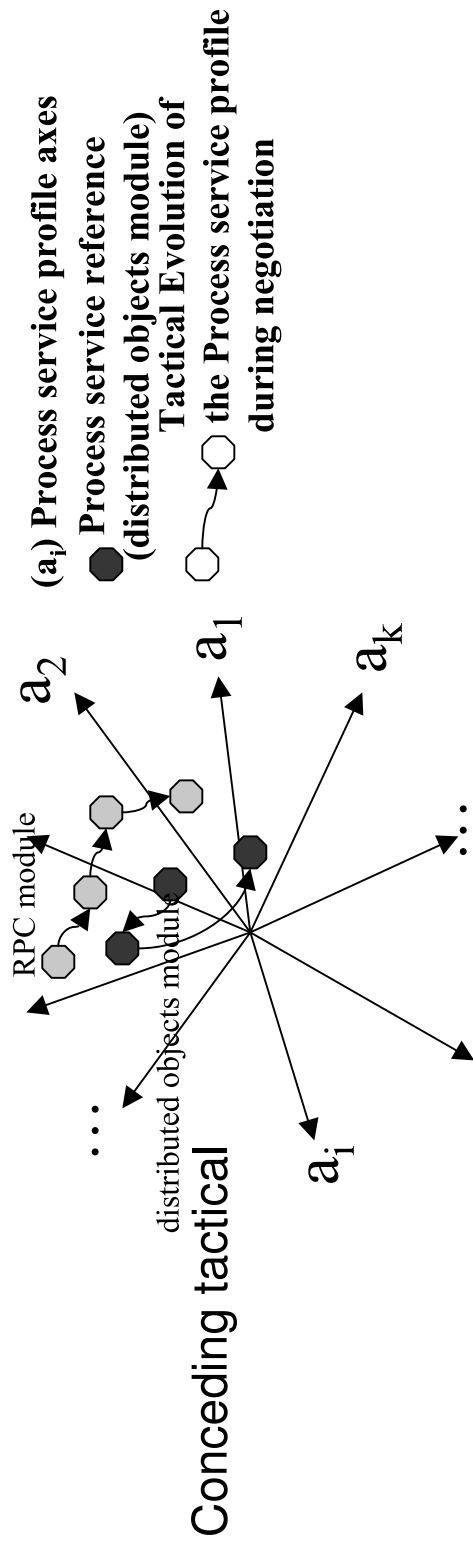
- **Negotiation Mechanisms :**
  - application of “our generic negotiation model for CSCW”, M. Munier, K. Baïna and K. Benali, CoopIS’00
  - Language : A speech act based Negotiation Language,
  - Protocol : A transactional rule guided Protocol,
  - Tactical : A methodology based on preference order relations between decision items.

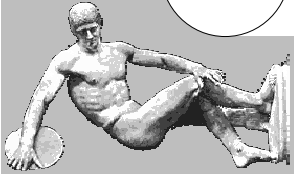


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# Dynamics

- Negotiation of Service Profile
  - Language : speech acts + profile attributes
  - Tactical : having less than a maximum distance



