

Tripcom

Project Presentation



March 2009



- Facts and Figures
- Vision
- Core Objectives
- Triple Space Architecture
- Use Cases
- Dissemination and Exploitation

Facts & Figures



■ Time

- Start date: April 2006
- End date: March 2009
- Duration: 36 months

■ Partnership

- Number of partners: 9
- Number of countries: 7
(AUT, BUL, ESP, FIN, GER, IRL, ITA)

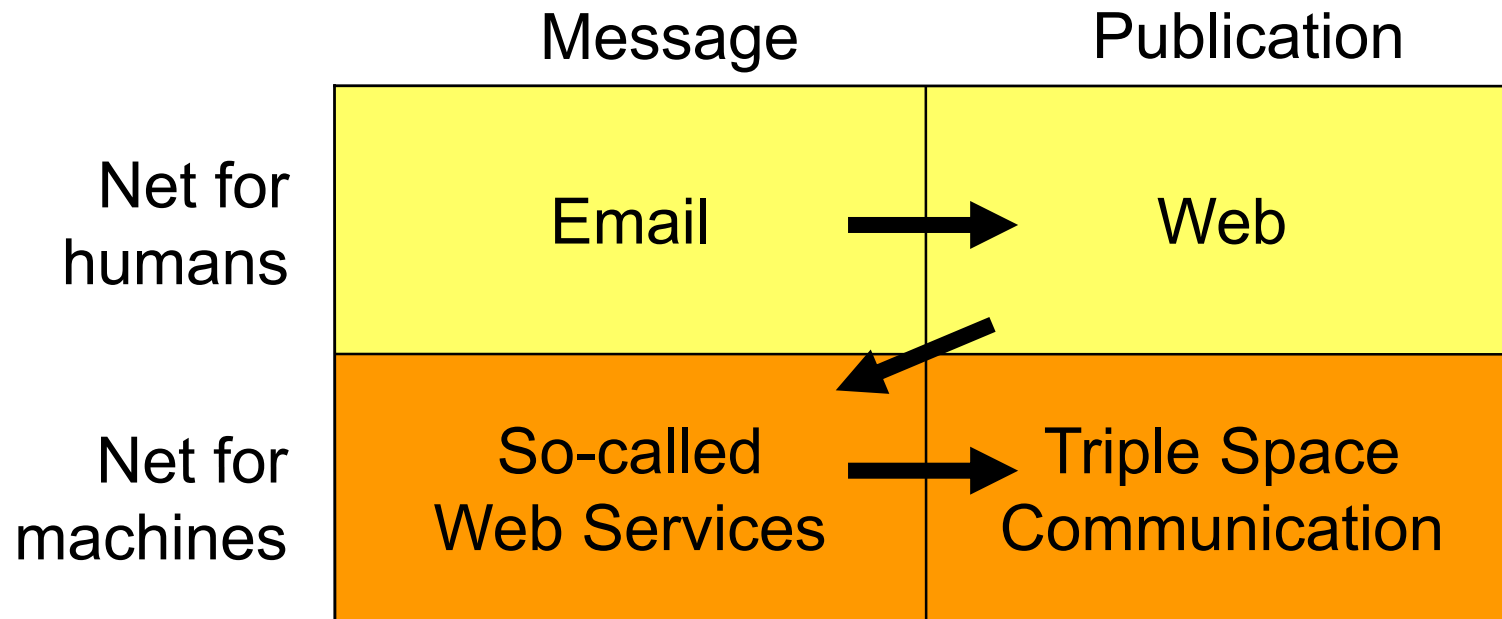
■ Work

- Number of work packages: 10
- Number of deliverables: 46
- Number of person months: 623

