Semantic Web Fred:

Project Objectives & SWF Framework

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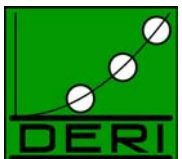
Net Dynamics



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Project Information

- Duration: 18 Month, started in Jan. 2004
- funded by WWFF
  - Co Operate Programme 2003
  - Priced as 2nd best Proposal in Call
- Partners
  - Net Dynamics
  - DERI Innsbruck
- Resources:
  - Website: http://nextwebgeneration.com/projects/swf/
  - SWF Framework: http://www.nextwebgeneration.org/projects/swf/papers/SWF-D1-SWFFramework-final.pdf
  - SFRED Whitepaper: http://www.netdynamics-tech.com/media/downloads/FRED-WhitePaper.pdf

Objectives

- enhance FRED technology for Automated Cooperation
- align FRED technology with emerging SWS technologies
- significant contribution to SWS technologies development
- an Integrated System of:
  - Agent Technology
  - Ontologies
  - goal-driven Service Resolution
  - Mediation Facilities
- SWF in FRED Environment & SWF in Semantic Web Environment

Starting Position

- **FRED system as existing:**

  FredBase: agent runtime environment
  - Agents are called Freds
  - Freds interact in Meetings

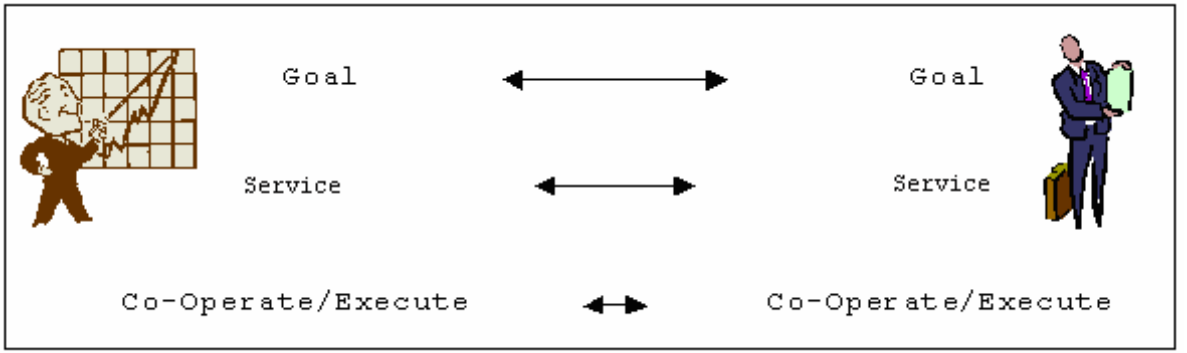
  Smart Objects: Ontology Data Handling Technology
  - Ontology Objects are transformed into Java Objects => Java Technologies for Ontology Usage & Management
  - Complete Ontology Management system, expressiveness mostly equivalent to OWL

  Goal-driven Task Resolution: Goals, Plans, Processes and Resolution Mechanisms existent, but rudimentary
- **WSMO**
- **SWS Technologies:**

  RDF / OWL, OWL-S, WSDL, SOAP, UDDI, WSIL, WSCI, WSCL, BEPL4WS, …

Cooperation Model

Aim: Map real world Cooperation Model into Software



=> **Symmetry** of cooperating parties:

