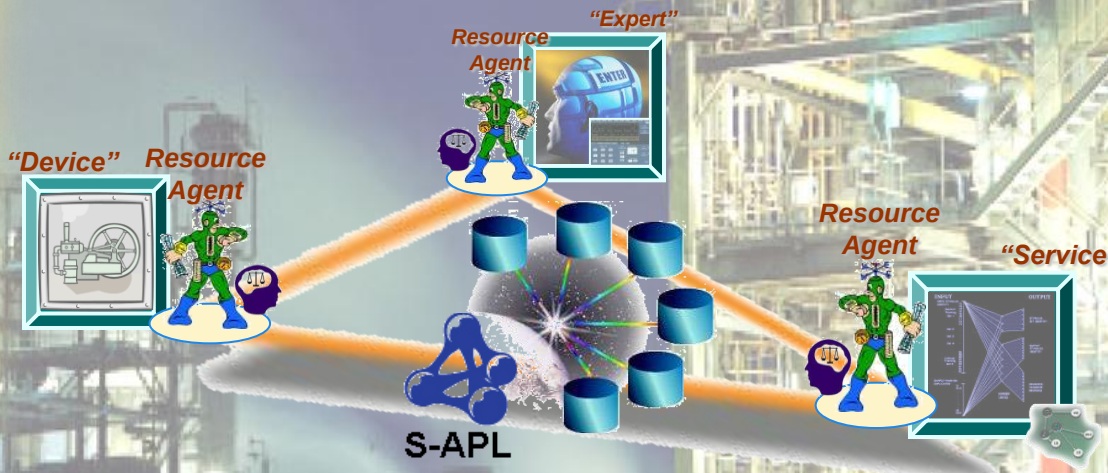
"Global Understanding Environment"

Towards Self-Managed Web of Everything

by Vagan Terziyan



FINGRID

ABB

TietoEnator
Building the Information Society

Inno-W

metso automation

TeliaSonera

NOKIA
Connecting People

TEKES

ECURAS
HANSA ECURAS OY

Industrial Ontologies Group

University of Jyväskylä

Oulu, 11 May, 2011

Presenter's short BIO and "self-(re)configuration" example

107 kg

82 kg

- Professor in Software Engineering;
- Head of Artificial Intelligence Dep.;
- Head of "MetaIntelligence" Research Lab.
- … in Kharkov National University of Radioelectronics (Ukraine)

"Self-reconfigurable" means that the system is capable of utilizing its own system of control to change its overall structural shape.

- Professor in Distributed Systems;
- Head of Industrial Ontologies Group …
- … in the Department of Mathematical Information Technology, University of Jyvaskyla (Finland)

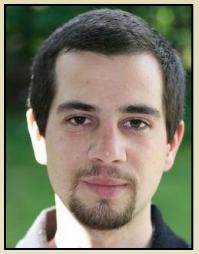
Industrial Ontologies Group

University of Jyväskylä AGORA HUMAN TECHNOLOGIES CENTER

IOG Team Kernel















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URL: http://www.mit.jyu.fi/ai/OntoGroup

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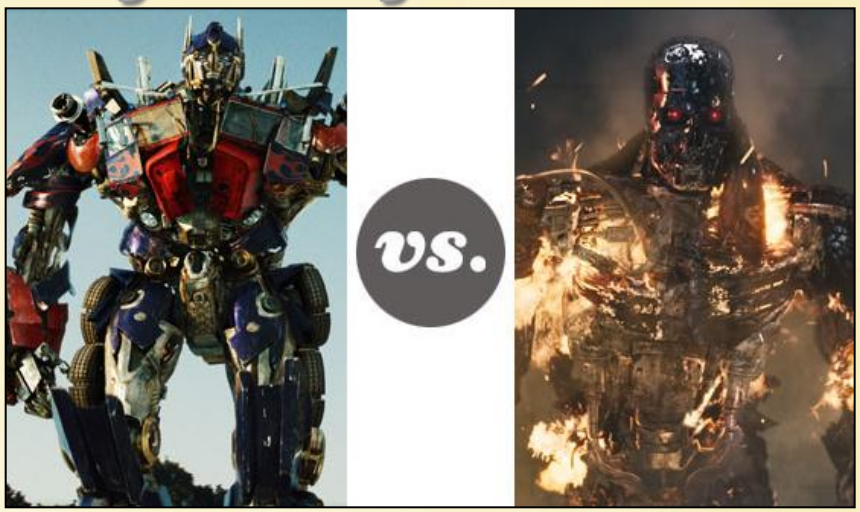
Group Profile (summary)

- Agent Technology
- Semantic Technology
- SOA and Cloud Computing
- Ubiquitous Computing
- Social Computing
- Artificial Intelligence

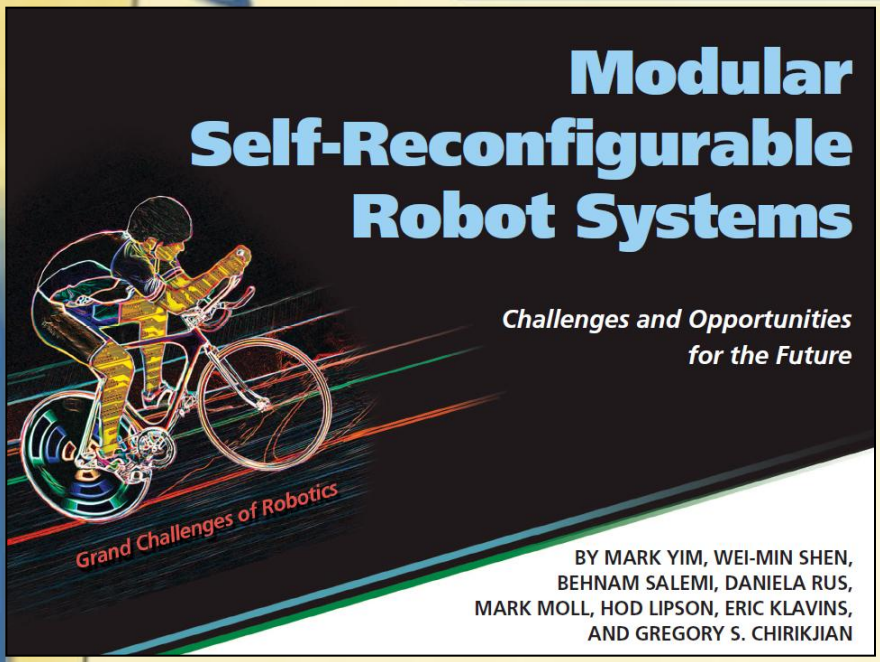
Complex, Distributed, Heterogeneous, Self-Managed, Web-Based Industrial Systems, Ecosystems, Platforms and Services

http://www.mit.jyu.fi/ai/Industrial_Ontologies_Group_booklet_print.doc

Self-Configurable Systems: Invented by Hollywood?



Why self (re)configuration?



One source of inspiration for the development of these systems comes from biological systems that self-construct out of a relatively small repertoire of lower-level building blocks (cells or amino acids, depending on the scale of interest). This architecture underlies the ability of biological systems to physically adapt, grow, heal, and even self-replicate - capabilities that would be desirable in many engineered systems.

Versatility: Self-reconfigurable systems are potentially ***more adaptive*** than conventional systems. The ability to reconfigure allows a system to ***disassemble and reassemble components*** to form new morphologies that are better suited for new tasks,

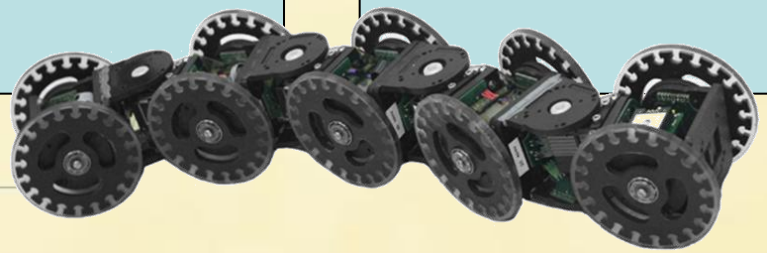
Robustness: Since system components are interchangeable (within a system and between different systems), self-reconfigurable systems can also ***replace faulty parts autonomously***, leading to ***self-repair***.

Low Cost: Self-reconfigurable systems can potentially lower overall cost by making many copies of one (or relatively few) type of modules so economies of scale and mass production come into play. Also, a range of a system can be made from one set of modules, saving costs through ***reuse and generality*** of the system.

Dynamic reconfigurability vs. self-configurability

- *Dynamic reconfigurability* is reconfigurability at run-time, but not necessarily based on system self-awareness and intentions and not necessarily supported by any special algorithms.

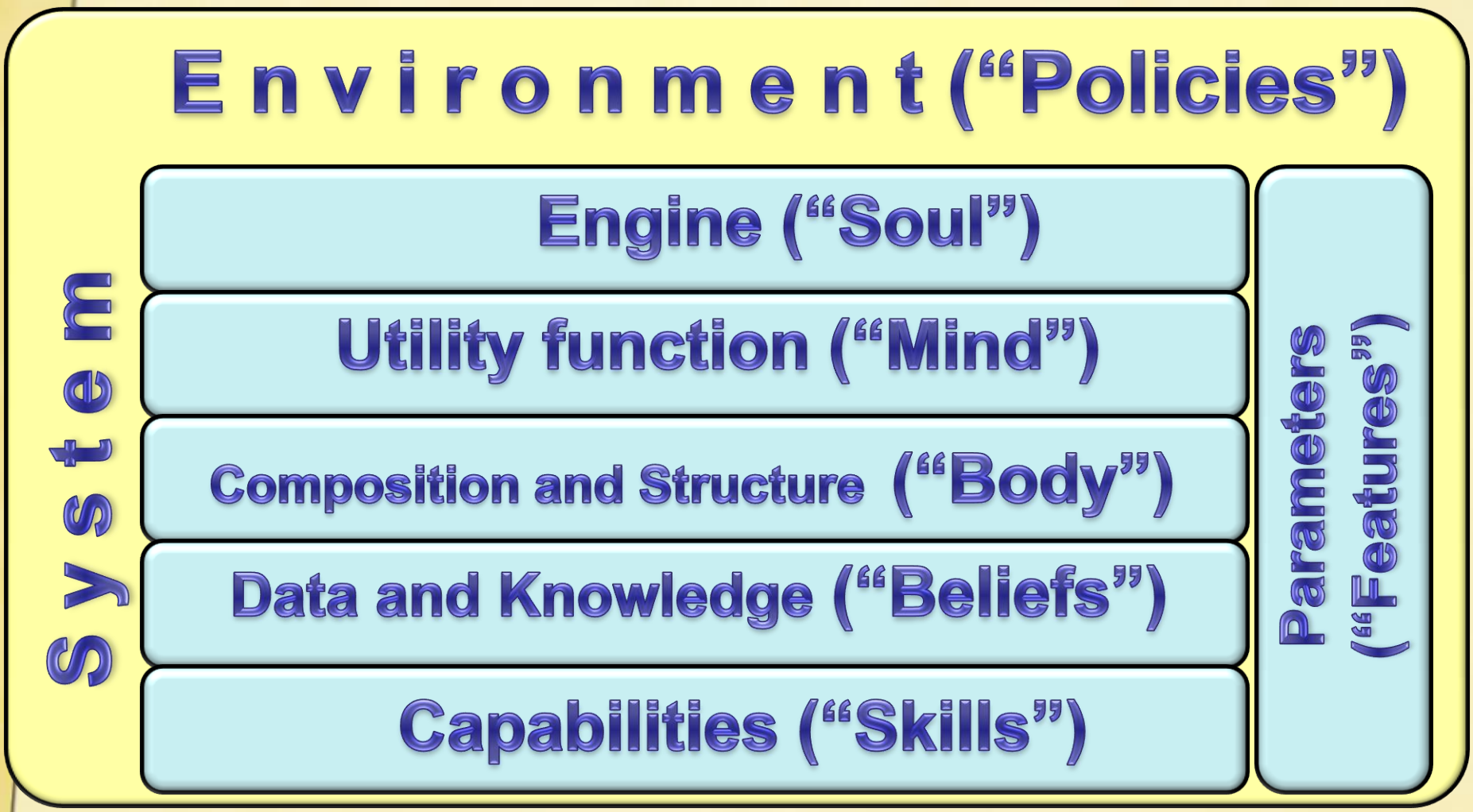
- *Self-configurability* is going one step beyond – the system is expected to autonomously and deliberately perform the reconfiguration.



What is configuration?

- **Composition** (content: components of data and capabilities),
- **Structure** (partonomy, business logic and interaction applied to content)
- and **Parameters** (features of the content and structure)

What is configuration of a self-configurable system?



Everything is configurable !