■ Money

- Budget total: €4,661,110
- EC funding: €3,650,000

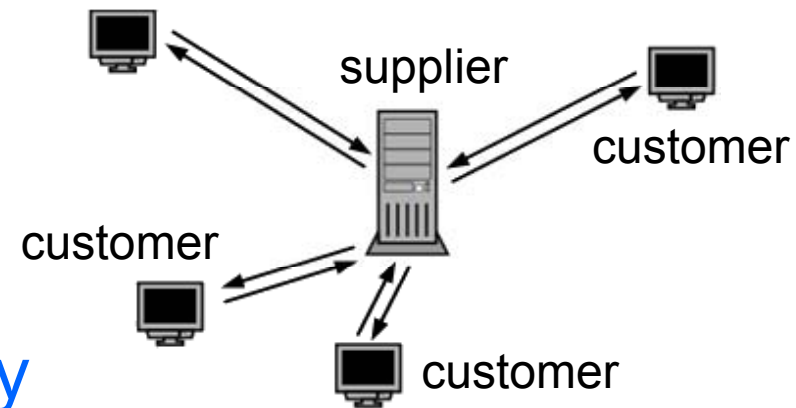




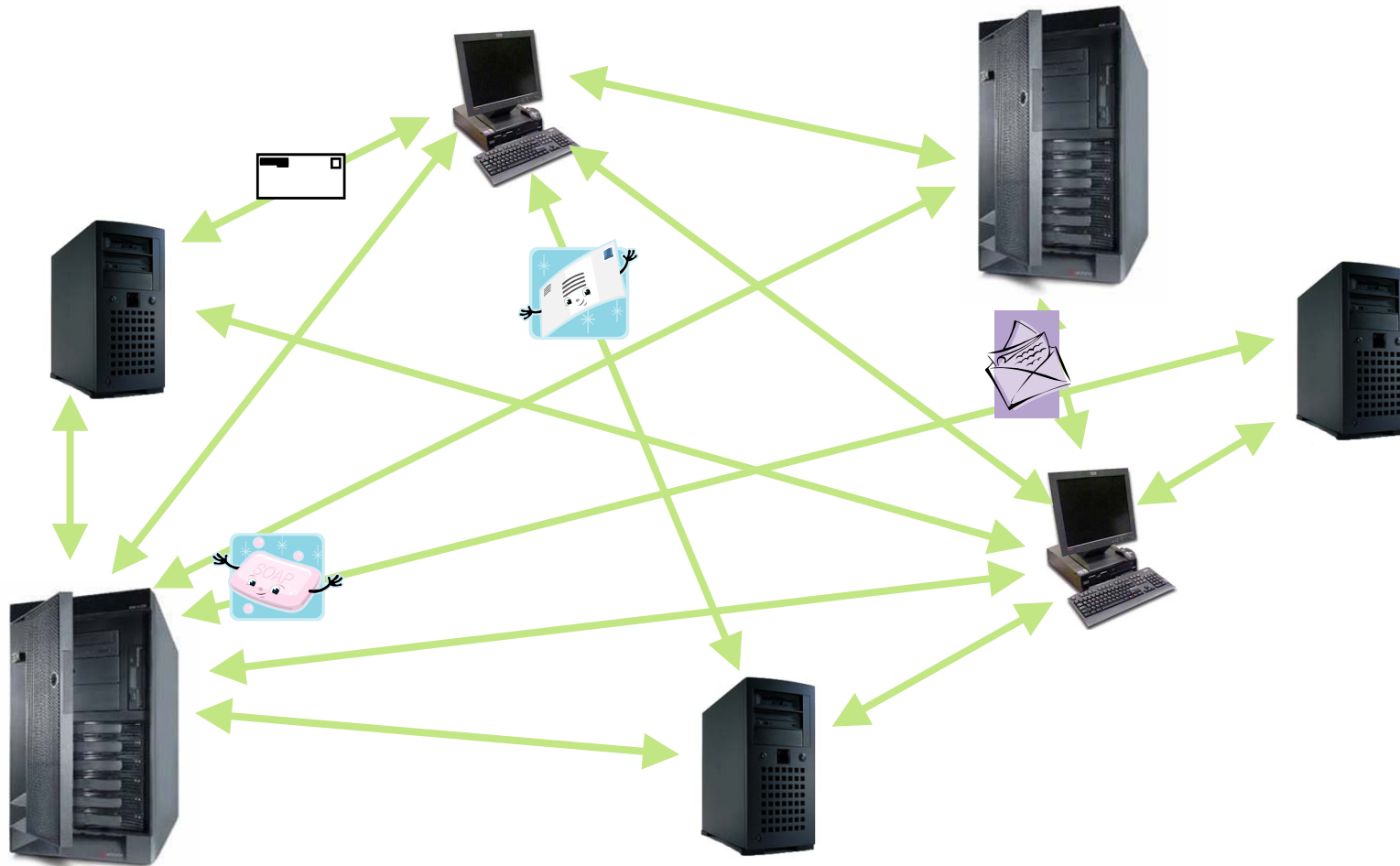
“Triple Space may become the Web for machines as the Web based on HTML became the Web for humans”