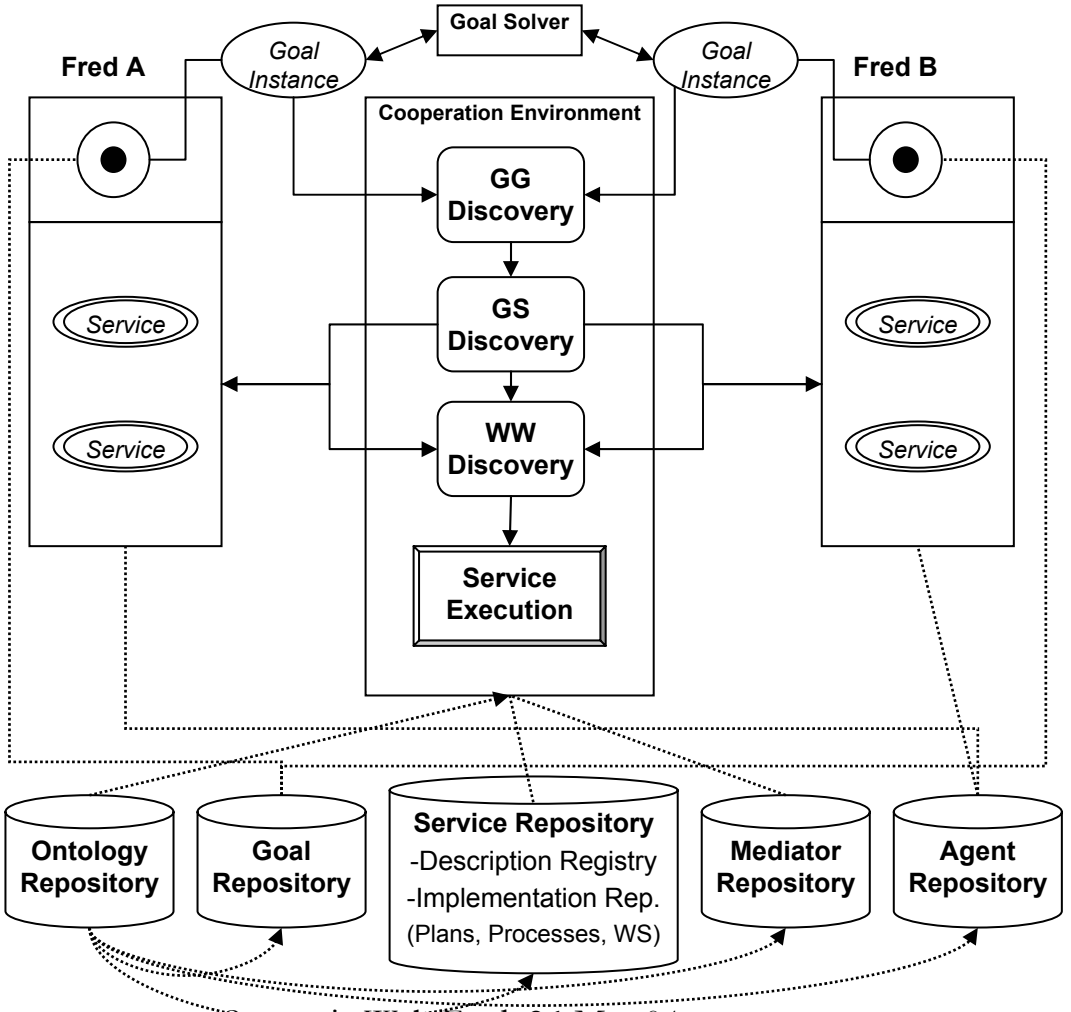
- Why:
  - Goals can only be achieved by cooperation of several parties
    (e.g. the CEO needs salesman for increasing company's success, salesman needs CEO for increase sale rate)
  - Every party is requester and provider at the same time
- Implication for System Architecture: **all potential partners need to have Goals and Services**

Implications on System Architecture

- **De-Coupling** of Requester and Provider
- **Symmetry** of cooperating parties
- **Dynamic Resolution** of Cooperation and Services at runtime
- **High Re-usability** of Components
- **Heterogeneity** of Resources

=> Very similar to Semantic Web Services

SWF Architecture

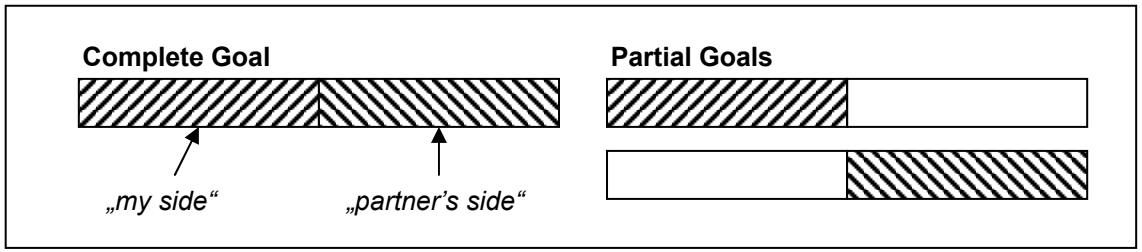


Ontologies

- provide machine readable terminology
- Domain Ontologies & System Ontologies
- Two "styles"
  - Smart Object Technology: to be internally used in plans and processes as before (Ontology API, mainly used to manipulate instances in applications)
  - WSMO Technology: to be used in all external descriptions like goal description and service description, mainly used in discovery by reasoner(s)
  - Map between both