Wanted: self-configuration within Internet

FP7: ICT Work Program for 2011-2012
Objective ICT-2011.1.3 Internet-connected objects

a) An open networked architecture for Internet-connected objects… . The architecture should maximise interoperability …, allow for re-use of object entities in the physical world across several application domains, and provide a coherent framework with open interfaces to manage the physical entities. Due to the mobility of objects and multiplicity of applications contexts, the architecture should support ***self-management, self-configuration and self-healing*** properties as well as scalable look up and discovery of "Internet of Things" resources and services and their subsequent mapping onto entities of the real world.

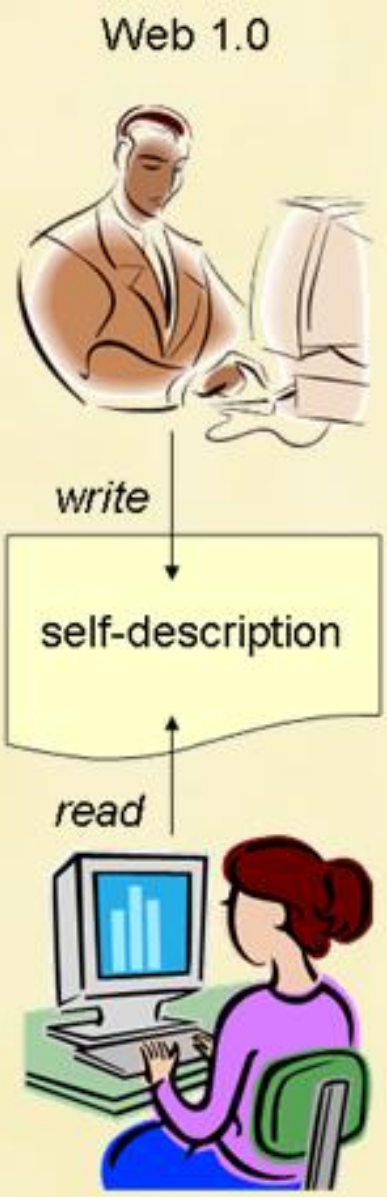
b) Adaptive software supporting data acquisition from a large number of sensors and providing integration with mainstream business platforms and components. Focus is on software to interpret the environmental and context information, detect information related to human intentions/behaviours, enable human-like inferences and multi-modal interactions, and eventually act on behalf of the users' intentions...

Current Web (Web 1.0, Syntactic Web)

Web 1.0 connects people to the content of static pages published in the World Wide Web.

Facilitates Information-to-Information interaction

In Web 1.0, a small number of writers create Web pages for a large number of readers.



Number of Public Web Pages

1990: 1

1998: 26 million (~26,000,000)

2008: >1 trillion (~1,000,000,000,000)

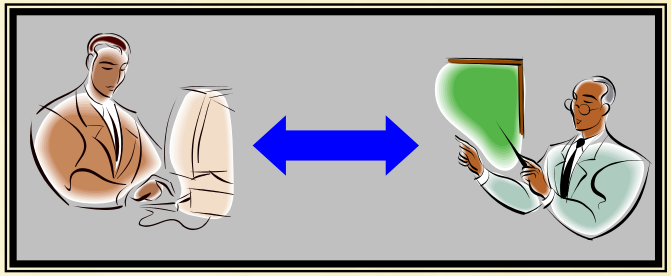
… more than the number of neurons in the human brain

Are we happy with it ?

Is it good for real technical applications ?

Web of Humans (Social Web, Web 2.0)

Human Communities



HaaS: Human-as-a-Service
HaaU: Human-as-a-User

Web 2.0
- Wikis
- Blogs
- Mashups
- Social Networks

Facilitates Human-to-Human interaction

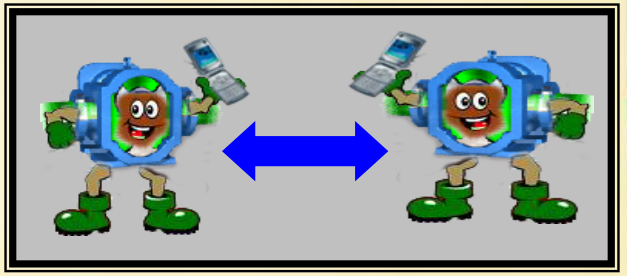
Web of Things

Machines,
devices,
computers, etc.

Web of Things

- Ubiquitous Computing
- Barcodes and RFID
- Embedded Systems
- Sensor Networks
- Smart Spaces

Facilitates Machine-to-Machine interaction



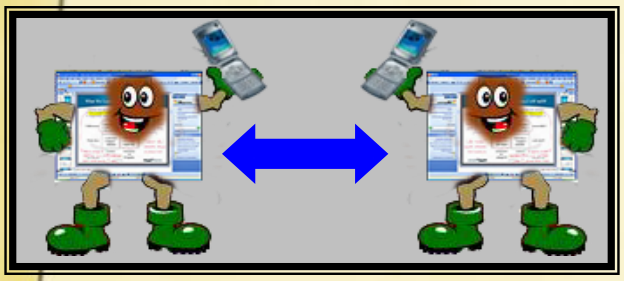
DaaS: Device-as-a-Service
DaaU: Device-as-a-User

Web of Services

Software and Services

Facilitates Software-to-Software interaction

Web of Services
Cloud Computing
SOA
SOAP, WSDL, UDDI
SaaS



SaaS: Software-as-a-Service
SaaU: Software-as-a-User

Pragmatic View to the Environment

facebook

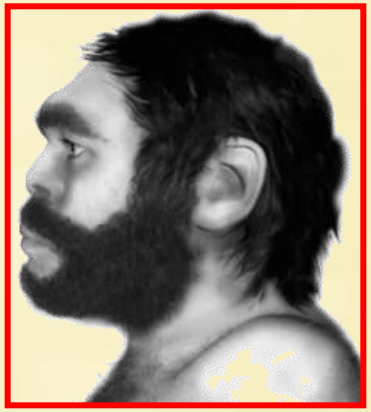
What for and how can I use it?

Everything as a Capability

...cooking"

...ironing"

"I am capable of...



...loving"

...taking care"

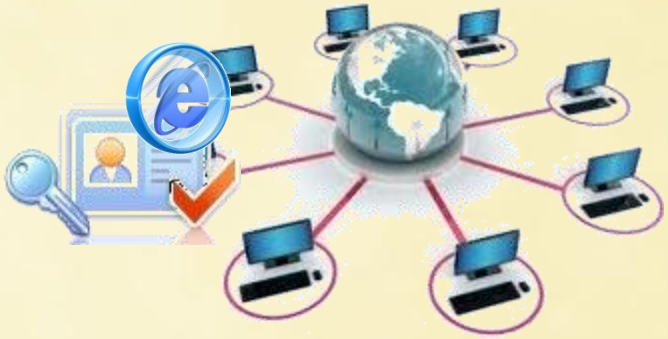
...reparing"

Capability: Product vs. Service

Software Product vs. Software-as-a-Service

Software Product

SaaS

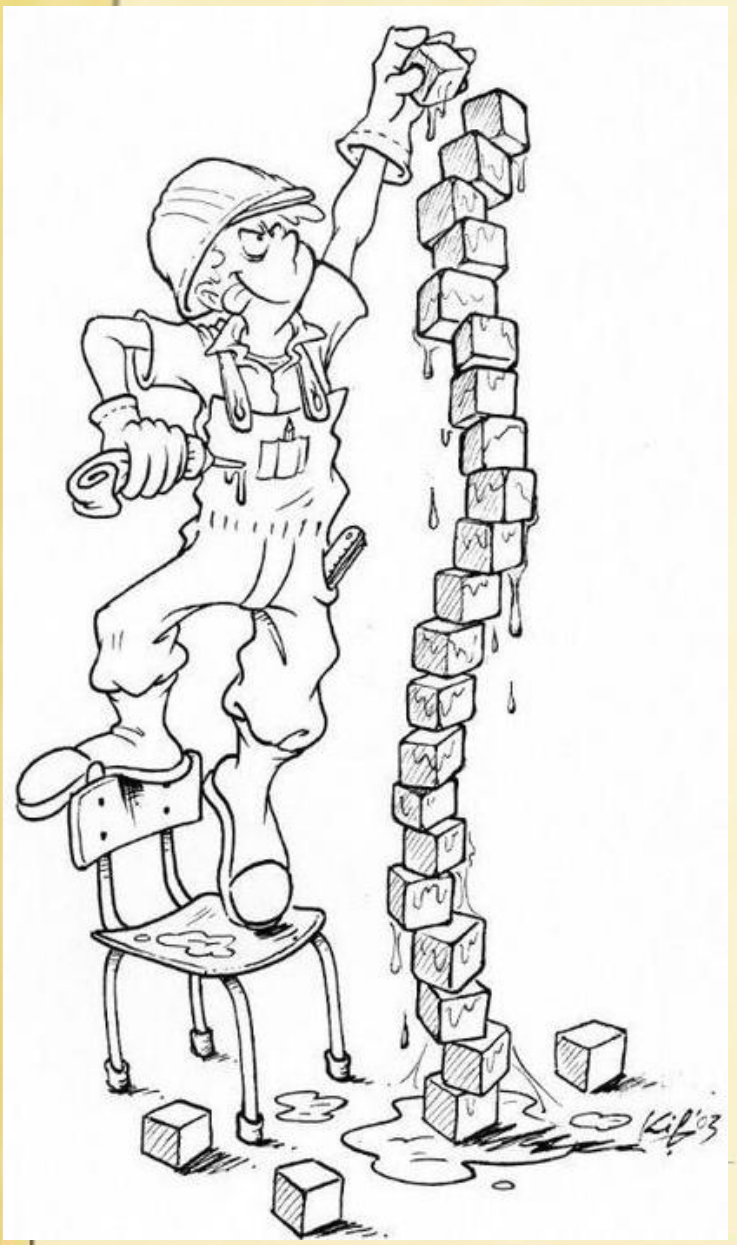


SaaS is a software application distribution and delivery model in which an application is hosted by a vendor or a service provider and its capabilities are made available for the use to a requester over the Internet

Advantages

- Accessible from anywhere with an internet connection;
- No local server installation;
- Pay per use or subscription based payment methods;
- Rapid scalability;
- System maintenance (backup, updates, security, etc) often included in service;
- Possible security improvements, although users with high security requirements (e.g., large corporations) may find SaaS a security concern;
- Reliability.

What is Service-Oriented Architecture ?



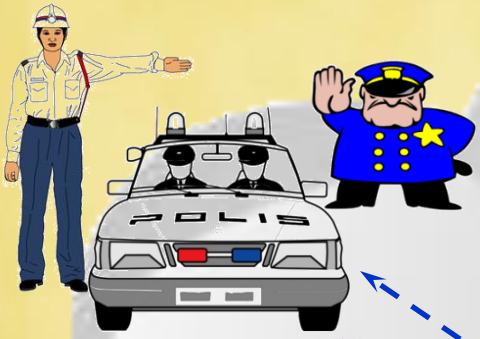
- ***SOA*** *is the practice of sequestering the core business functions into independent services that don't change frequently. SOA is a tool for software (as a service) integration. Rather than defining an API, SOA defines the interface to remote Web-based services in terms of protocols and functionality.*

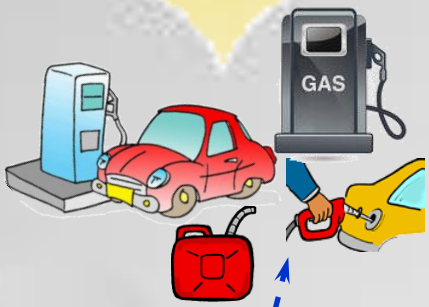
Service Oriented Architecture (SOA) *is a means of designing and building software. It is a manufacturing model.*

Software as a Service (SaaS) *is a means of receiving software through an external party to your business similar to telephone or power utilities. It is a sales and distribution model.*

[J Natoli, Intel]