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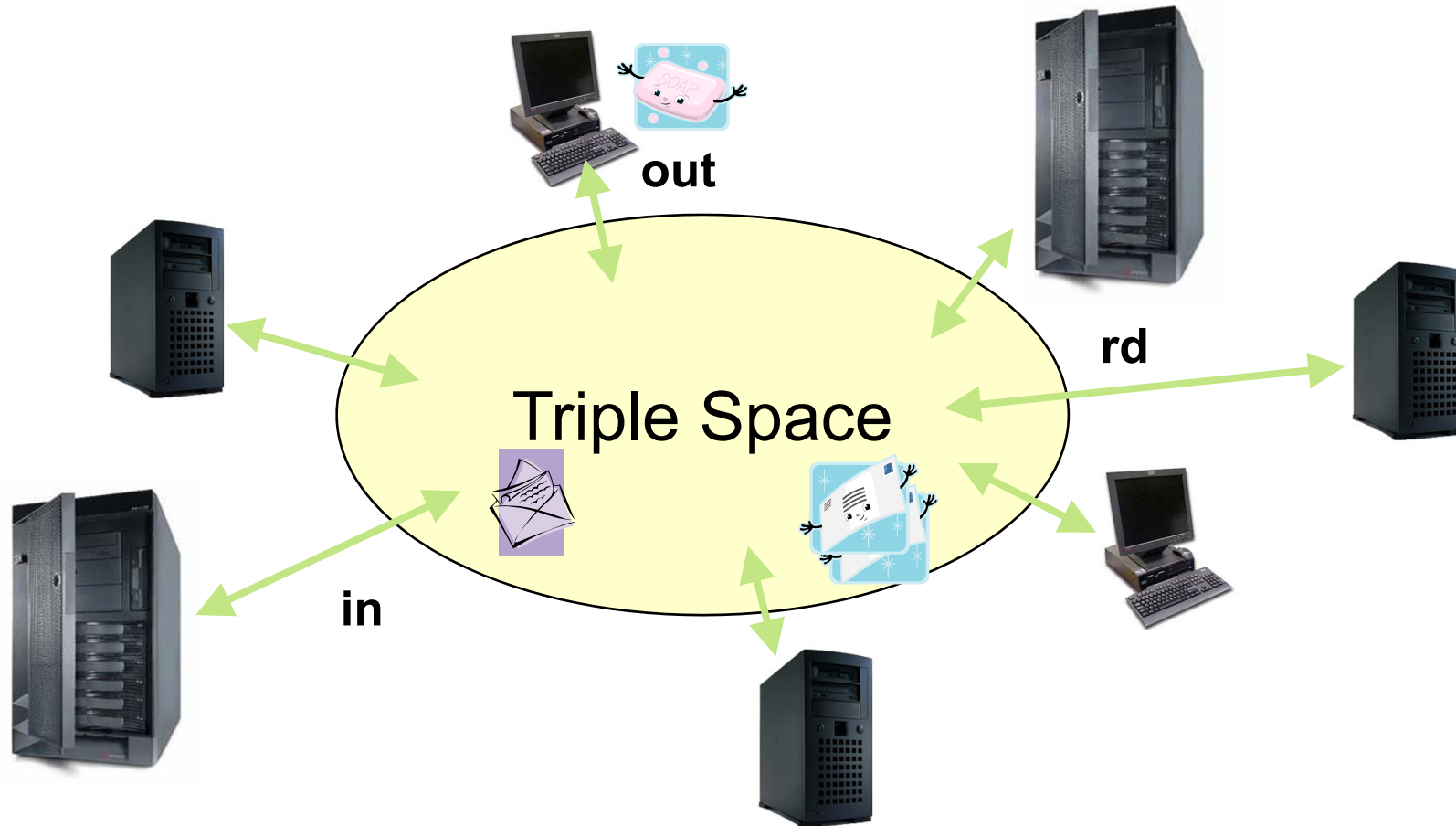
- Web based computer interaction dominated by **message exchange based communication**.
 - Web services / SOAP
 - Agents
- Does not follow the Web architecture and **results in unnecessary complexity** on machine to machine interaction.
- Web scales to its current size because it uses **persistent publication** as the communication paradigm as well as defined interfaces and uniform addressing.