Cooperative Goals

- Usage of Goals in SWF:
  - Decouple partners by function, time and resource
  - Search/Request for Cooperation (sell goal and buy goal -> cooperate)
  - Goal-driven Service Resolution (buy goal -> buyer's service)
- Cooperative Goals:
  - Object of Interest
  - Cooperation Role
- Goals Schemas & Goal Instances
- Partial description of a Goal Instance (how much of "cooperation" in advance?)
  - How much does the requester know about "future" provider?
  - Partial Goal: only from owner's perspective (more realistic)



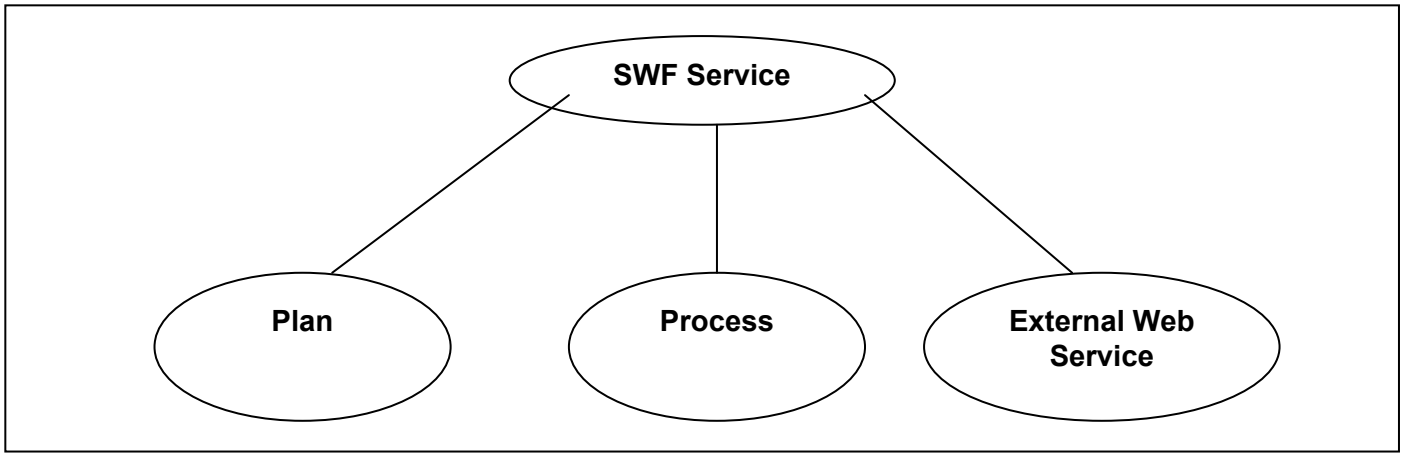
Cooperative Goal Description

- WSMO – Goal Description Elements
  - Imported Ontologies / Used Mediators
  - Postconditions
  - Effects
  - Non Functional Properties

- Additional for Goal Instances (to be verified):
  - Owner, Creation Date
  - Goal Instance Resolution Steps: : “created”, “pending”, “inProgress”, “resolved”

SWF Service Model

3 Types of Services:



- Common Description Language: WSMO (with modification / extensions)
- Distinct implementation languages: plan framework, Java, XPDL/E
- Service Type is only of interest during execution