Cloud Computing: Outsourcing Infrastructure

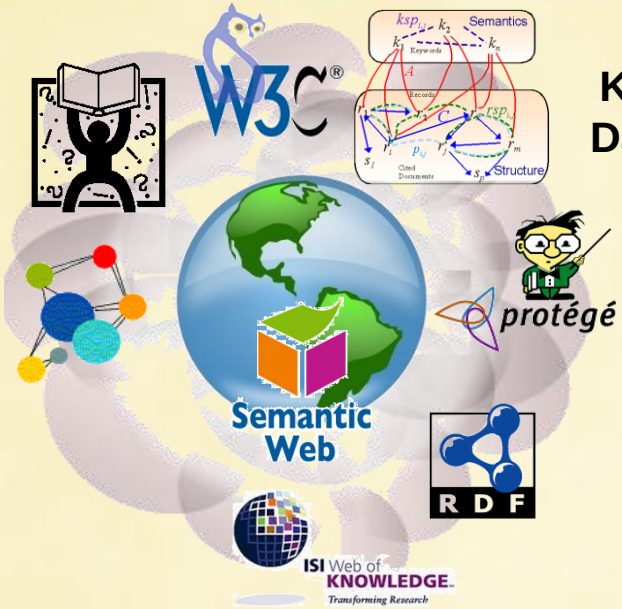




"Taxi Business" Cloud

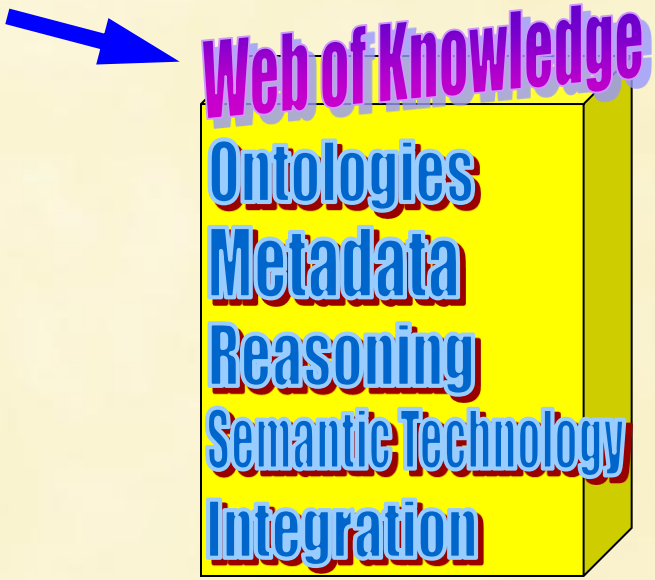
User application

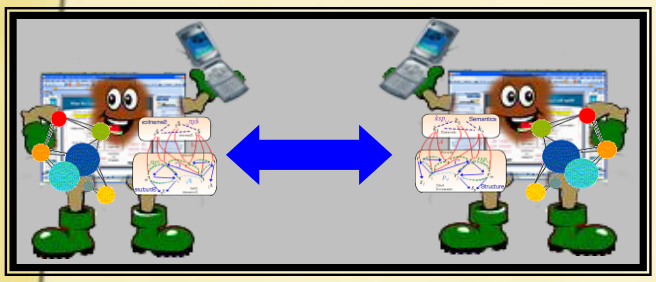
Web of Knowledge (Semantic Web, Web 3.0)

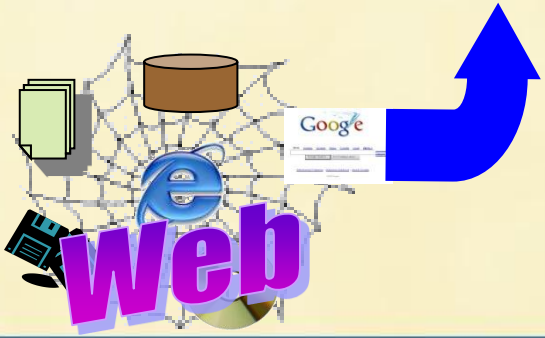


Knowledge and Data Collections

Facilitates Knowledge-to-Knowledge interaction

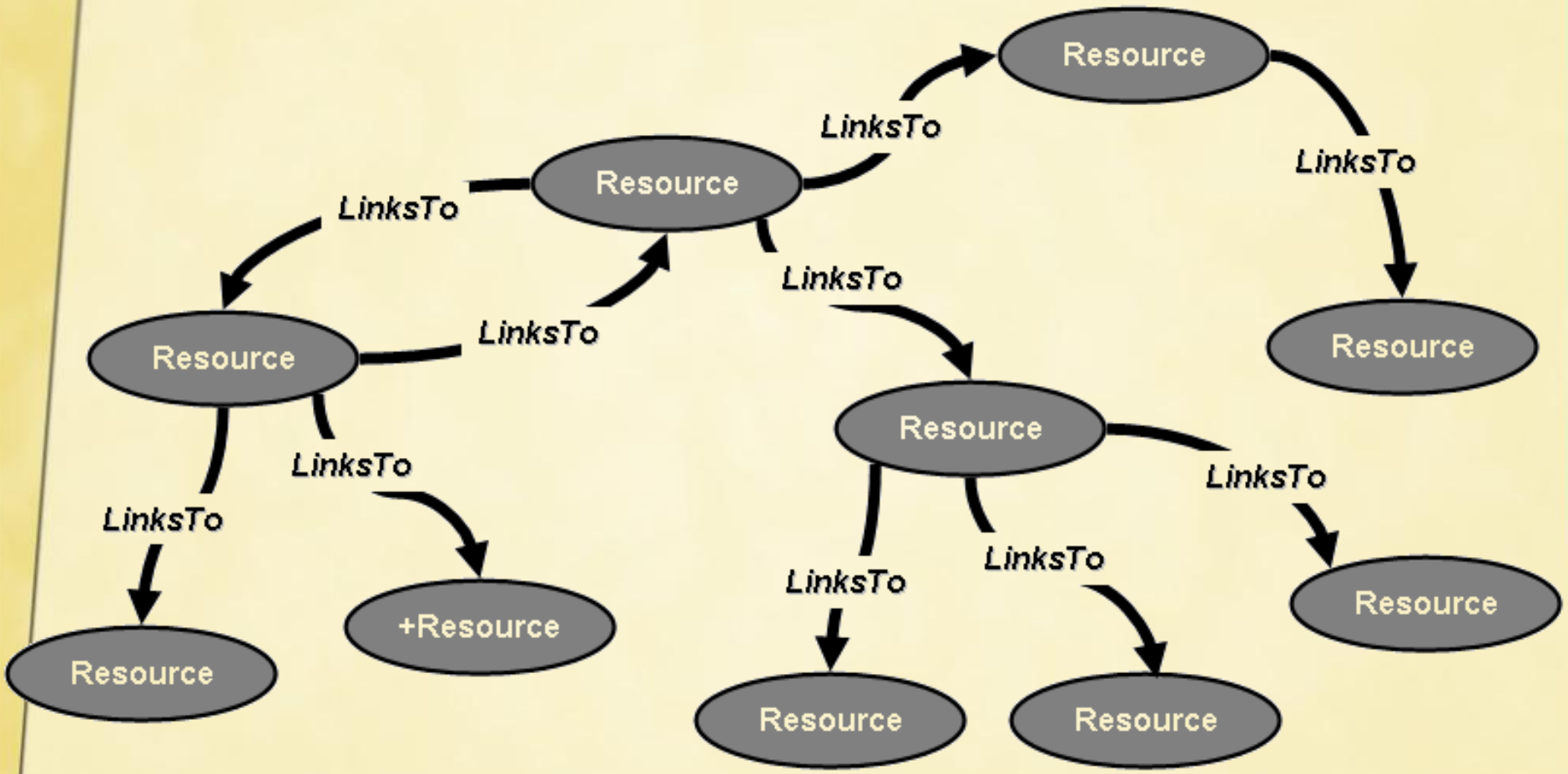






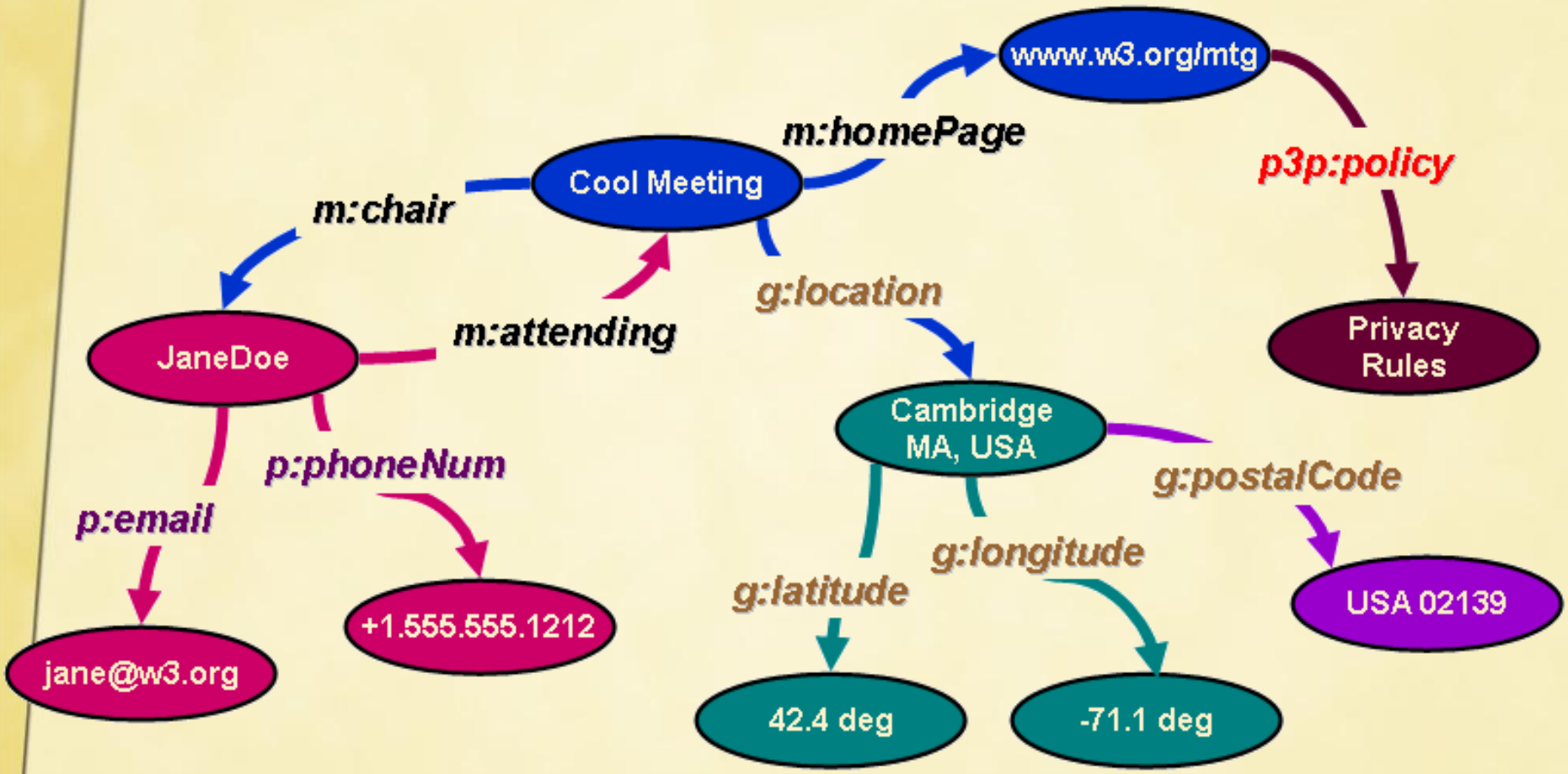
KaaS: Knowledge-as-a-Service
KaaU: Knowledge-as-a-User

Most of the Current Web (dumb links)

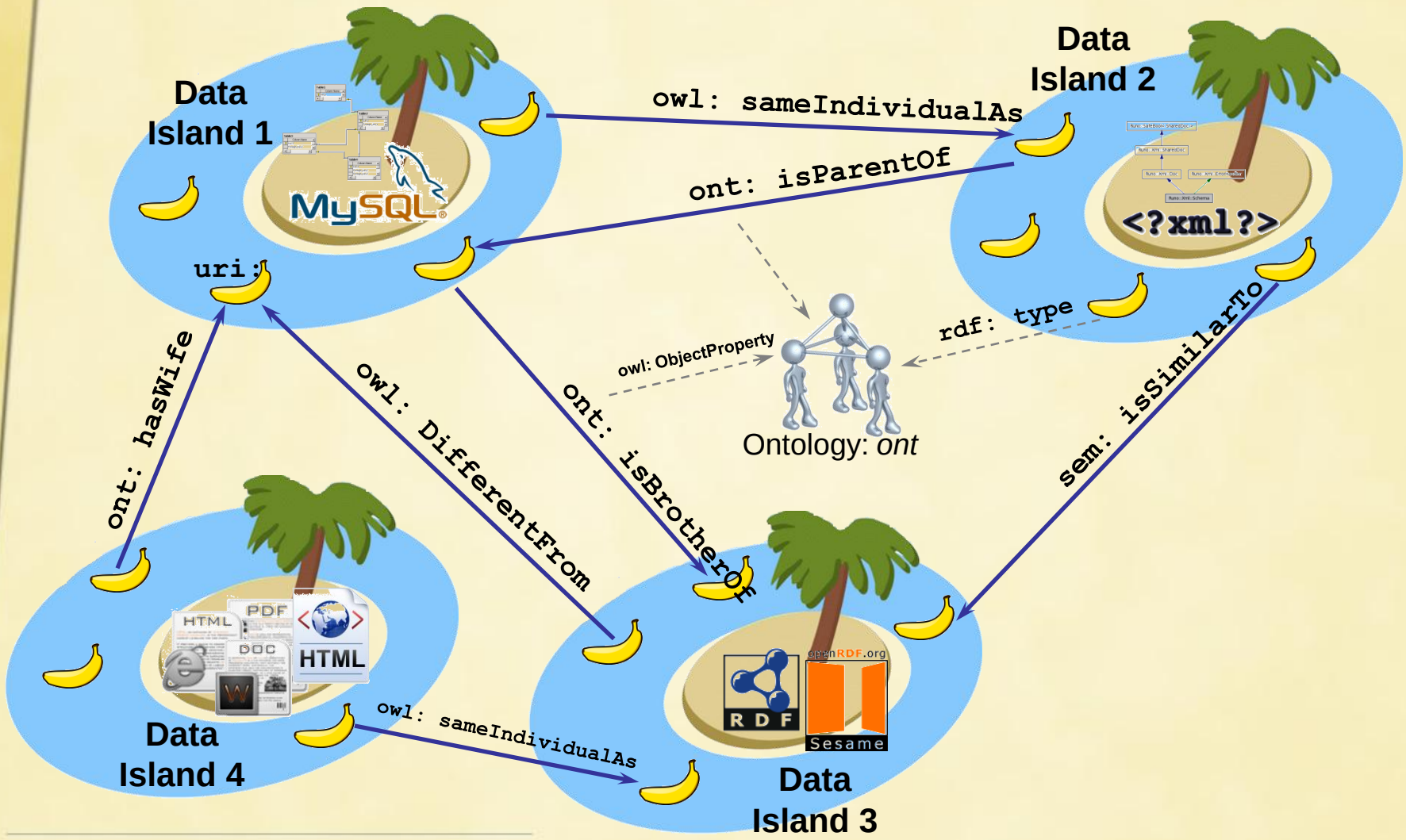


Semantic Web

(data connected by relationships)