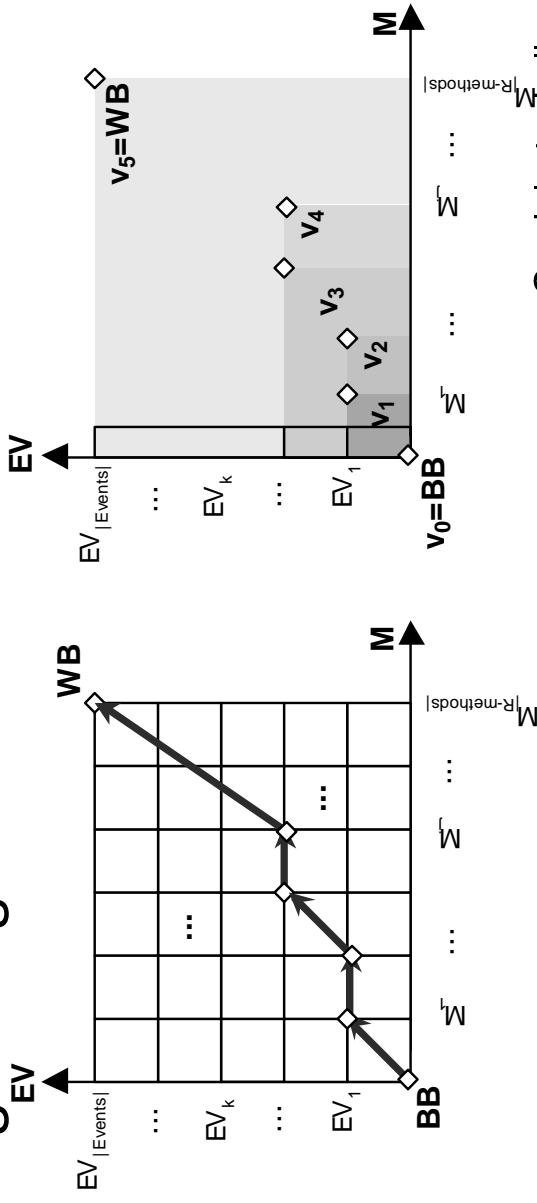


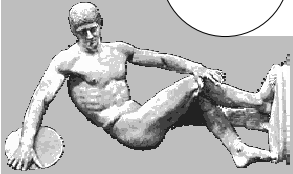
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# Dynamics

- Negotiation of Service API visibility contract
  - Language : speech acts + API (methods, events)
  - Tactical : progressing inside a contract set

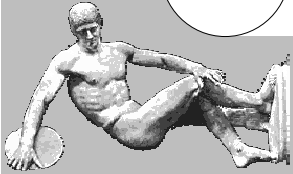
Conceding tactical  
Provider view





# *A generic process service interconnection Model – sum up*

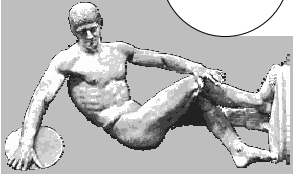
- Step 1 : creating and profiling process service,
- Step 2 : publishing process service (request/provide),
- Step 3 : process service neighbourhood computing,
- Step 4 : process service profile negotiation,
- Step 5 : process service API visibility contract negotiation,
- Step 6 : process service wrapping (contract signature),
- Step 7 : process service enactment,
- Step 8 : process service life cycle monitoring.



# *Model implementation in our CSCW plate-form DISCOBOLE*

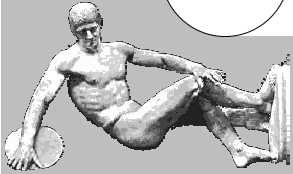
- DISCOBOLE as DIStributed COoperation and Business prOcess on LinE
  - CORBA based Negotiation Support System :
    - Generic NSS applied to Process Service Profile Negotiation, and to API visibility Negotiation
  - CORBA based Process Service Support System :
    - Private/Requested/Provided Process Service Spaces, Process Service Categorisation and Profiling, Matching Predicate, Neighbourhood Computing, Profile Negotiation, API visibility contract Negotiation, Wrapping, Enacting, etc.





# *Conclusion and Perspectives*

- A generic process service interconnection model supporting **dynamics** and **visibility**
- In progress work
  - Process Service data spaces,
  - Process Service composing and coordination,
  - Process Service interconnection **coherence**.



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## Papers

- “A negotiation model for CSCW”, M. Munier, K. Baïna, and K. Benali, Cooperative Information Systems (CoopIS'00), September 2000, Eilat, Israel
- “A process service model for dynamic enterprise process interconnection”, K. Baïna, K. Benali, and C. Godart, (CoopIS'01), September 2001, Trento, Italy

service fournis

tous mes services fournis

Provided-e-learning\_portal\_ser

services requis des partenaires

services requis des partenaires

C\_learning\_portal\_developpement\_service

Requested\_e\_learning\_portal\_service

services requis

tous mes services requis

services fournis des partenaires

services fournis des partenaires

C\_learning\_portal\_developpement\_service

mes négociations de profils de services

toutes les négociations

mon service	son service	Partenaire
Provided-e-learning_portal_service	Requested_e_learning_portal_service	C_learning_portal_developpement_service

historique de négociation

Acte

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```

espace privé de service

Provided-e-learning\_portal\_servic

espace de travail

espace privé de service

Requested\_e\_learning\_portal\_servi

Espace de Ressources Espace de Services Espace de Communication

service fournis tous mes services fournis

services requis tous mes services requis

Requested\_e\_learning\_portal\_

mes négociations de profile toutes les négociations

mon service

Requested\_e\_learning\_portal\_service Provided-e-learning\_portal\_service E\_learning\_portal\_developpement\_service