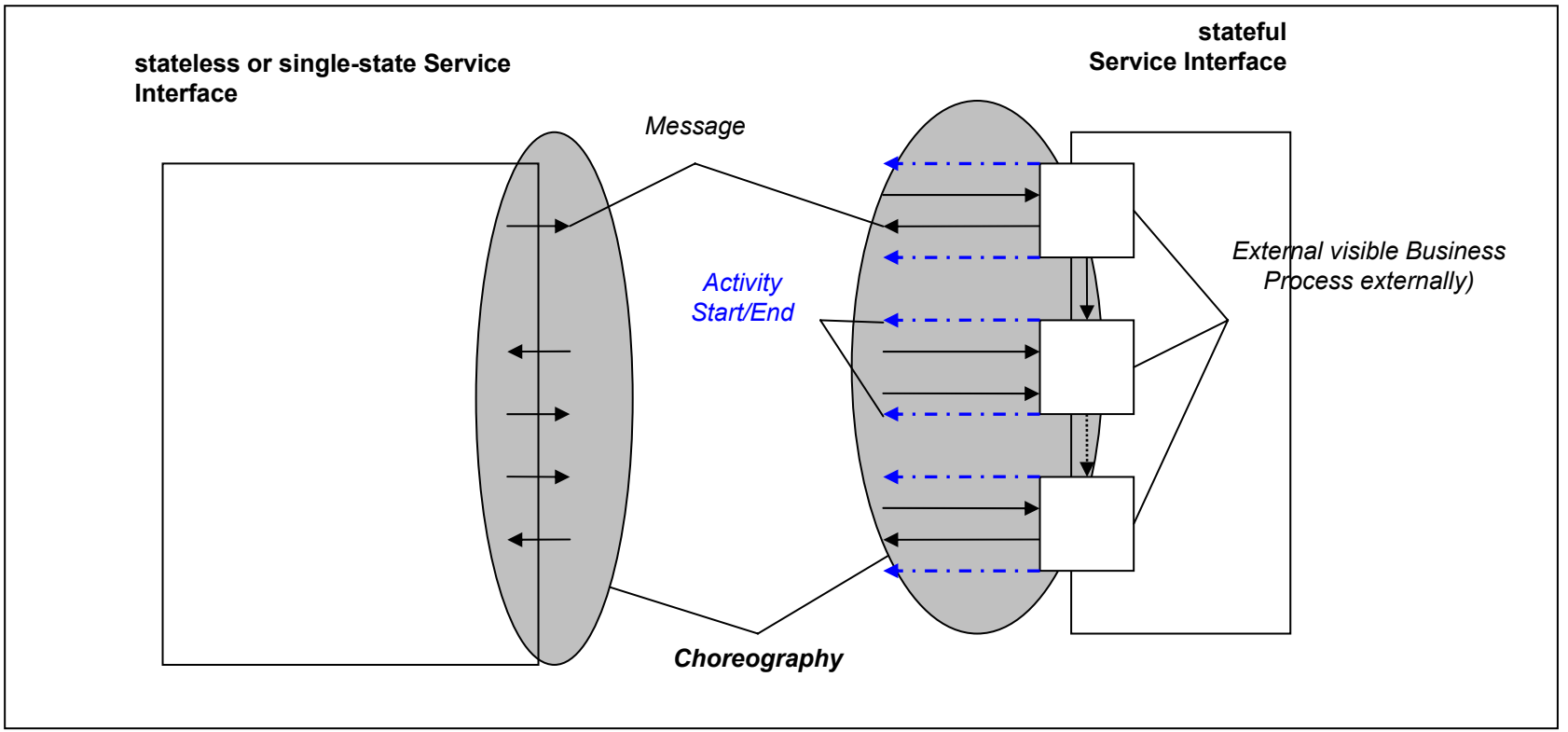
SWF Service Description

Major Description Elements

- Imported Ontologies / Used Mediators
- Capability (like WSMO)
- Interface (only Choreography, see later)
- Grounding (access / binding, error & compensation)
- Service Type
- Non Functional Properties (like WSMO)