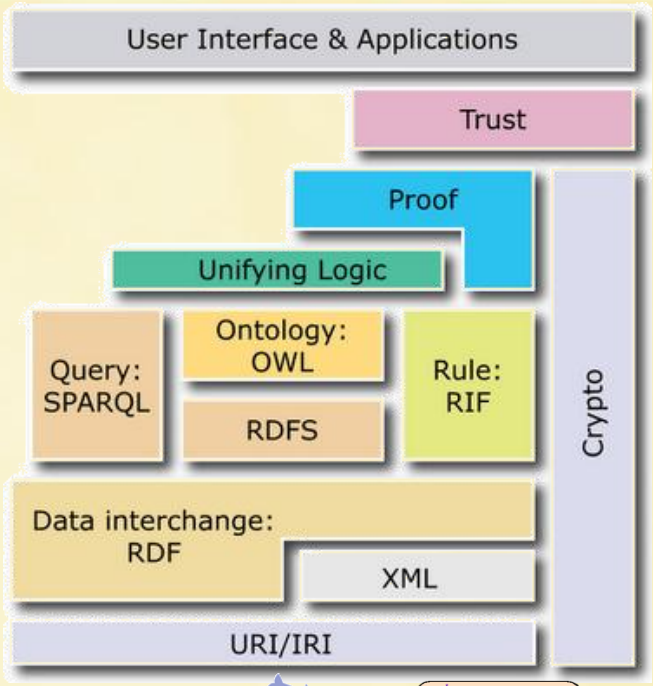


Linked Data:
"Bridges" between "Islands" of Data



Summary: What is Semantic Web ?

- The **Semantic Web** is an evolving development of the World Wide Web in which the meaning (semantics) of information and services published on the Web and their inter-relationships are explicitly defined, making it possible for the Web-based software tools, agents, applications and systems to discover, extract and ***"understand" Web information resources and capabilities and automatically utilize it***.
- **Semantic Technologies** are designed to standardize and support interoperability and integration of information content and capabilities (services) of Web-based systems and components at local and global scale.
- As a ***software technology***, semantic technology encodes meanings separately from data and from application code to enable machines to understand, share and reason with them at execution time.



Why Semantic Web? (Ora Lassila)

A DIFFICULT MESSAGE

- Any specific problem (typically) has a specific solution that does not require Semantic Web technologies
- Q: Why then is the Semantic Web so attractive?
  A: For future-proofing

Semantic Web can be a solution to those problems and situations that we are yet to define

(seriously, I am not kidding...)

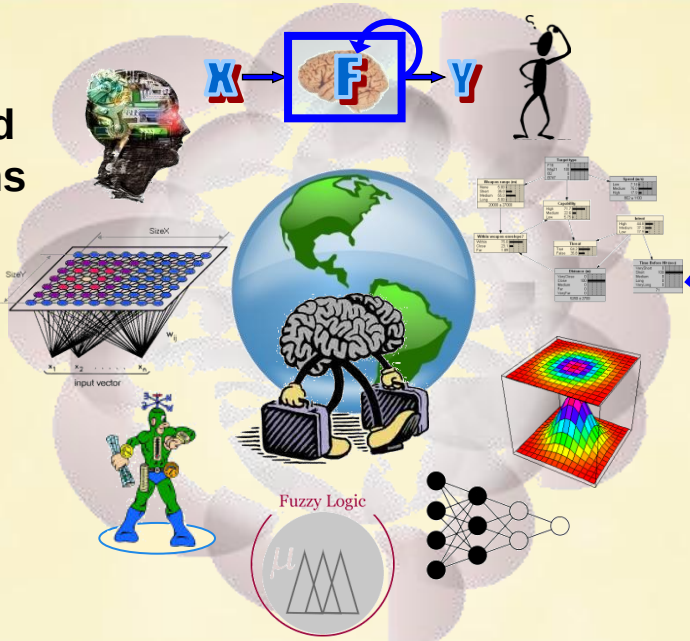
NOKIA
Connecting People

- *"Semantic Web is about to reach its full potential and it would be too costly for companies not to invest to it…"*

(Ora Lassila, Nokia Research Center (Boston), IASW-2005, Jyvaskyla)

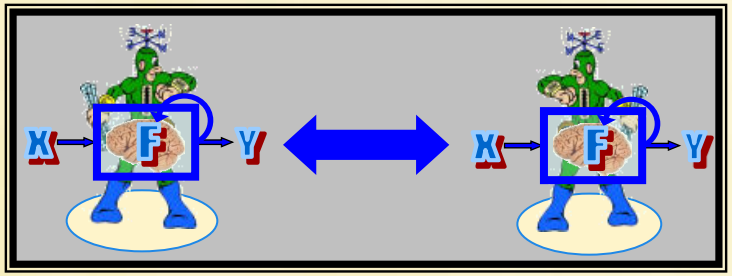
Web of Intelligence (Distributed AI, Web 4.0)

Intelligent Agents and Applications



Facilitates Intelligence-to-Intelligence interaction

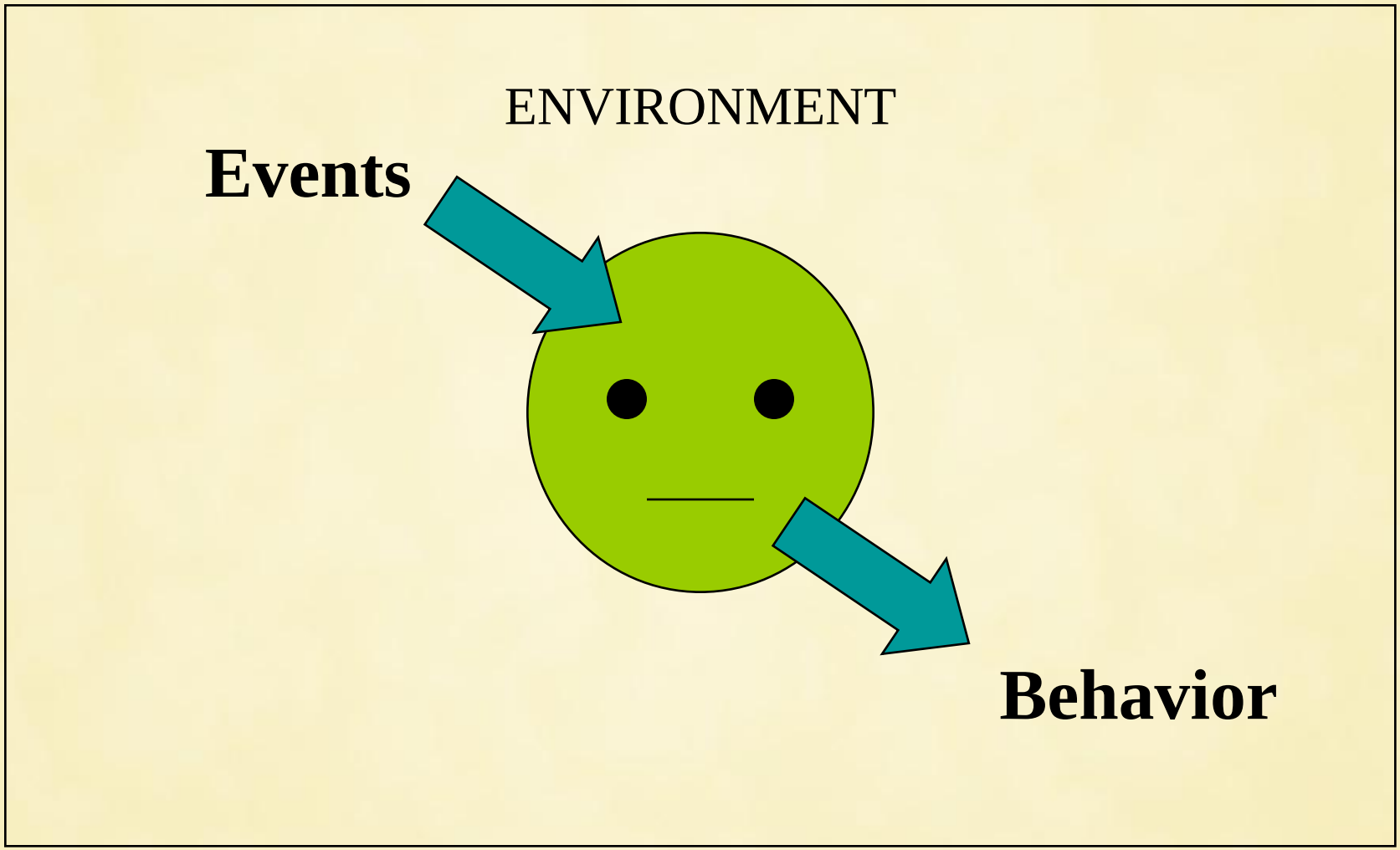
Web of intelligent entities (*intelligence* services), browseable, searchable, composable, self-managed, dynamic, mobile …



Web of Intelligence
Agents and MAS
Data and Web Mining
Machine Learning
Self-Management
Context-Awareness

INTaaS: Intelligence-as-a-Service
INTaaU: Intelligence-as-a-User

What is an Agent?

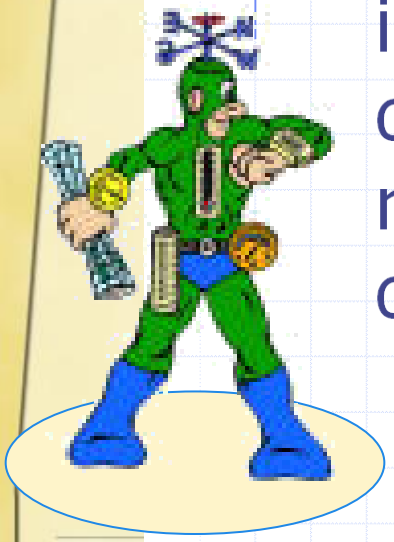


Summary: What is Agent ?

