

After Three Years of WP2 – Triple Space Knowledge Representation



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- Overview
- Scientific results of WP2 in
 - Year one
 - Year two
 - Year three
- Potential extension works

- WP2 had the main task to deal with the issues of:
 - representing semantic data models such as RDF and OWL efficiently and consistency within a tuplespace.
 - modeling the tuples as well as the tuplespaces semantically
 - triples and triplespace organization within Triple Space
 - the relationships and distribution in Triple Space

- Tuple and Tuplespace model
 - State-of-the-art analysis of approaches and their implication for storage and tuplespace interaction
 - Specification of a data model on the basis of the RDF syntax and semantics document
- Specification of the RDF tuple model and of the tuplespace model
 - the form of the triple/tuple
 - the structure of triplespace (subspaces, hierarchy not overlapping)
- Tuplespace ontology

- **Distribution:**
 - Locating relevant information in a distributed triplespace. An approach has been developed that combines index tables for triple patterns with DHT-based location of relevant index information.
 - Specification and development of a distributed indexing system
 - Development of Distribution Manager
- **Metadata:**
 - A basic model for storing RDF data in triplespaces has been extended to support complex structures
 - The metadata model used to describe the triplespaces
 - Development of Metadata Manager

Ontology and rule representation:

- Formal specification of the integration of WSML-Flight semantics in triplespace through:
 - TRREE rule set specification
 - IRIS reasoner
- Implementation of WSML-Core++ rule sets for TRREE reasoner

- We introduced our distribution strategy for Triple Space, and outlined our plans to optimise this through extensions and self-organization
- Following issues were raised after the year 2 review:
 - „There is no clear indication what level of reasoning support is actually needed“
 - „An open problem that still needs to be addressed is the way derivable information is indexed“

- Optimization:
 - Improvement in design and development of Distribution Manager and Metadata Manager components
 - In the DM, we introduced extra look-up tables which make the look-up more efficient and increase the chance to find *inferred* triples
- Self-organization in Triple Space
 - Provided three concepts for the self-organization:
 - Self load-balancing
 - Client Proximity
 - Semantic Relationship
 - Detail specifications of self load-balancing

■ 4 Deliverables, 9 Tasks

WP2: Triple Space Knowledge Representation

D2.1	<u>Representing RDF semantics in tuples.</u>	R	PU	M12	<u>FUB</u>
D2.2	<u>Specification of Triple Space ontology.</u>	R	PU	M12	<u>LFUI</u>
D2.3	<u>Ontology and rule representation in a tuple space.</u>	R	PU	M24	<u>ONTO</u>
D2.4	<u>Semantic Clustering and Self-Organisation in Triple Space.</u>	P	PU	M28	<u>FUB</u>

WP 2: Triple Space Knowledge						FUB	LFUI	TUW	ONTO	TID			
					Target PM	22	15	6	18	2	63		
	In charge	Start	End	Duration							Sum	Deliverable	Estimated PM
T2.1	RDF representation as tuples	1	6	6	6	1			2	0,5		D2.1	20
T2.2	Triple space ontology	1	12	12	3	3,5			2	0,5		D2.2	12
T2.3	Implementation RDF tuplespace	7	12	6	1	1		2,5				D2.1	20
T2.4	Specification semantic clustering	13	18	6	2	2	1			1		D2.4	18
T2.5	Evaluation of T2.1 and T2.3 w.r.t. OWL and beyond	13	18	6	2,5	1			3			D2.3	13
T2.6	Implementation semantic clustering	19	23	4	2	1	2	1,5				D2.4	18
T2.7	OWL and rules representation as tuples	19	24	5	3	4,5			6			D2.3	13
T2.8	Implementation self-organization clustering	24	28	4	2,5	0	2					D2.4	18
T2.9	Evaluation of implementation/Integration to WP6	29	36	7		1	1		1			D6.4	
Sum					22	15	6	18	2				

- Distribution in Triple Space
 - Methodologies for the triplspace locating
 - Approaches for the index generation and storage (other than three times storage of indexes)
 - Rule-based clustering of triplesaces between storage nodes (Semantic rules, ontology rules ...)
- Self-organization
 - Swarm-based approaches
 - Model-driven self-organization
 - Self-adaptation and self-healing in Triple Space

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