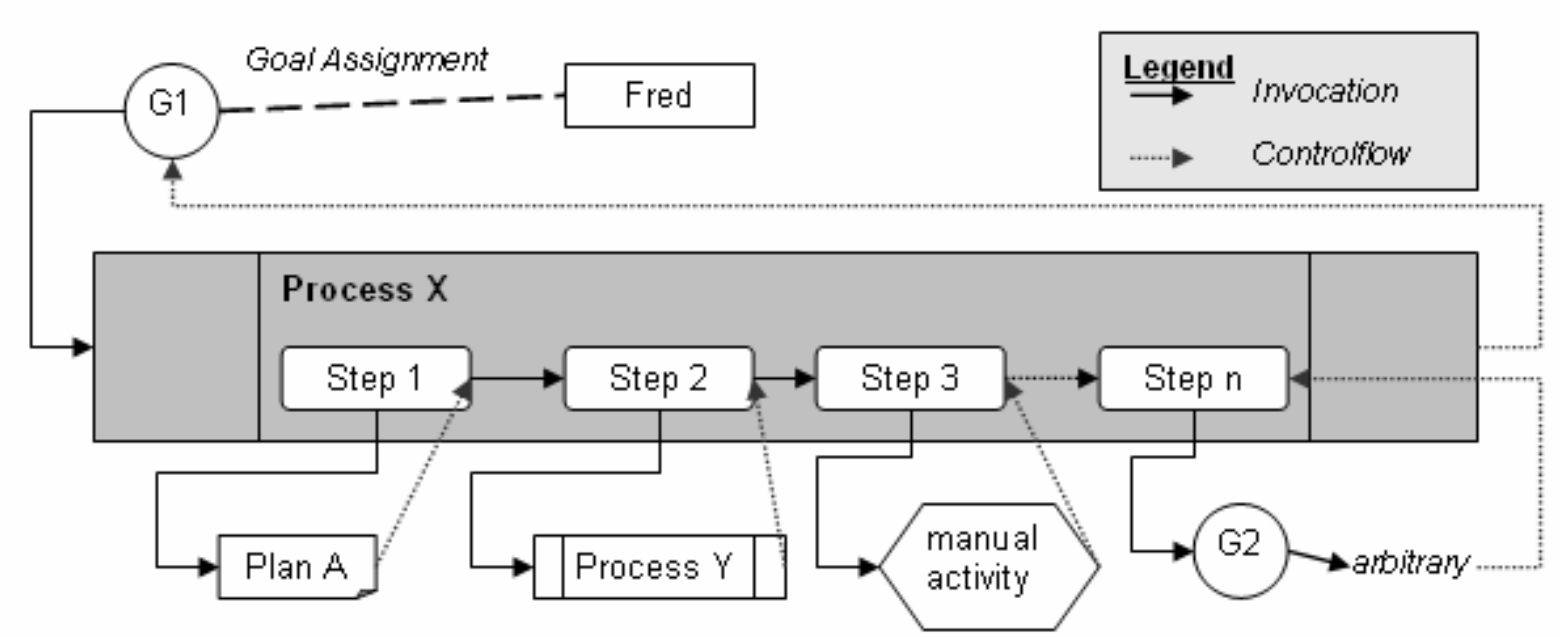
SWF Service Interface

only Choreography (not completely specified yet)



SWF Service Interface (cont.)