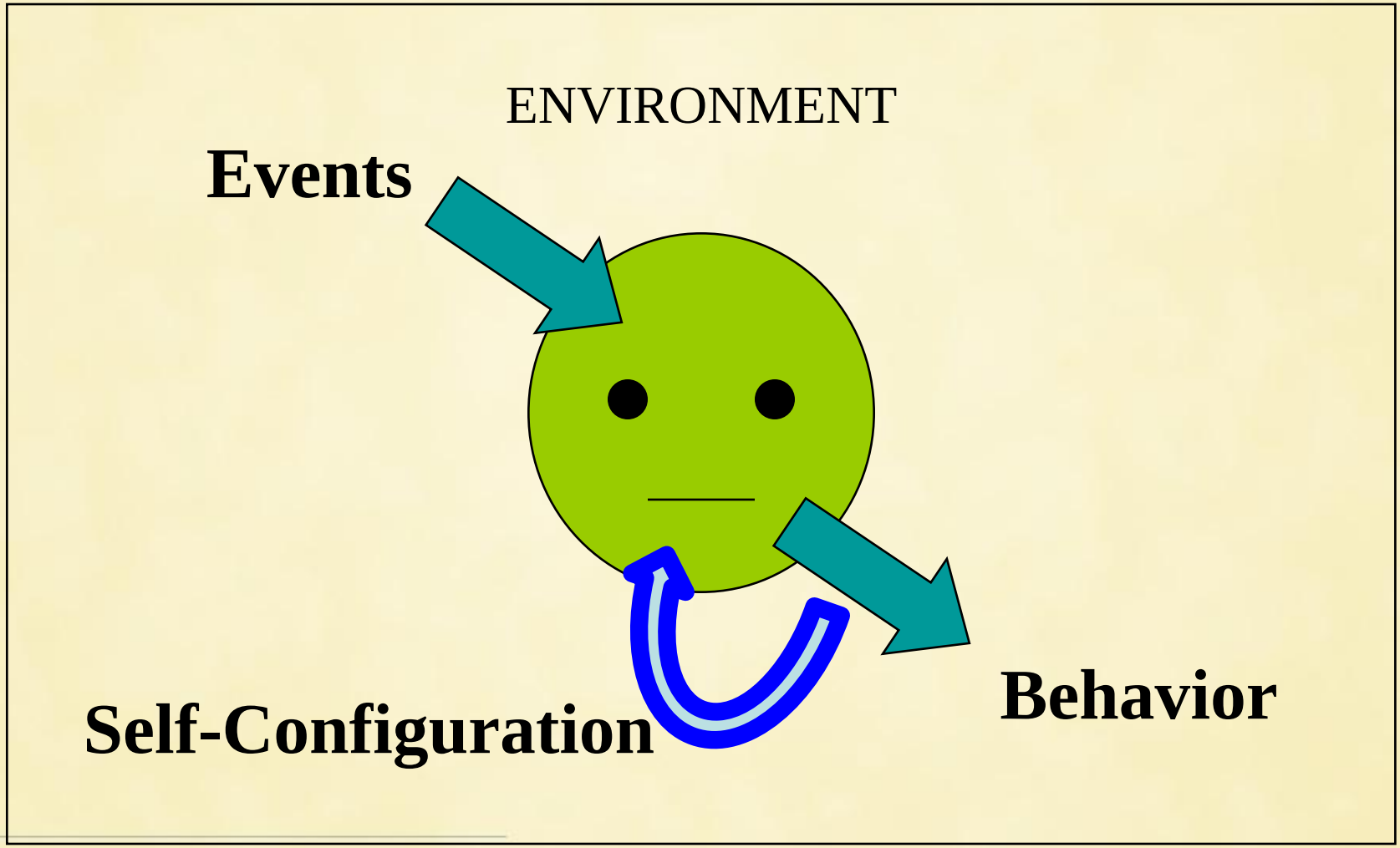
Intelligent Agents

- Software entities that carry out some set of operations on behalf of a user or another program with some degree of independence or autonomy, and in so doing employ some knowledge or representation of a user's goals or desires.

IBM, Intelligent Agent Definition

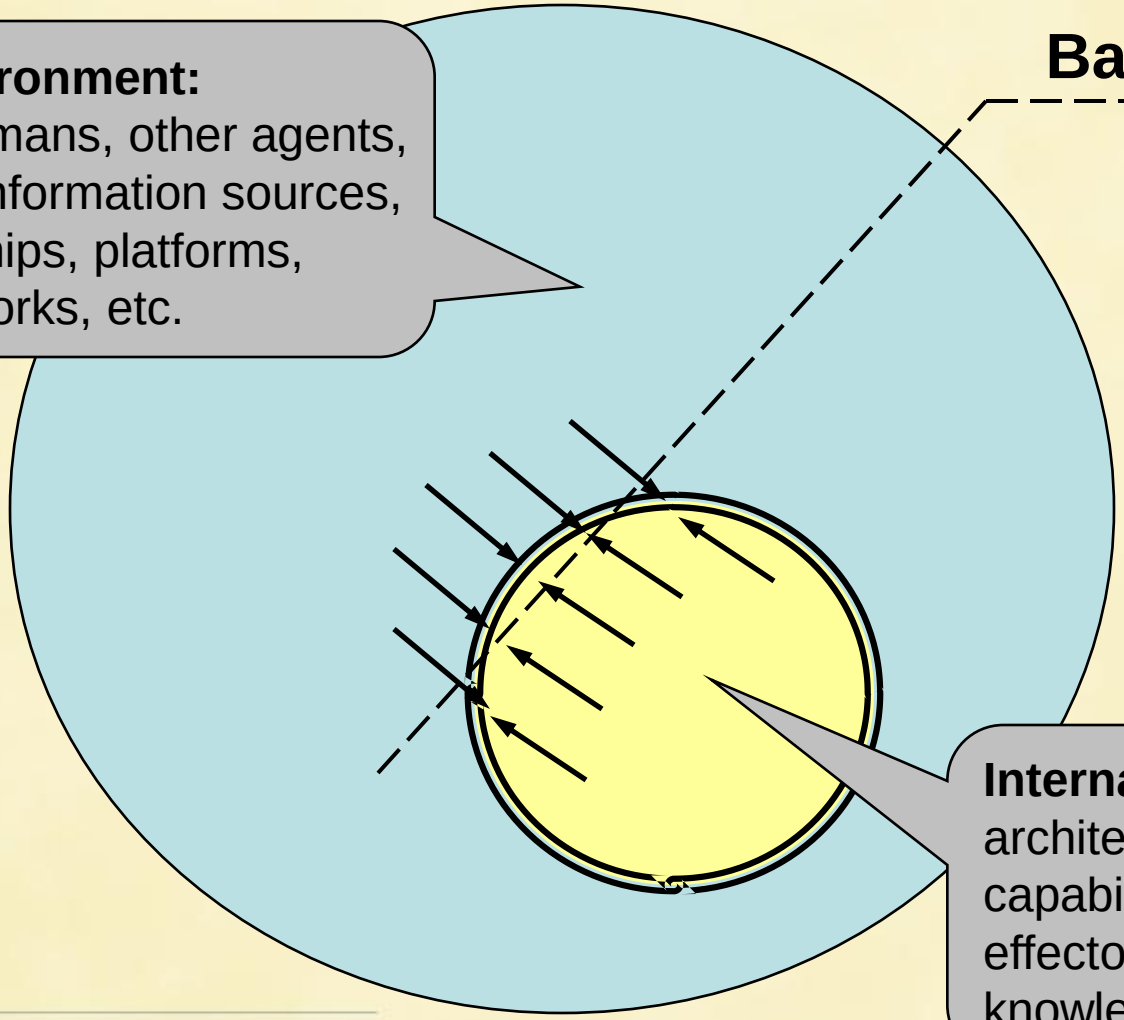


What is an Intelligent Agent?
Self-Configurability !



Internal and External Environment of an Agent

External Environment:
user, other humans, other agents, applications, information sources, their relationships, platforms, servers, networks, etc.



Internal Environment:
architecture, goals, capabilities, sensors, effectors, profile, knowledge, beliefs, etc.

Intelligent Agent Definition [Terziyan, 1993, 2007]

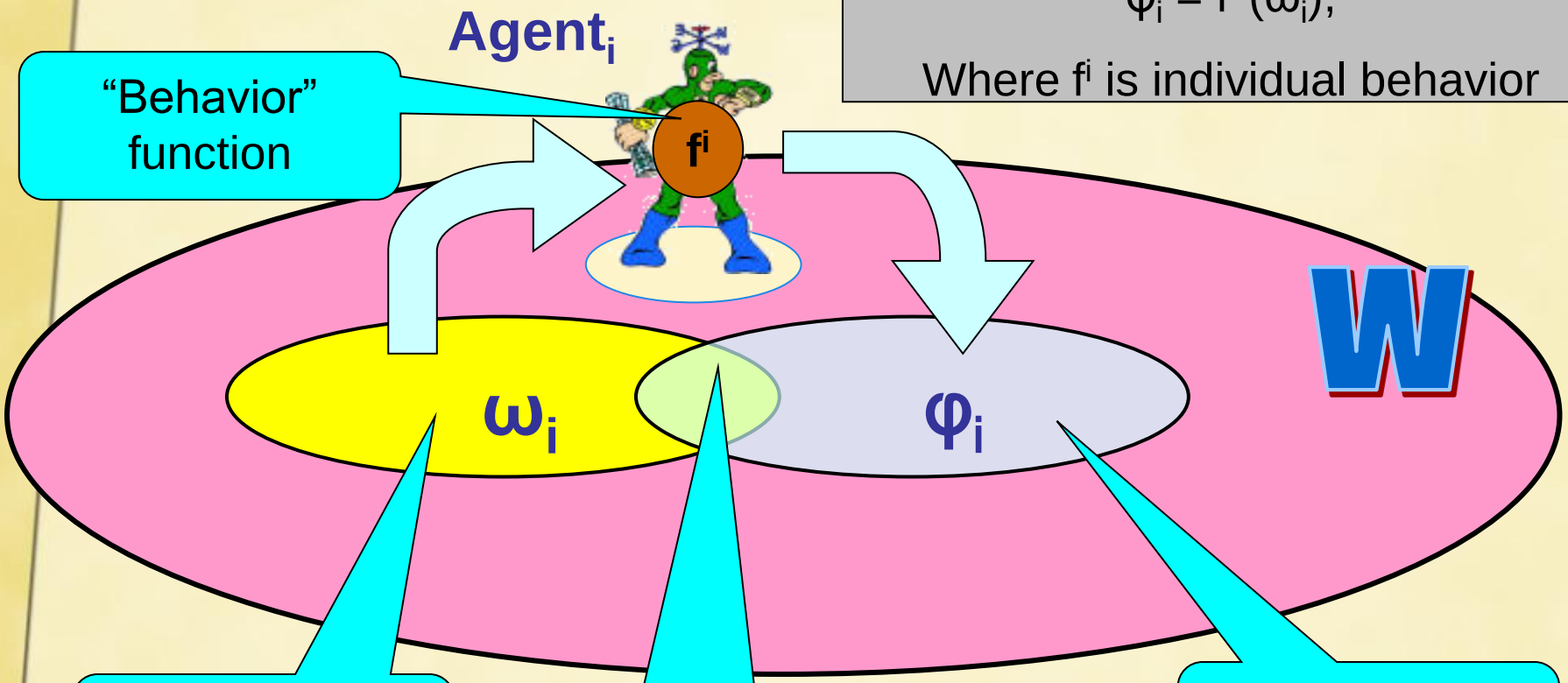
Intelligent Agent is an entity that is able to *keep continuously balance between its internal and external environments* in such a way that in the case of unbalance agent can:

- *change external environment* to be in balance with the internal one ... **OR**
- *change internal environment* to be in balance with the external one … **OR**
- find out and *move to another place* within the external environment where balance occurs without any changes … **OR**
- closely *communicate* with one or more other agents (human or artificial) to be able *to create a community*, which internal environment will be able to be in balance with the external one … **OR**
- *configure sensors* by filtering the set of acquired features from the external environment to achieve balance between the internal environment and the deliberately distorted pattern of the external one. I.e. "*if you are not able either to change the environment or adapt yourself to it, then just try not to notice things, which make you unhappy*"

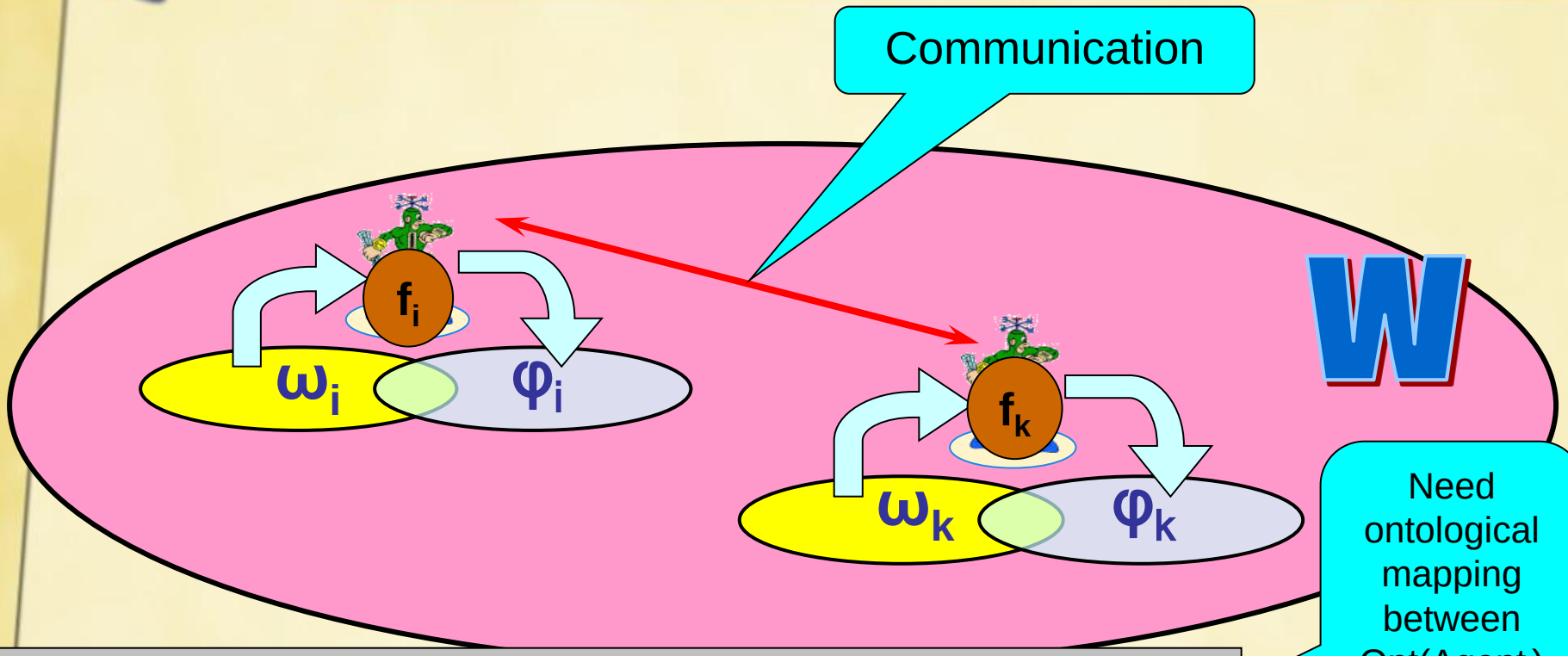
Agent and the World
(W = Internal + External Environments)