Message Based Communication



Message are passed directly between entities.

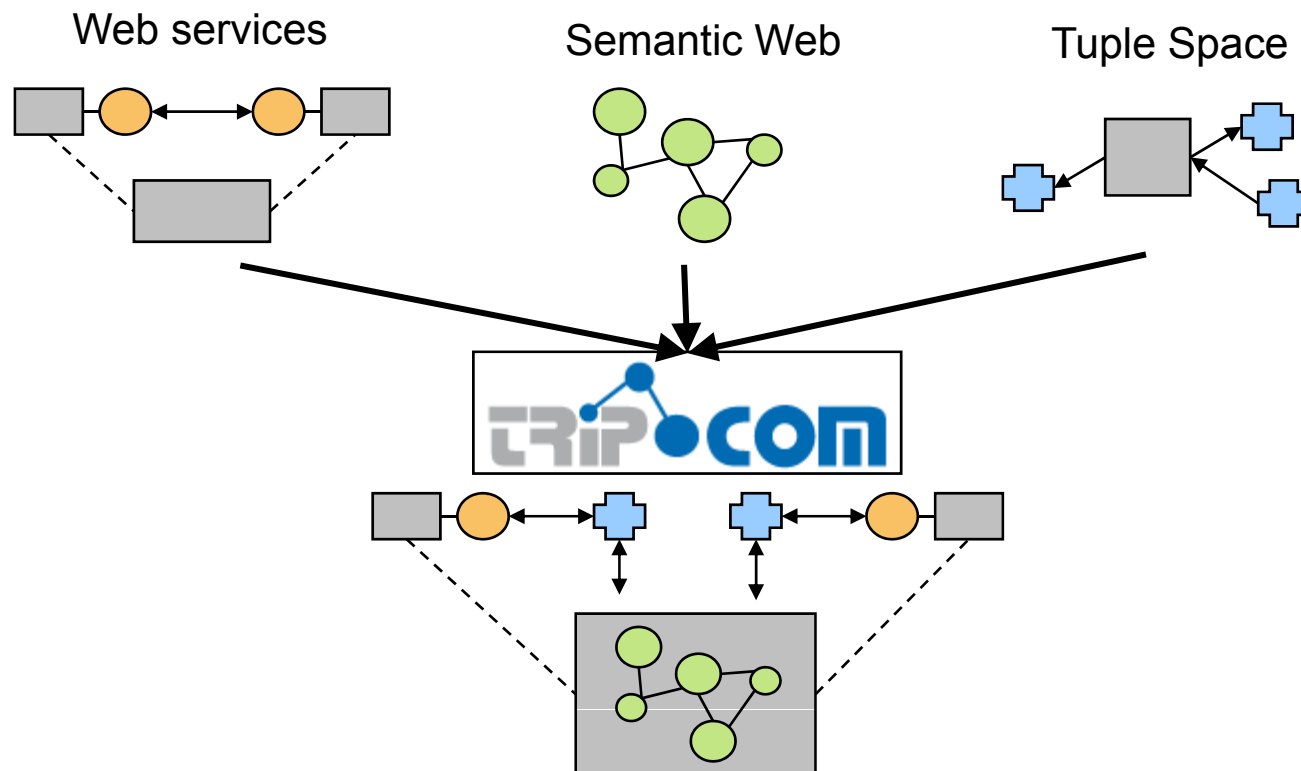


Message are exchanged between entities over an intermediary using a simple interface.

The Result



Triple Spaces provide a communication paradigm for *anonymous* and *asynchronous* information exchange that ensures the *persistency* and *unique identification* of the communicated *semantic, semi-structured* data.



Semantic Web + Web Services

Semantic Web Services

Semantic Web + Tuple Spaces

Triple Space

Semantic Web Services + Triple Space



- Based on Tuplespaces model for parallel computing (Linda language, Yale, ~1982)
- Idea:
 - A space contains items (“tuples”)
 - Items can be put into the space (**out**)
 - Items can be read (**rd**) or withdrawn (**in**) from the space
 - A “matching” rule guides what is withdrawn relative to a pattern (“template”)
 - Data is addressed associatively
 - Very high-level coordination model with a simple API

- From Tuplespace to Triple Space, influenced by Semantic Web technologies
 - Tuples are extended to support RDF Triples in the space
 - The primitives `out/in/rd` are extended with operations on the space that take into account the specifics of “semantic tuples”
 - Matching uses inference

- **Time autonomy** means
 - No time dependencies between data provider and reader.
 - Accesses to the triple space and write or read of information at own discretion of process.
- **Location autonomy** means
 - Triple space as a storage location is independent from any storage space in the provider or reader of data.
 - Complete independence is achieved by ensuring that triples are passed to and from the triple space by value and in the format required by the triple space.
- **Reference autonomy** means
 - Provider and reader of data do not have to know each other
 - Reading and writing of data can be anonymous.
- **Data schema autonomy** means
 - Triples are external data schema
 - Data provider and reader are independent of the internal data schemas they have.

1. Improve the ideas of Tuple Space computing by adding semantics
2. Integration of Web service infrastructure with the newly emerging Triple Space
3. Establishing a novel Semantic Web service paradigm
4. Address the lack of standardized business data ontologies
5. Scalable and linkable Triple Space storage
6. Security and trust mechanisms

