Semantic Representation of Context Models: A Framework for analyzing and understanding

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Outline

- Motivations
- Objectives
- Context models & Context-aware systems
- Analysis framework
- Study case
  - Context Model for Business Process
- Conclusions & Future work

Motivations

- Context notion plays a central role on **context-aware systems**

- **Context model** determines **adaptation** capabilities

  - It delimitates **observed information** and **reasoning methods**

- Several **context models** are available

  - Different application domains implies different models

  - New application domains starting to use context notion

- It is quite **difficult** to **compare** and to **analyze** available context models

Objectives

○ **Analysis framework**

- Analyze and understand context models
- Contribute development of new models

○ **Study case**

- Context model for Business Process domain

✓ Motivations

✓ Objectives

○ **Context models & Context-aware systems**

○ Analysis framework

○ Study case

    • Context Model for Business Process
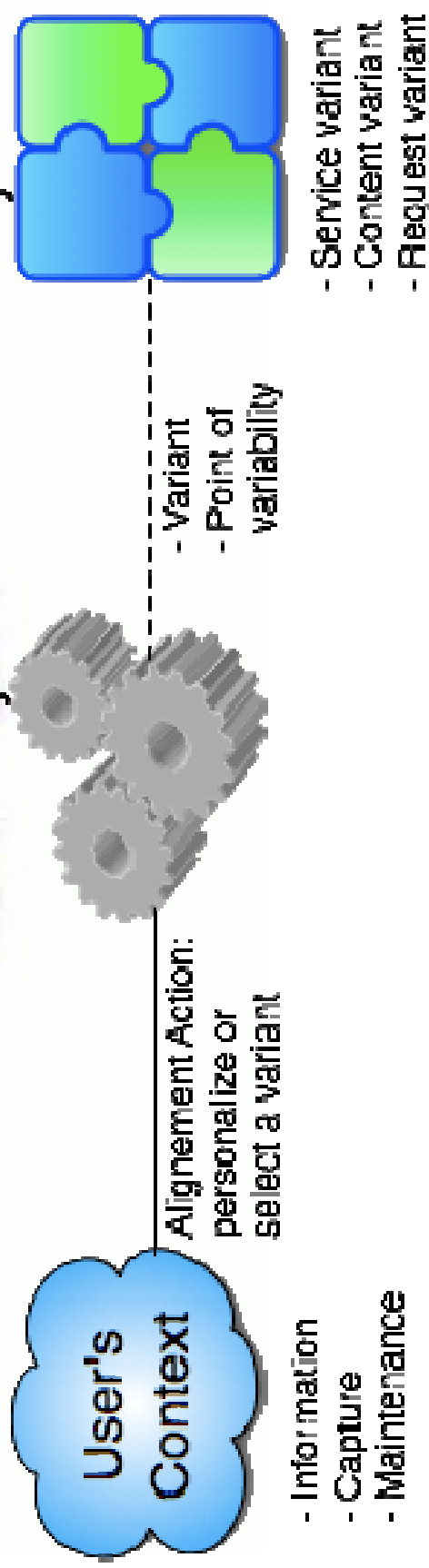
○ Conclusions & Future work

Context models &
Context-aware systems

- ○ New **application domains** starting use context notion
  - Business Process Modeling (BPM)
- ○ Several different **context models available**
  - Different **structures**: from key/values till ontology
  - Different **proposals**: content adaptation, service composition, discovery...
  - **Observed context** differs from a system to another
  - **Capture and maintenance** often not considered

Context models &
Context-aware systems

○ Context-aware systems

- Different **behavior** face to context changes

- Context as a parameter for support **variability**

Information System

- Service variant
- Content variant
- Request variant

- Variant
- Point of variability

Variable System

User's Context

Alignement Action: personalize or select a variant

- Information
- Capture
- Maintenance

CIAO'09 / ESWC'09

✓ Motivations

✓ Objectives

✓ Context models & Context-aware systems

○ **Analysis framework**

○ Study case

  • Context Model for Business Process

○ Conclusions & Future work

Analysis framework

○ **Goals**

- Analyzing and evaluating context models
- Helping understanding of such models
- Contributing with new models definition

○ **Evaluation criteria**

Information	Structure	Capture	Maintenance	Reasoning	Action
What context information should be observed?	How this information is represented?	What is the method used to obtain this information?	How we can maintain this information up-to-date?	Is it possible to interpret this information?	What are the actions taken based on the model?