Agent$_i$ alone may "play" a function:
$\varphi_i = f^i(\omega_i)$,

Where f^i is individual behavior



Indirect Collaboration (via communication)



Need ontological mapping between $Ont(Agent_i)$ and $Ont(Agent_k)$

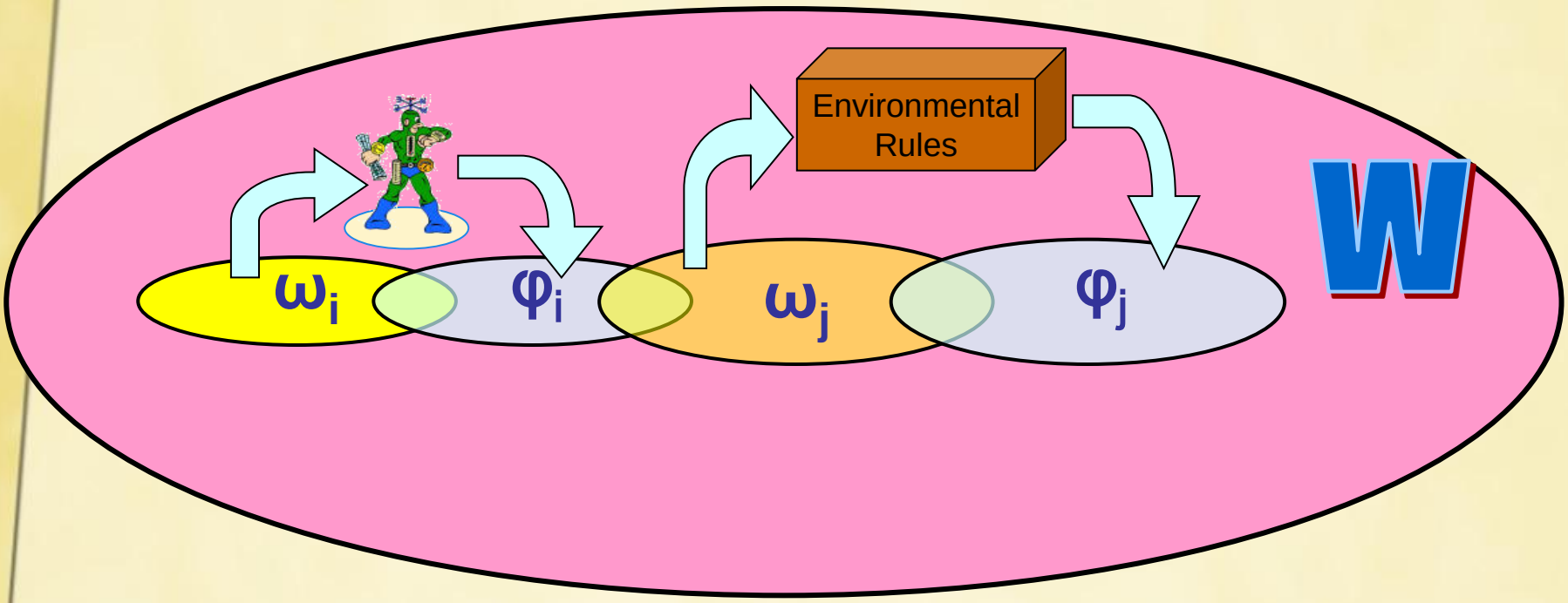
$Agent_i$ and $Agent_k$ together may "play" 6 types of functions:

$$\varphi_i = f^i(\omega_i);\ \varphi_k = f^k(\omega_k);\ \varphi_i = f^{ki}(\omega_k);\ \varphi_k = f^{ik}(\omega_i);$$

$$\varphi_i = \mathbf{F^1}(f^i(\omega_i), f^{ki}(\omega_k));\ \varphi_k = \mathbf{F^2}(f^k(\omega_k), f^{ik}(\omega_i)),$$

where **F** - collaborative behavior

Indirect Control (via environment)



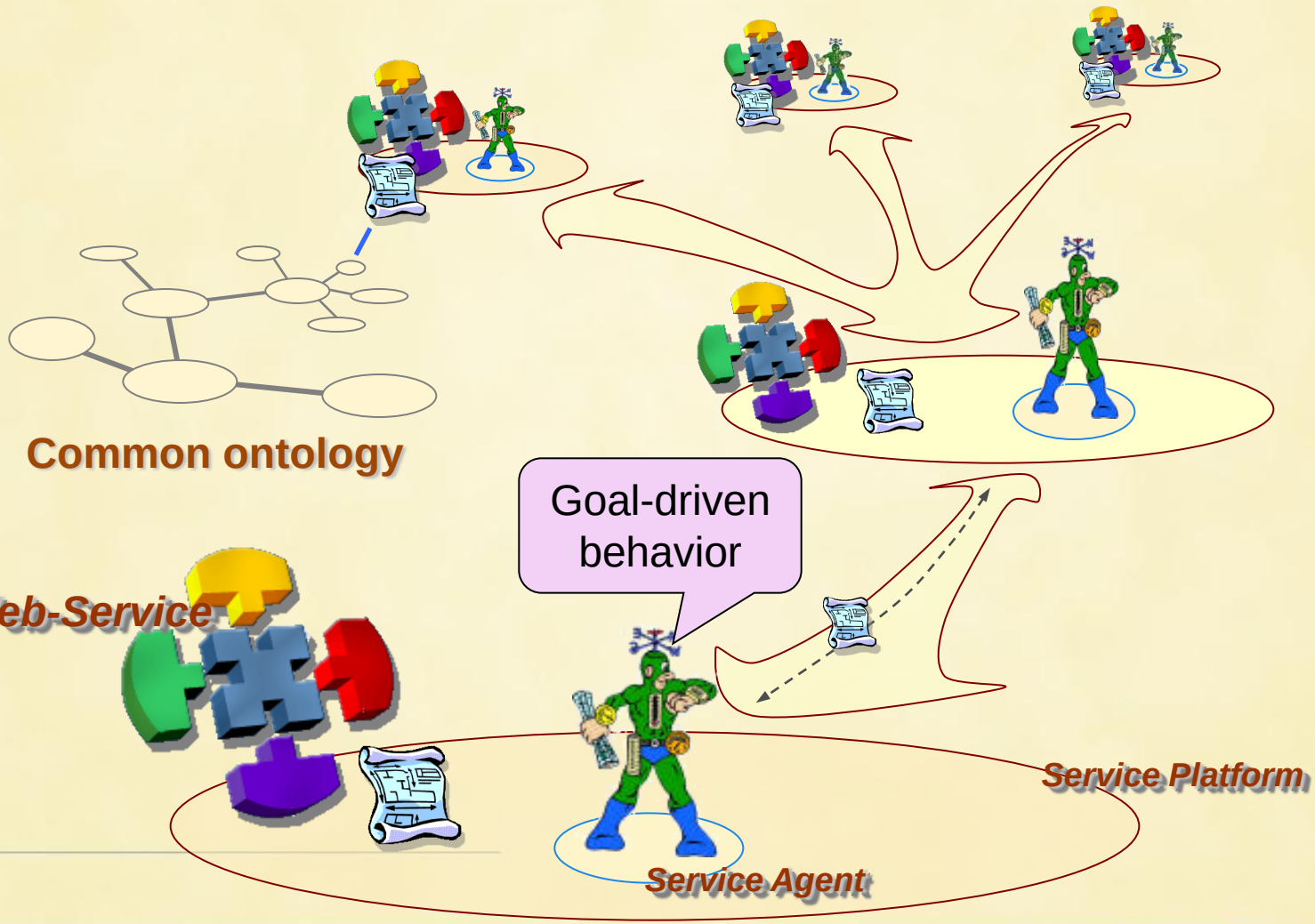
Agent$_i$ may “play” 2 types of functions knowing rules of the environment:

$$\varphi_i = f(\omega_i);\ \varphi_j = \mathbf{R}(f(\omega_i)),$$

where **R** – function of environmental rules

Rented Service vs. Proactive Service

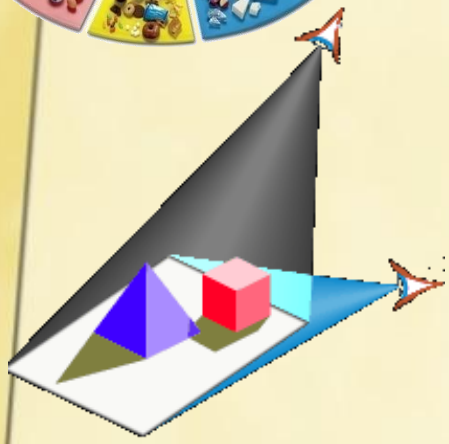
Proactive Web-Services: adding an agent to service platform – allows agent-based S2S communication



Summary: Why Agents ?

- Growing complexity of computer systems and networks
- Distributed nature of systems (data, software, users, etc.)
- Ubiquitous computing, “Internet of Things” scalability challenges
- Need for self-manageability of a complex system
- Need for new software development paradigms in designing distributed systems
- Agent-based approach meets the above challenges …
- ***And finally: Agents are excellent tool for self-configuration !!!***

Web of Context

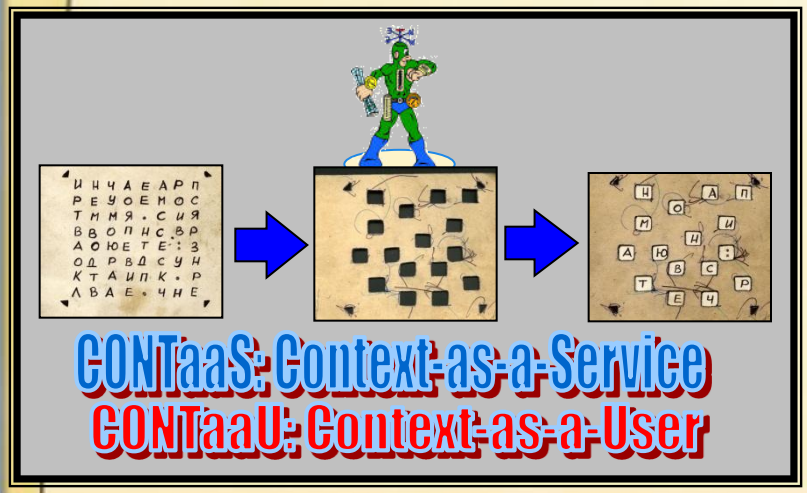


Context views, weights, masks and filters

Facilitates Context-to-Context interaction

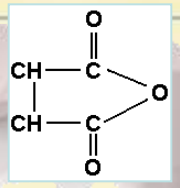
Web of Context

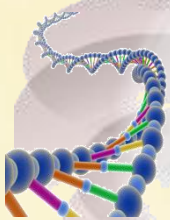
- Context as a viewpoint
- Context-based filtering
- Context-driven search
- Context-driven ranking
- Quality of Resource
- Context-discovery

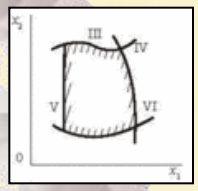


Web of Policies

Formal relationships, constraints, limitations, laws, mathematical models, defined business logic, communication protocols, goals/tasks definitions, permissions, prohibitions, commitments, conventions and other policies





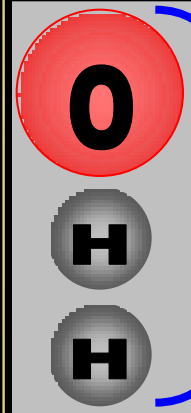


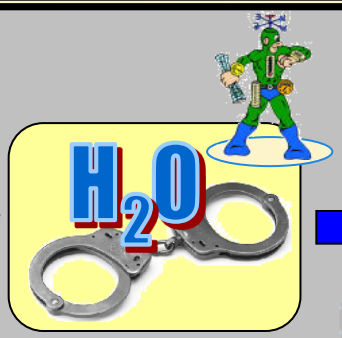
$E=mc^2$

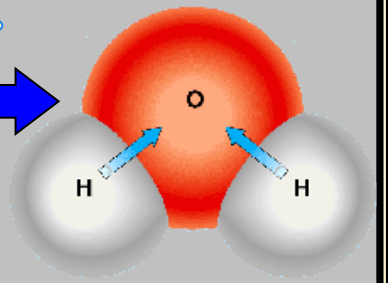
Facilitates Policy-to-Policy interaction