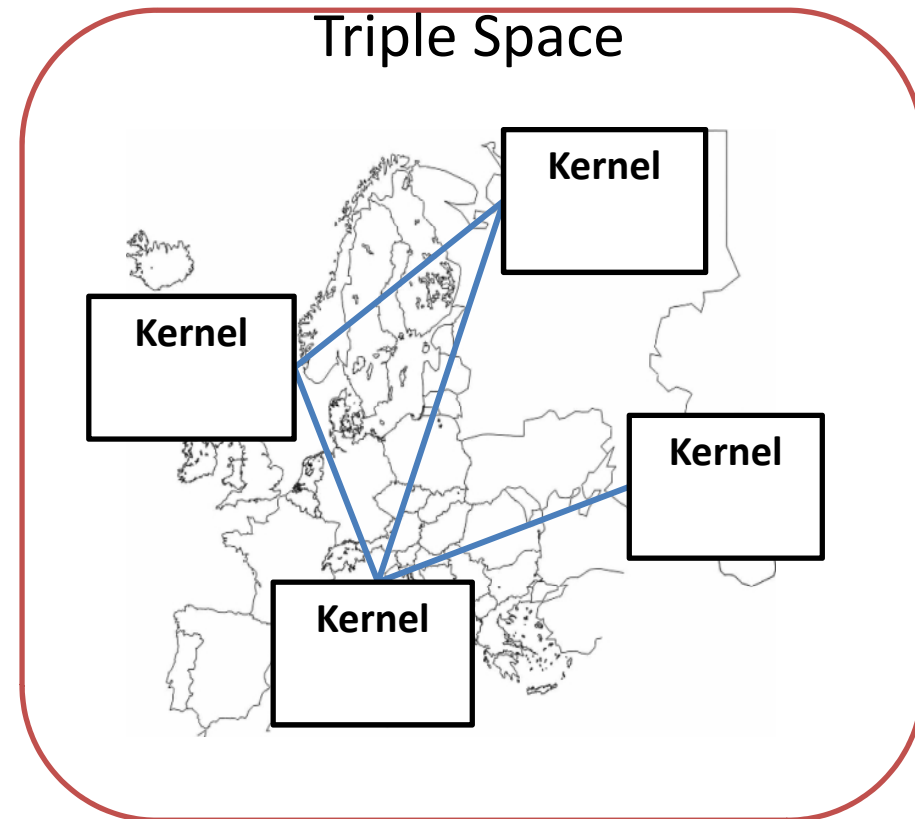
- Reference Architecture (D6.1)
- Reference Implementation (D6.4, D2.3, D3.4)
- High-Performance RDF Repositories (D1.3)
- Solutions to Security & Trust in Distributed Systems (D5.4)
- Integration with WSMO/L/X (D4.5)
- Ontologized Version of Selected EDI Standards (D7.2)
- Realization in Two Concrete Use Cases (D8A.2, D8B.2)