Analysis framework

○ Examples

• Tonielli et al. 2008

Information	Structure	Capture	Maintenance	Reasoning	Action
User, device and service profile	++ (ontology)	++ (automatic)	++ monitoring)	++ (semantic matching)	Discovery & configuration services

• Kirsch-Pinheiro et al. 2004

Information	Structure	Capture	Maintenance	Reasoning	Action
User physical & collaborative context	+ (OO model)	-	-	+ (similarity measures)	Content filtering

Analysis framework

- Most of context models adopt a **user-centric** vision

  – Users participate to business process

  – Such process influence user's behavior

- **Context-aware systems** and **context models** may evolve to external spheres
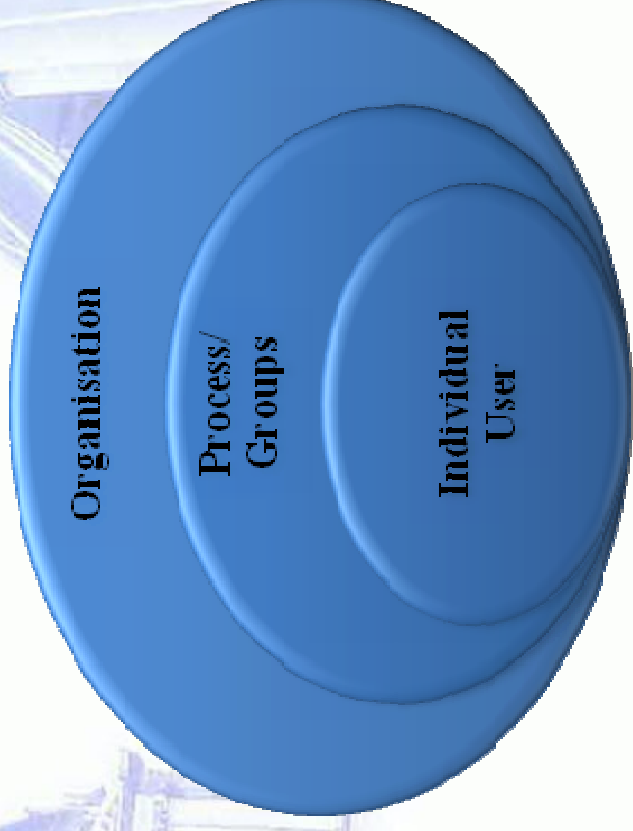

Context sphere

Organisation

Process/ Groups

Individual User

√ Motivations

√ Objectives

√ Context models & Context-aware systems

√ Analysis framework

○ **Study case**

   • **Context Model for Business Process**

○ Conclusions & Future work

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Context Model for
Business Process (CM4BP)

○ **Business process (BP)**
- Linked activities that realise a business objective within an organisation

○ **Role**
- Responsibilities of each **actor** (a user)
- **Tasks** are assigned to roles, allocated to actors

○ **Business flexibility**
- Context knowledge allows **adapting** business process
- **Variability** on the BP
- Ex.: assignment of a role to an actor that vary according to user's context