Web of Policies

- Policy-Based Control
- Policy-Based Reasoning
- Policy-Based Coordination
- Policy negotiations
- Policy integration



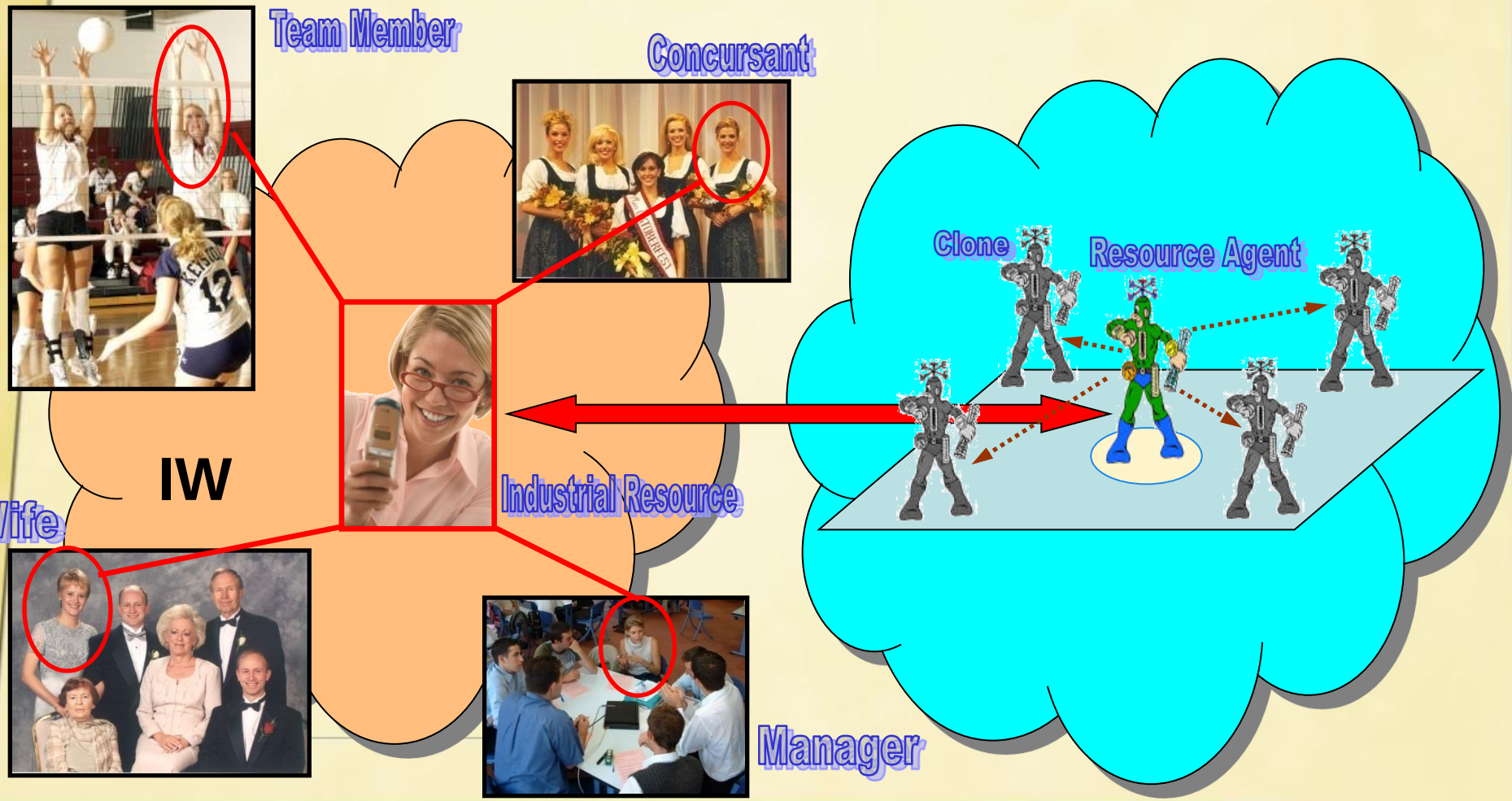




PaaS: Policy-as-a-Service
PaaU: Policy-as-a-User

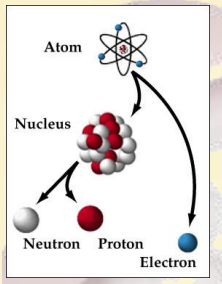
Multiple Policies

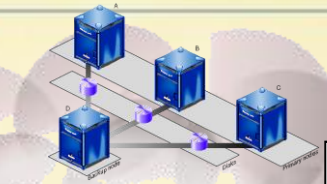
- Each industrial resource can theoretically be involved to several processes (organizations, relationships), and appropriate commitments (policies) of each process are applied to it, which can be either supplementary or contradictory. This means that the resource is part of several more complex resources and its role within each of the resource might be different. Modeling such resources can be provided by appropriate resource agent, which can make clones of itself and distribute all necessary roles among them.

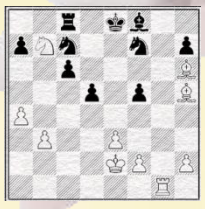


Web of Configurations

… is the Web of "partonomy" (a classification based on part-of relation; not the same as taxonomy, which is a classification based on similarities). Configuration of an object (parts and their relationships) together with all policies applied to these parts fully describes the object from inside.



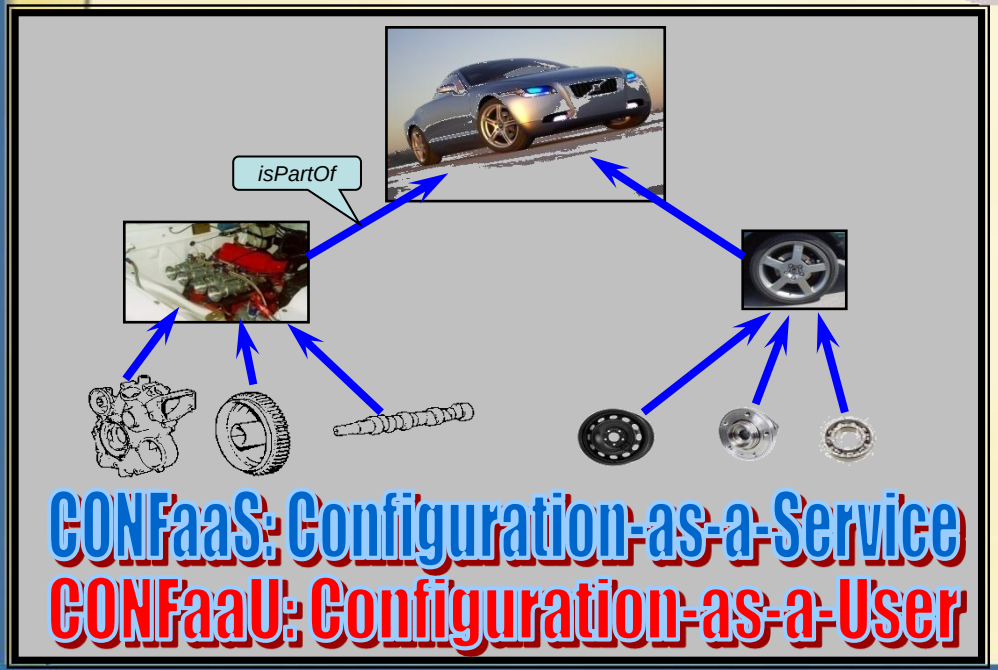




Facilitates Configuration-to-Configuration interaction

Web of Configurations

- Self-Configuration
- Configuration-Based Reasoning
- Mobile Configuration
- Configuration Web Browser
- Proactive Configuration

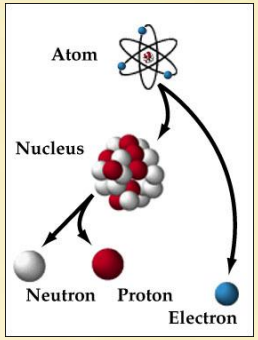


CONFaaS: Configuration-as-a-Service

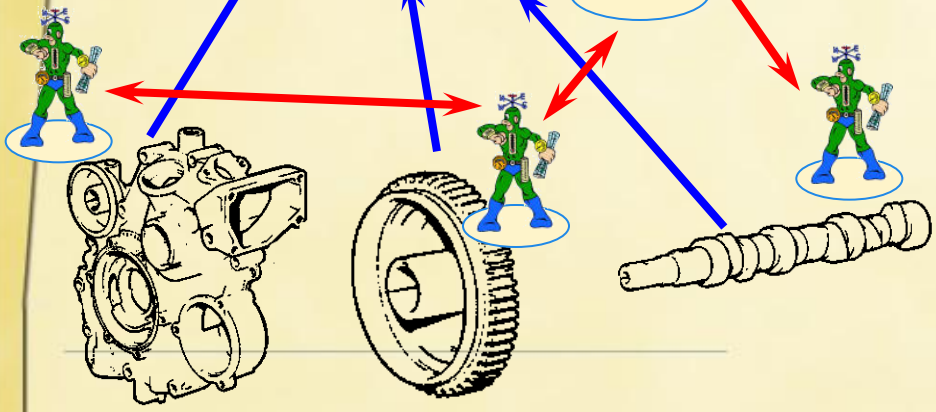
CONFaaU: Configuration-as-a-User

Proactive Configuration

Part_of **product hierarchy in the ontology** ***results to hierarchical MAS***

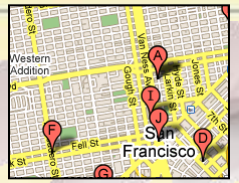


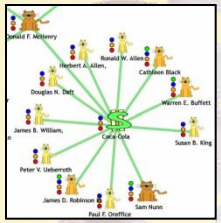
isPartOf

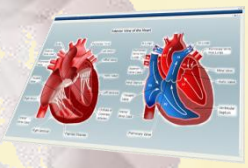


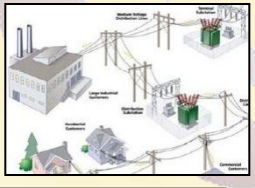
Web of Presentations

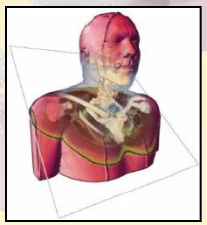
… is the Web of visualization providers (or "metaproviders" according to 4i ("for-eye") technology). The same content (either static or dynamic, homogeneous or heterogeneous) will be presented (and if needed also filtered and mashed) by different ways by different visualization providers .











Facilitates Presentation-to-Presentation interaction

Web of Presentations

- Semantic Mash-Ups
- Context-based presentation
- Presentations Web Browser
- Cloud of Visualizators
- Proactive Visualization