- Standardization impact (D9.5) in
 - Semantic Web
 - Semantic Web Services
 - Coordination Systems

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High-level View of Triple Space

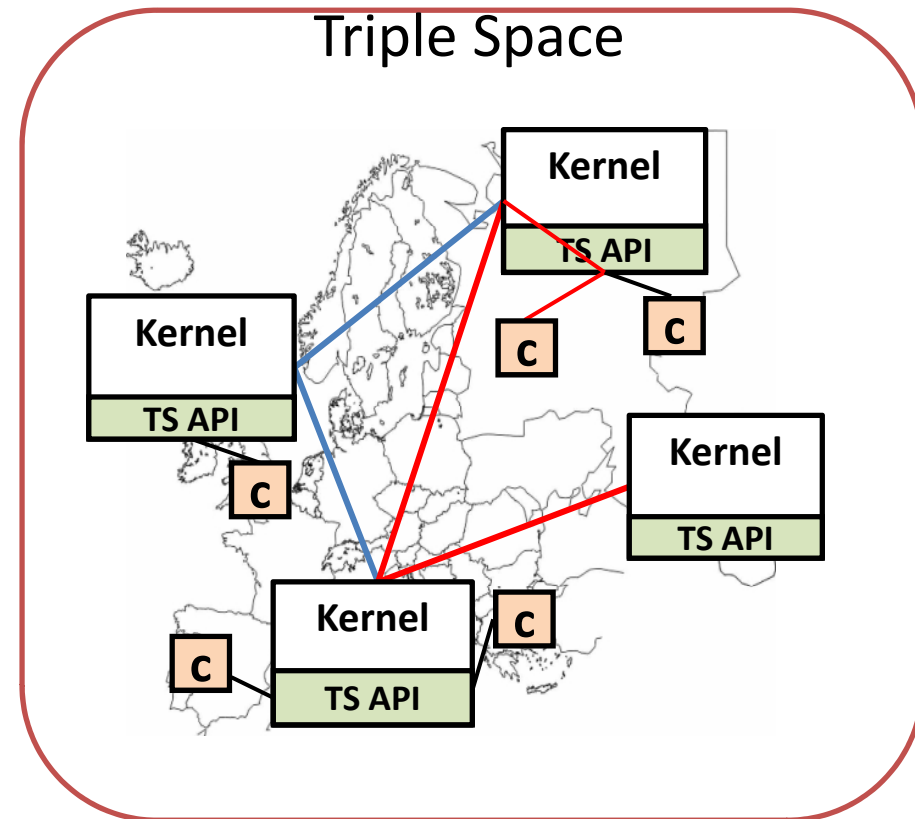


- Distributed Infrastructure
 - Without a central, single point of control
 - Consisting of multiple kernels