# Role-based Business Process Meta-Model (RBPM)
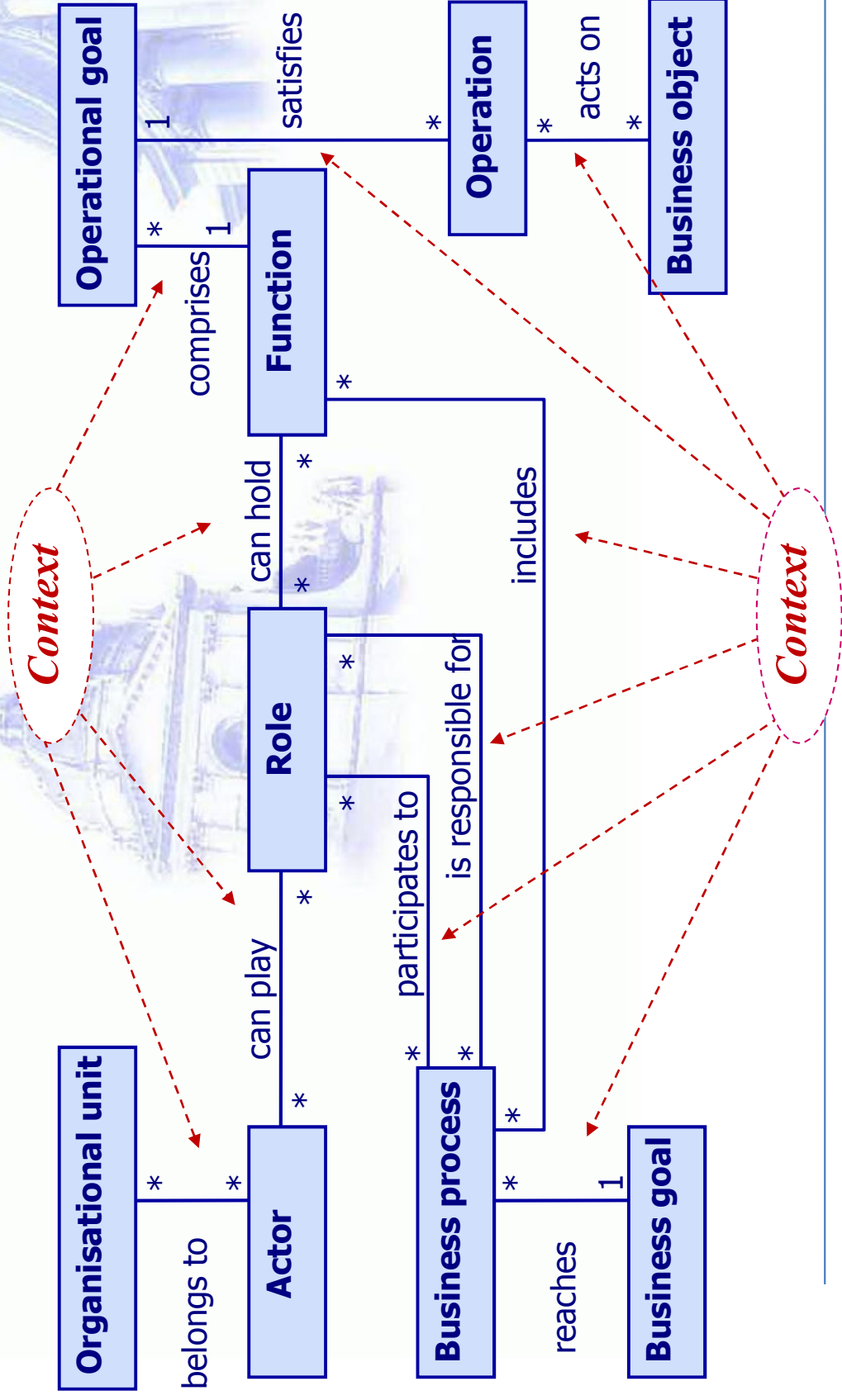
CM4BP: information

○ **Information criterion**

 • What context information should be observed?

○ Defining **relevant context information** on a BP

 • any information reflecting changing circumstances during the modeling and the execution of a BP

○ Possible **context elements**

 • User's experience, availability, achievement history ...

 • Physical elements: location, time, device...

○ **Observed Entities**

 • Process, actor, role...