Partenaire

histoire de négociation

Acte

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services requis des partenaires

services requis des partenaires

E\_learning\_portal\_developpement\_service

Untitled

sélectionnez une force illocutoire

- Assertifs
- Prohibitifs
- refuser
- Expressifs
- Directifs

Oui Annuler

espace de travail

espace privé de service

Requested\_e\_learning\_portal\_servi

Espace de Ressources Espace de Services Espace de Communication

service fournis tous mes services fournis

services requis tous mes services requis

Requested\_e\_learning\_portal\_

mes négociations de profile toutes les négociations mon service

Requested\_e\_learning\_portal\_

services requis des partenaires

E\_learning\_portal\_developpement\_service

services requis des partenaires

E\_learning\_portal\_developpement\_service

Partenaire

E\_learning\_portal\_developpement\_service

histoire de négociation

Acte

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E\_learning\_portal\_developpement\_service.contre-proposer[ <17, 14500.0, UNIX, true, true, false, false, false ]

Untitled

sélectionnez un schéma de coopération

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prix_en...	14500
OS	UNIX
JSERVLET...	true
CORBA_use	true
ORACLE_use	false
JDBC_use	false
JSP_use	false
XML_use	false

Oui Annuler

espace de travail

espace privé de service

Requested\_e\_learning\_portal\_servi

Espace de Ressources Espace de Services Espace de Communication

service fournis tous mes services fournis

services requis tous mes services requis Requested\_e\_learning\_portal

services requis des partenaires E\_learning\_portal\_developpement\_service

services fournis des partenaires

services fournis des partenaires

Requested\_e\_learning\_portal

mes négociations de prof toutes les n! mon service Requested\_e\_learning\_portal

histoire de négociation

Acte

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E\_learning\_portal\_developpement\_service.demander [ <17, 13000.0, UNIX, true, true, false, false, false ]

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E\_learning\_portal\_developpement\_service.contre-proposer [ <17, 14500.0, UNIX, true, true, false, false, false ]

Untitled

Voulez-vous agir par : refuser

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[ name =prix_en_euro, value =14500.0 ]
[ name =OS, value =UNIX ]
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```

Oui Non

espace de travail

Espace de Ressources Espace de Services Espace de Communication

service fournis

tous mes services fournis

services requis des partenaires

services requis des partenaires

E\_learning\_portal\_developpement\_service

services requis

tous mes services requis

Requested\_e\_learning\_portal\_service

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mes négociations de profils de services

toutes les négociations

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Requested_e_learning_portal_service	Provided-e-learning_portal_service	E_learning_portal_developpement_service
<p>histoire de négociation</p> <p>Acte</p> <pre> E_learning_portal_developpement_service.demander[ &lt;17, 13000.0, UNIX, true, true, false, false, false, false &gt; ] C_learning_portal_developpement_service.proposer[ &lt;20, 19500.0, UNIX, true, true, true, false, false, false &gt; ] E_learning_portal_developpement_service.contre-proposer[ &lt;17, 14500.0, UNIX, true, true, true, false, false, false &gt; ] C_learning_portal_developpement_service.refuser[ &lt;17, 14500.0, UNIX, true, true, true, false, false, false &gt; ] </pre>		

espace privé de service service fournis services requis services fournis des partenaires services requis des partenaires mes négociations de

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espace de travail

**Espace de Ressources**

- service fournis
- tous mes services fournis
- Provided-e-learning\_portal\_ser

**Espace de Services**

- services requis
- tous mes services requis

---

**Espace de Communication**

- services requis des partenaires
- services requis des partenaires
- C\_learning\_portal\_developpement\_service

**services fournis des partenaires**

- services fournis des partenaires
- services fournis des partenaires
- C\_learning\_portal\_developpement\_service

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mes négociations de profils de services

toutes les négociations

son ser...	Partenaire
mon service	C_lear...

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histoire de négociation

Provided-e-learning\_portal\_service

```

Acte
C_learning_portal_developpement_service.unifier(17, 10000.0, UNIX, true, false, false, false, false, false)
E_learning_portal_developpement_service.demander(17, 13000.0, UNIX, true, true, false, false, false)
C_learning_portal_developpement_service.proposer(20, 19500.0, UNIX, true, true, true, false, false)
E_learning_portal_developpement_service.contre-proposer(17, 14500.0, UNIX, true, true, false, false, false)
C_learning_portal_developpement_service.refuser(17, 14500.0, UNIX, true, true, false, false, false)

```