High-level View of Triple Space

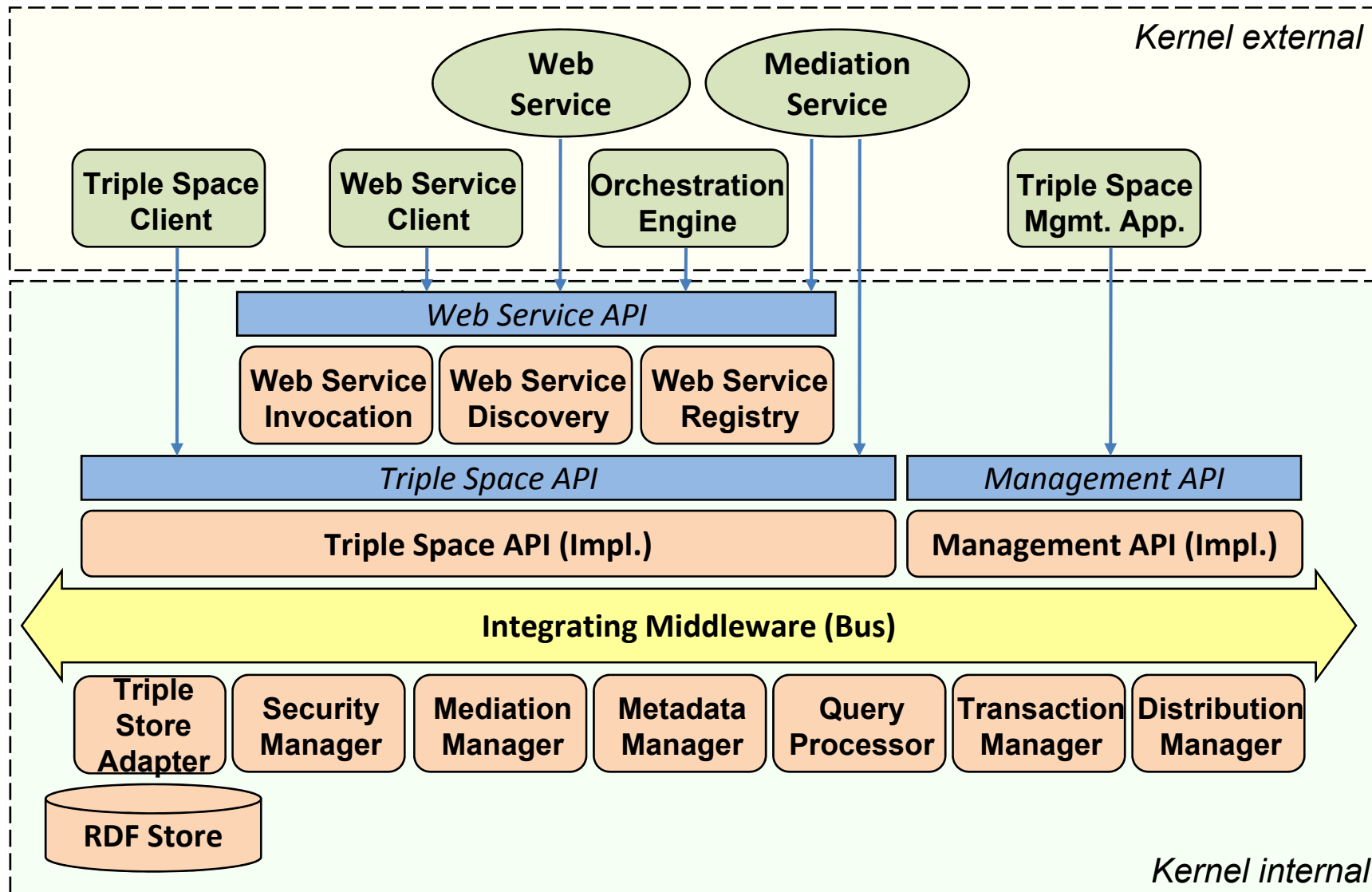
- Distributed infrastructure
 - Without a central, single point of control
 - Consisting of multiple kernels
- Kernel
 - Exposes the Triple Space API
 - Manages a subset of Triple Space data
 - Distributes requests
 - Is under a single authority
- All data is accessed transparently through an arbitrary TS API / kernel