CM4BP: structure
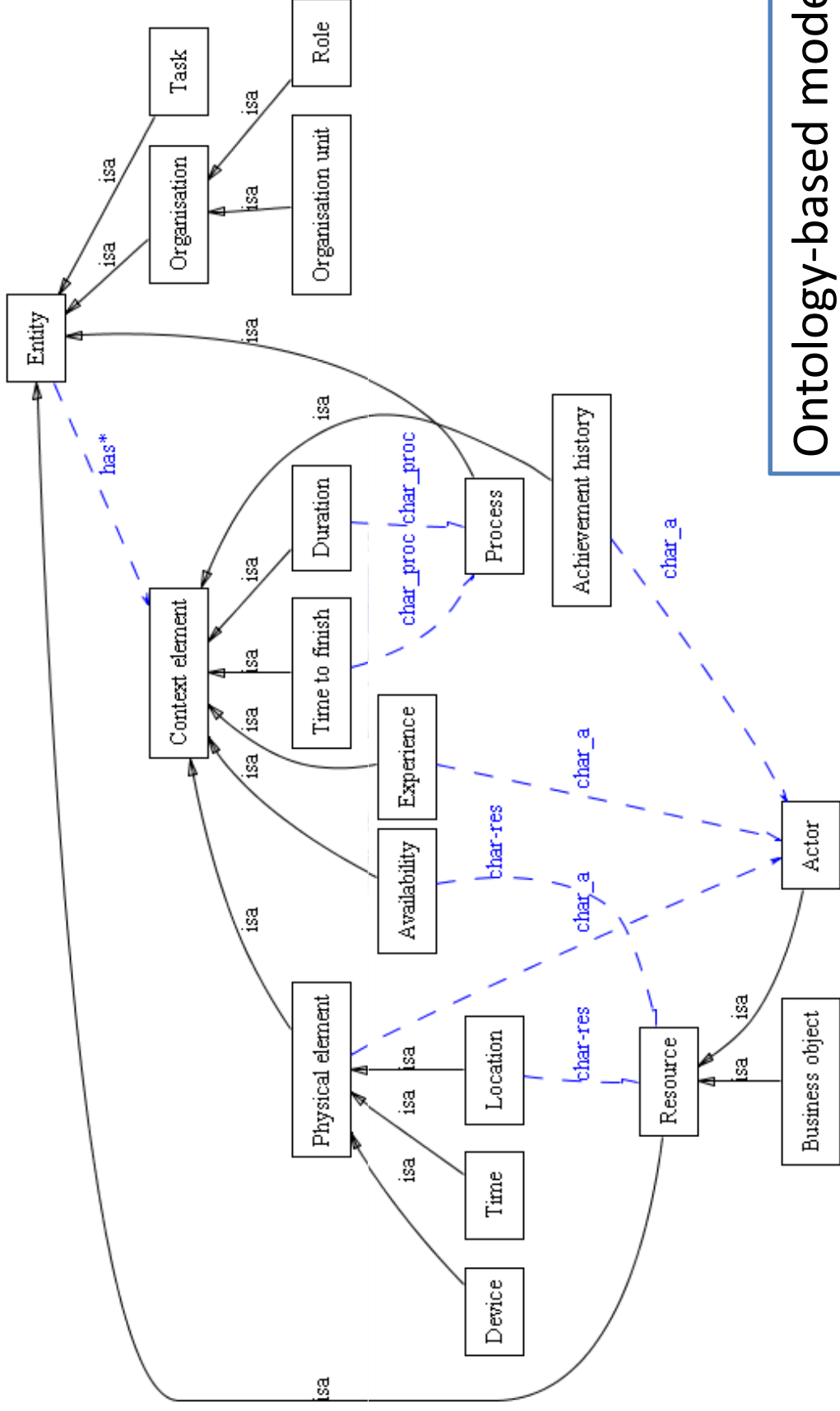
Ontology-based model

CM4BP: reasoning

○ **Reasoning by first-order logic**

○ Predicate **CRK (Attribut, Subject, Link, Values)**

- **ATTRIBUTE** : context element involved on the predicate
- **SUBJECT** : context entity that is concerned (e.g. actor)
- **VALUE** : the attribute value
- **LINK** : relation binding the attribute and the value.
  - Preposition (in, at), comparison operator (=, >), adverb (near)

CRK (Experience, Georges, >, 5 years)

$\forall x, x \in ACT, ACT \subseteq ACTORS, CRK(Experience, x, >, 5\ years)$

CM4BP

○ Resuming

Information	Structure	Capture	Maintenance	Reasoning	Action
Context elements (experience, history, location, device....) for context entities (user, role....)	++ (ontology)	-	-	++ (1st order logic)	Process enactment, process flexibility

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Conclusions & Future work

o **Context model** as a parameter for adapting system behavior

  • **Relevant** context information **differs** from a domain application to another

o **Analysis framework**

  • Analyzing and comparing different context models

o **CM4BP**

  • Context model focusing business process flexibility

Conclusions & Future work

○ **Perspectives**

- Exploring analysis framework on SOA-based systems
  - ▪ Adapting supplied services
  - ▪ Exploring high levels on context sphere
- Exploring capture and maintenance issues on CM4BP