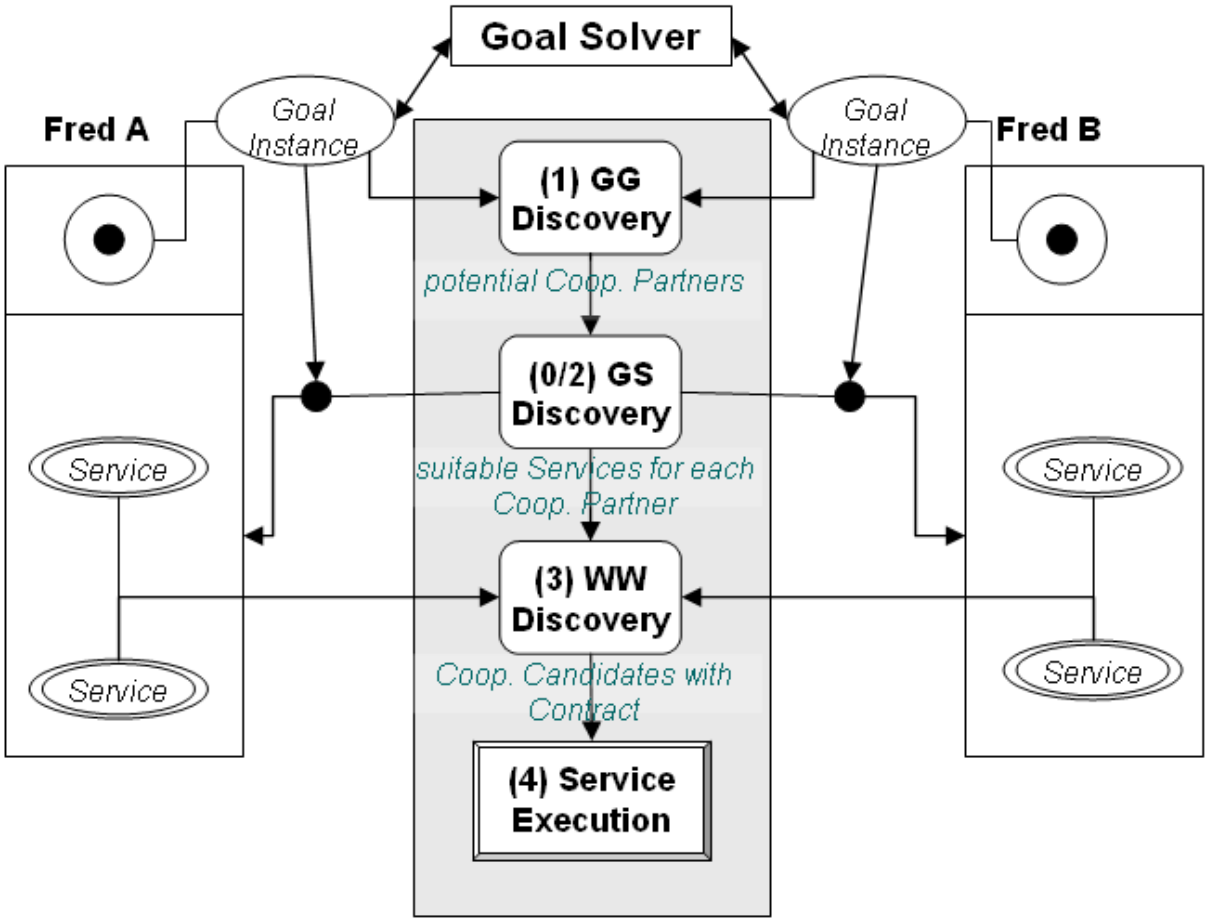
Orchestration covered by FRED Processes



Repositories

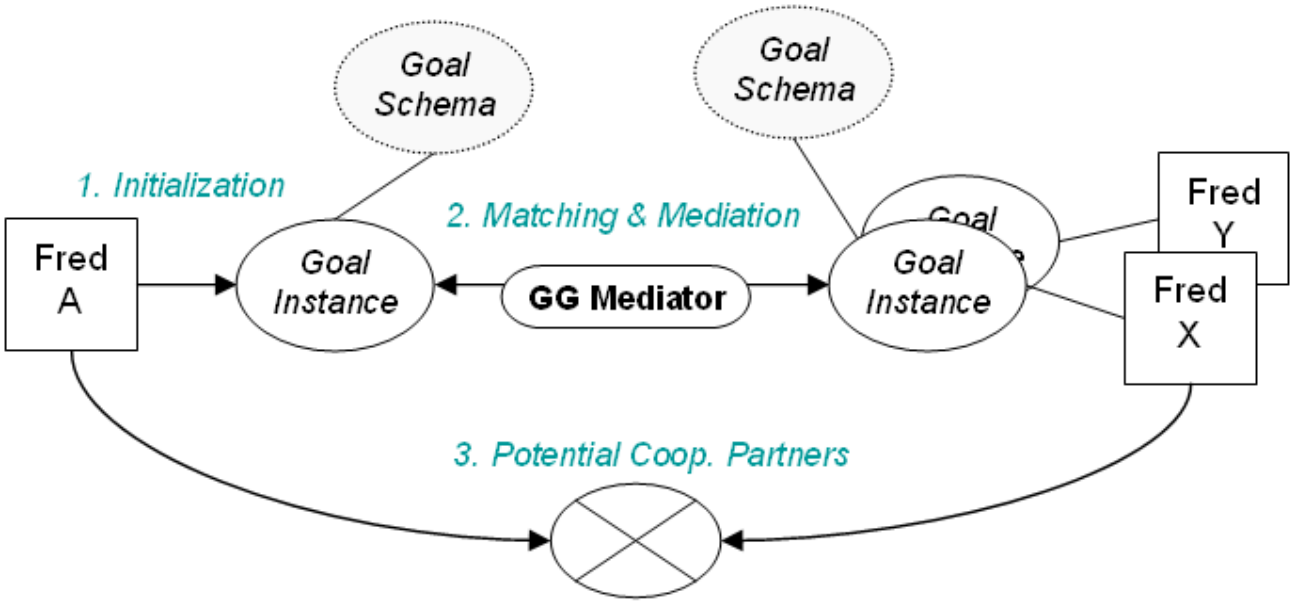
- **Ontology Repository**
  - Smart Objects technology sufficient
- **Goal Repository**
  - Holds Goal Schemas & Goal Instances
- **Service Description Repository**
  - Holds service descriptions
- **Service Repository**
  - Holds Plans & Processes
  - enhanced UDDI Registry (see WSMO D10 – Registry)
- **Agent Repository**
  - Existing in FredBase