C ... Triple Space Client Application

- **Persistent publication** of semantic data
- Retrieval by **semantic matching** in a **time-** and **space-independent** manner
- **Mediation** of data between heterogeneous services
- **Coordination** of concurrent access situations
- Appropriate **security and trust** mechanisms
- Use of **Web service protocol stack** and **Semantic Web** technologies
- **Industrial scenarios** with requirements of scalability, robustness, and flexibility

Triple Space Architecture



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- Aim: Realise Triple Space as a global infrastructure for machine communication of semantic data based on the Web principles of persistent publication and simple interaction
- Specific use cases in the project:
 - Extend Semantic Web Service communication
 - Enhance EAI with semantics and coordination
 - Enable the infrastructure necessary to support a European Patient Summary

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Dissemination Channels



<http://essi-cluster.org/>



SEKT (Semantically-Enabled Knowledge Technologies), <http://sekt.semanticweb.org/>



DIP (Data, Information and Process with Semantic Web Services), <http://www.nextwebgeneration.org/projects/dip/>



Knowledge Web
<http://knowledgeweb.semanticweb.org/>

Other Related efforts/projects:



Super <http://www.ip-super.org>
Cocoon <http://www.cocoon-health.com/>
Infrawebs <http://www.infrawebs.org/>

Target Standardization Bodies:



World Wide Web consortium (W3C)



Organization for the Advancement of Structured Information Standards (OASIS)

- Events organized or co-organized by TripCom
 - **Workshop** on *Middleware for the Semantic Web: Enabling a Web of Knowledge and Services (MSW)* at ICSC 2008 and 2009
 - International **Workshop** On Semantic Extensions to Middleware: Enabling Large Scale Knowledge Applications (SEMELS '08) at OnTheMove 2008 and 2009
 - Received offer to continue this workshop for the next 5 years
 - **Workshop** on *Coordination Models and Applications: Knowledge in Pervasive Environments (CoMA)* at WETICE 2008 and 2009
 - IEEE International **Conference** on Semantic Computing – Special Session on „Scalability in Semantic Computing: The European View“ at ICSC 2008 and 2009
 - **Journal** of Software: Special Issue on Semantic Extensions to Middleware, 2009
 - **Conference**: Future of the Internet Symposium (FIS 2008)
 - **Tutorial**: "TripCom: Large-Scale Knowledge Applications“ at FIS 2008
- Public Available **Ontologies** : EDIFACT, EAI, eHealth, BPEL
 - Available under: <http://www.tripcom.org/ontologies>

- Nokia 
 - Exchange of experiences with Nokia Research, Helsinki
 - *Triple-Space Based Computation Platform – Sedvice*
 - Investigation of further research opportunities
- LarKC 
 - Uses TripCom expertise (deployment, scalability evaluation) to realize Thinking@HOME
- SOA4All 
 - Uses TripCom technology to realize the Service Web
 - TripCom participated at SOA4All meetings dedicated to architecture issues
- SUPER 
 - Joint work on the BPEL Ontology

- Members of TripCom were involved in the work on the following standards:
 - SPARQL (W3C)
 - WSDL 2.0 (W3C)
 - SA-WSDL (W3C)
 - SEE (OASIS)
 - Triple Space Web service binding (planned)



The Standardization & Reference Architecture Service



End of Document