Automated Cooperation Workflow



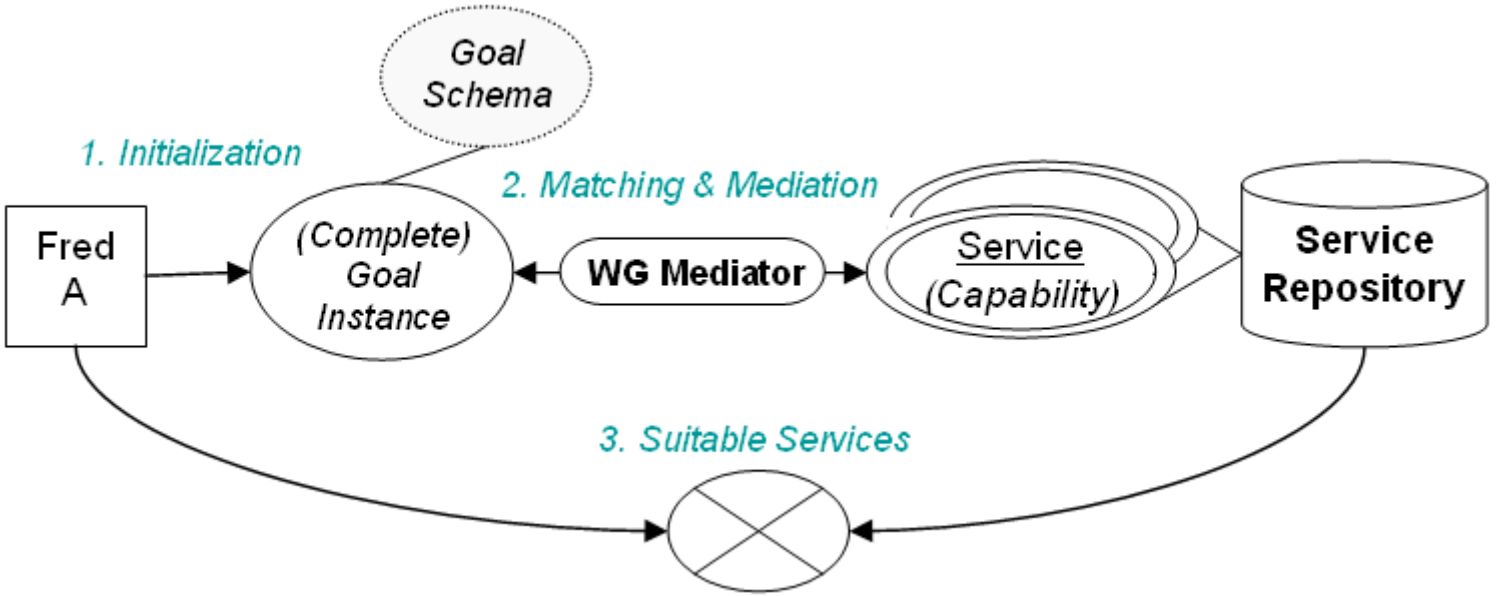
GG Discovery

- Detection of potential cooperation partners by matching Cooperative Goals
- determining Compatibility of Cooperative Goals
  - Object of Interest (the same)
  - Cooperation Role (compatible)



GS Discovery

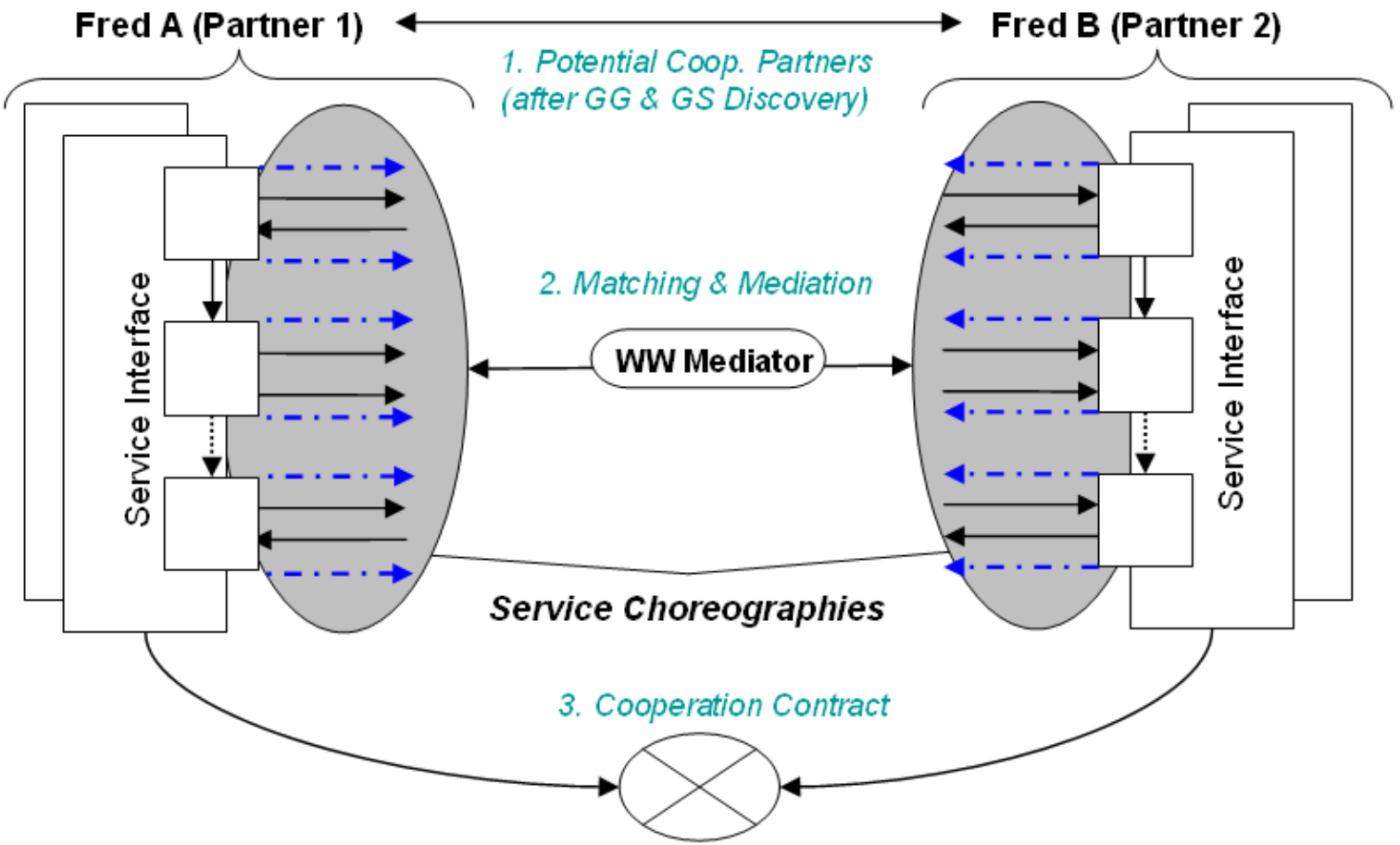
- detection of suitable Services that a partner has to provide for solving a Cooperative Goal
- equivalent to Service Discovery in WSMO



WW Discovery

- Identify Services that can interact according to their choreography ("matching choreographies")
- Mechanism: Service Interface Compatibility by Choreography Matching:
  - Messaging Compatibility Check
  - Behavior Compatibility Check
  - Dynamic Choreography Creation and Adaption
- Use WW Mediator
- Determine Cooperation Contract

WW Discovery



Execution Environment

- Cooperation & Service Invocation
- Cooperation Contract
- Service Execution
  - Resources for Execution of different Service Types
  - Error handling and Compensation
- Meeting Management
- Freds Management

Project Workplan

- SWF Framework: finished
- SWF Goal and Service Description Language Specification

  05 – 07/2004
- SWF Tools and Mechanisms Specification

  08/2004
- SWF Semantic Processing Unit Specification

  01/2005

</ Semantic Web Fred Framework>

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