FOR EYE TECHNOLOGY

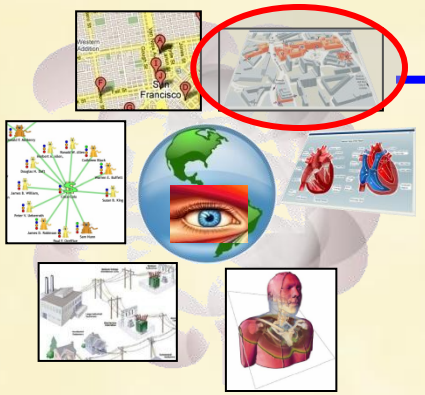
VISaaS: Visualization-as-a-Service

VISaaU: Visualization-as-a-User

4i Philosophy: Visualization-as-a-Service

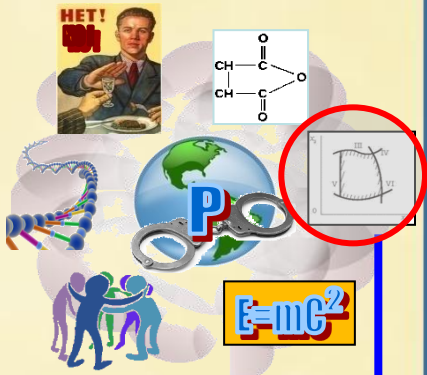
Web of Contexts

Web of Visualization Service Providers

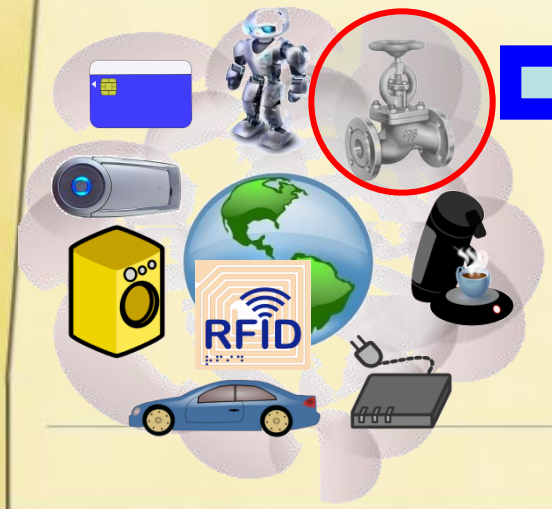


Web of Configurations

Web of Policies



Web of Things

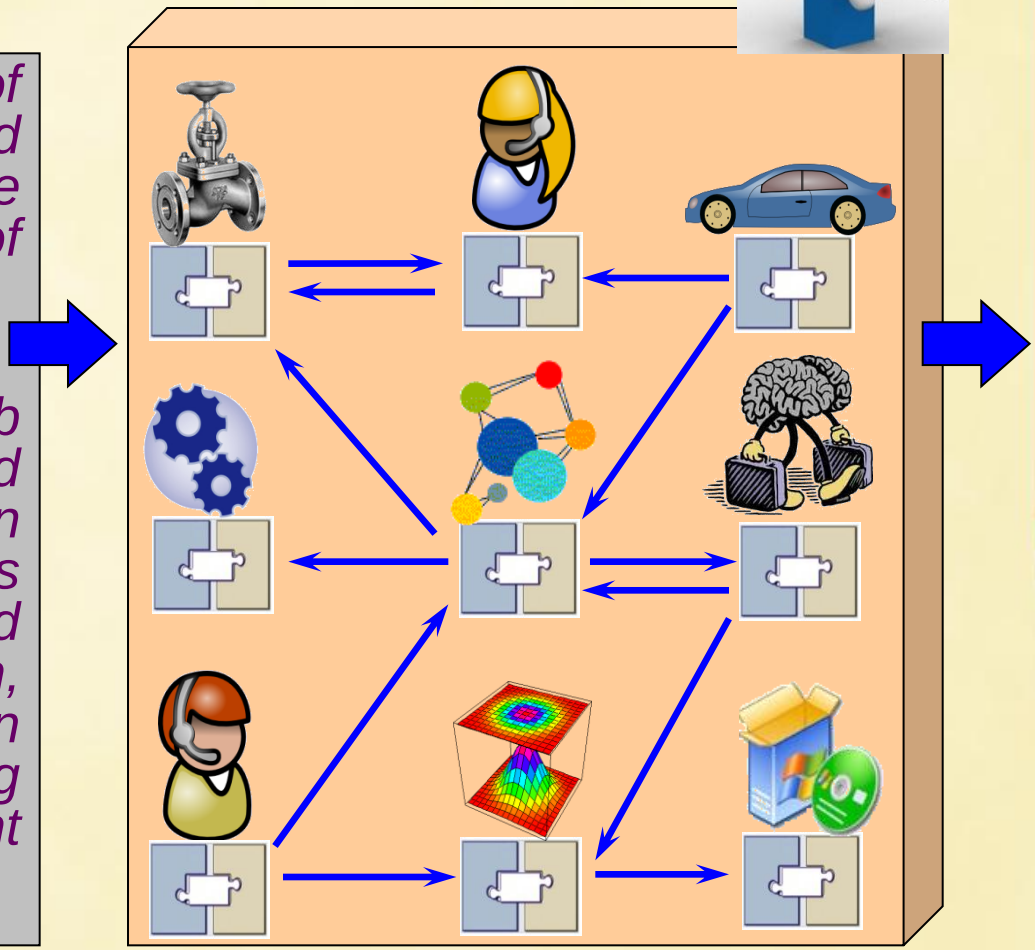


4i Browser

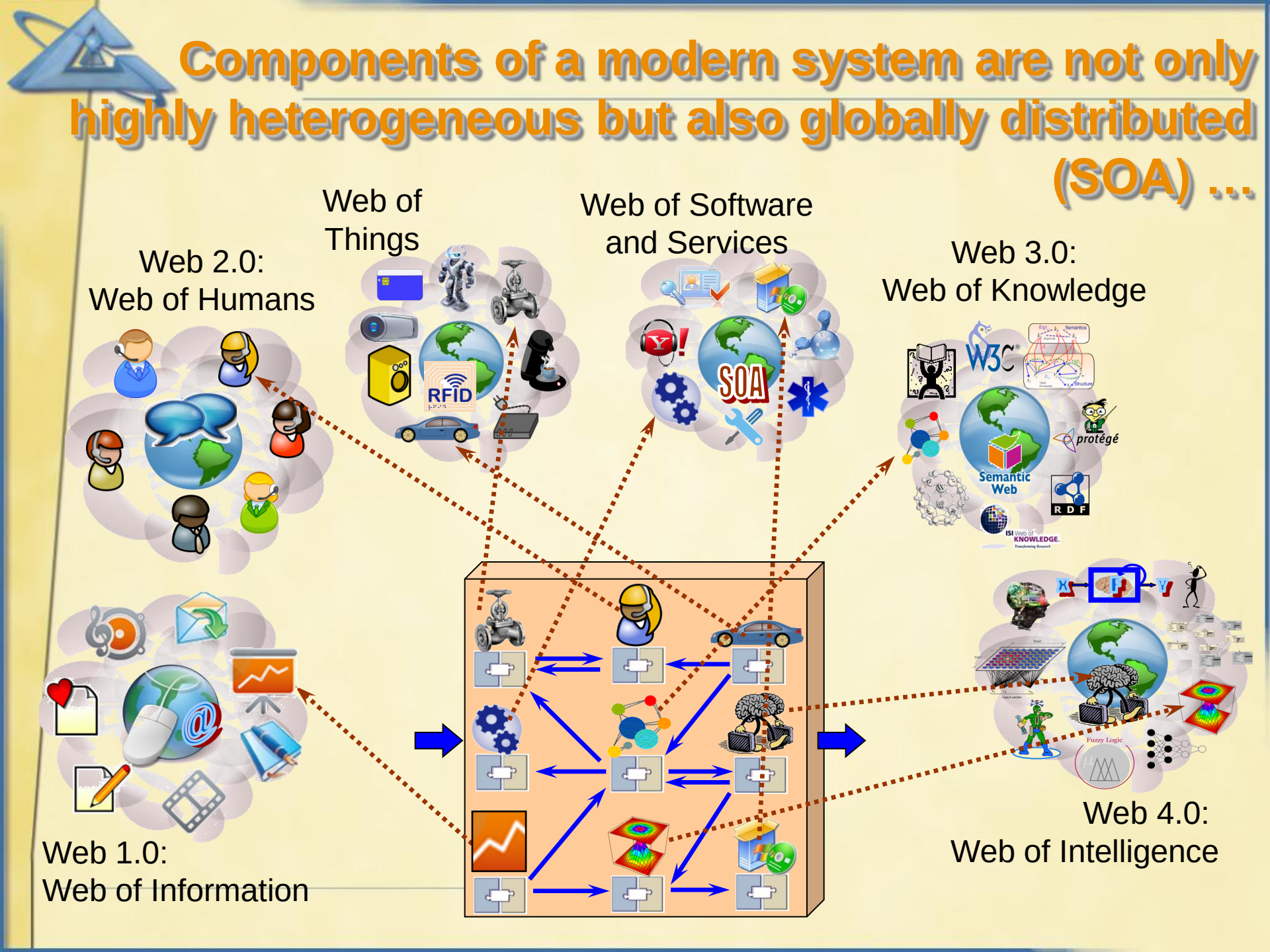
FOR EYE™ TECHNOLOGY

Still not enough?

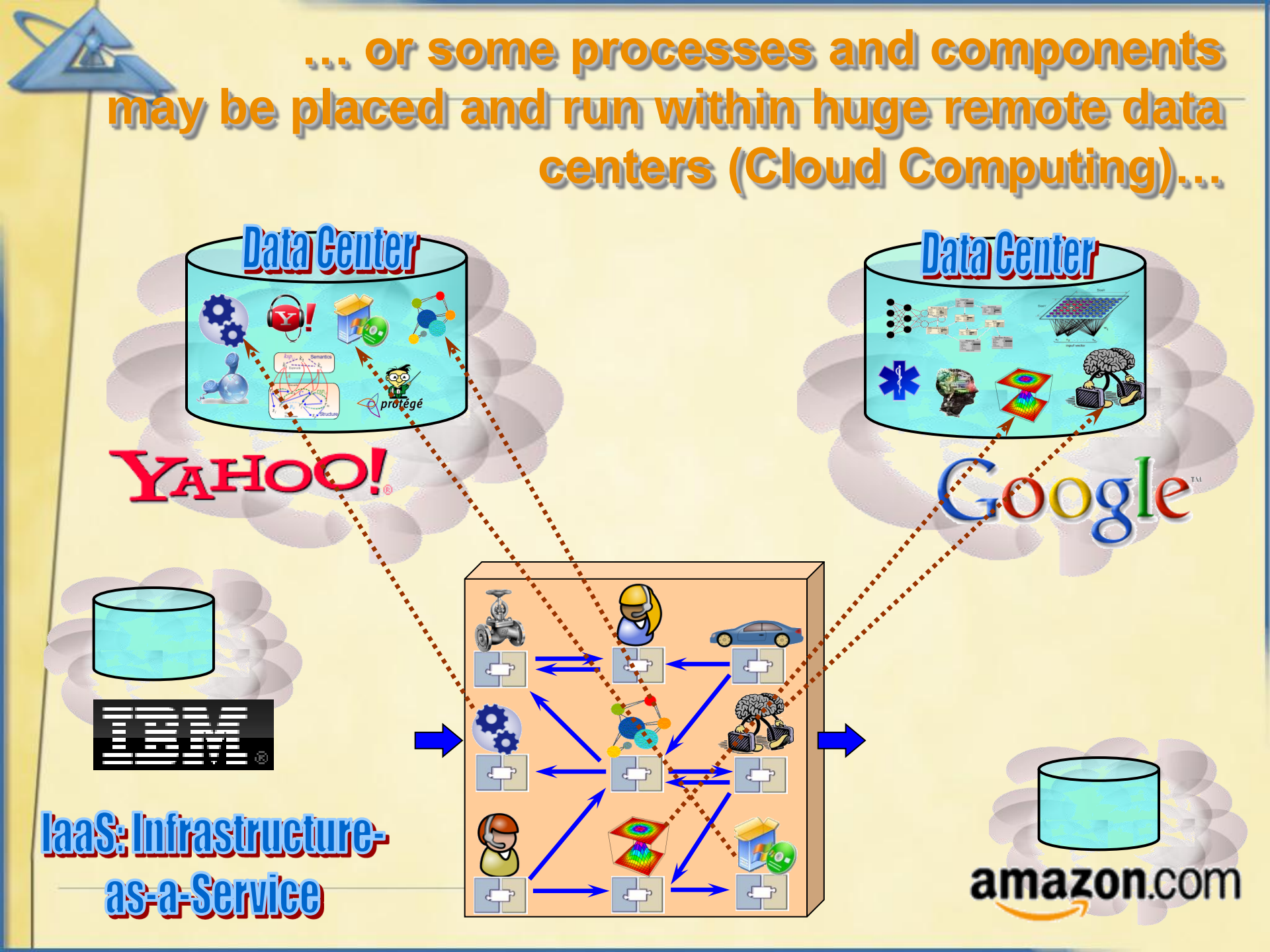
- *According to these visions of future Web, interoperability and collaboration will be possible only within mentioned groups of resources.*
- *However future Web applications and Web-based systems will contain heterogeneous components and therefore will demand support for integration, interoperability, collaboration and mutual service provisioning between resources of different types.*



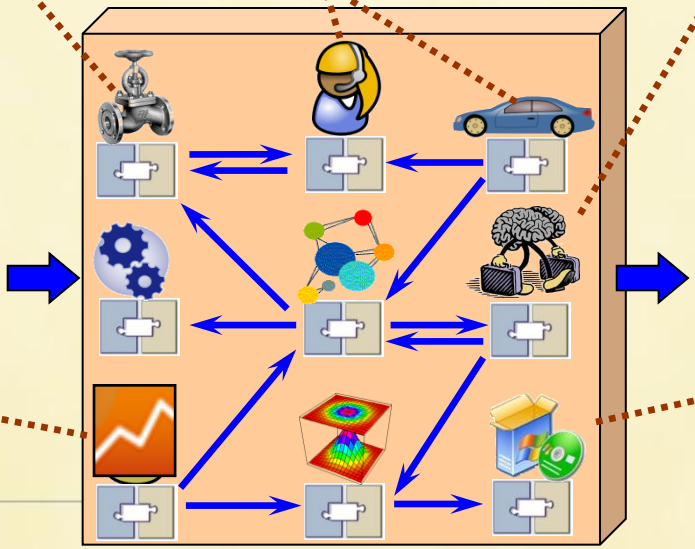
Components of a modern system are not only highly heterogeneous but also globally distributed (SOA) ...



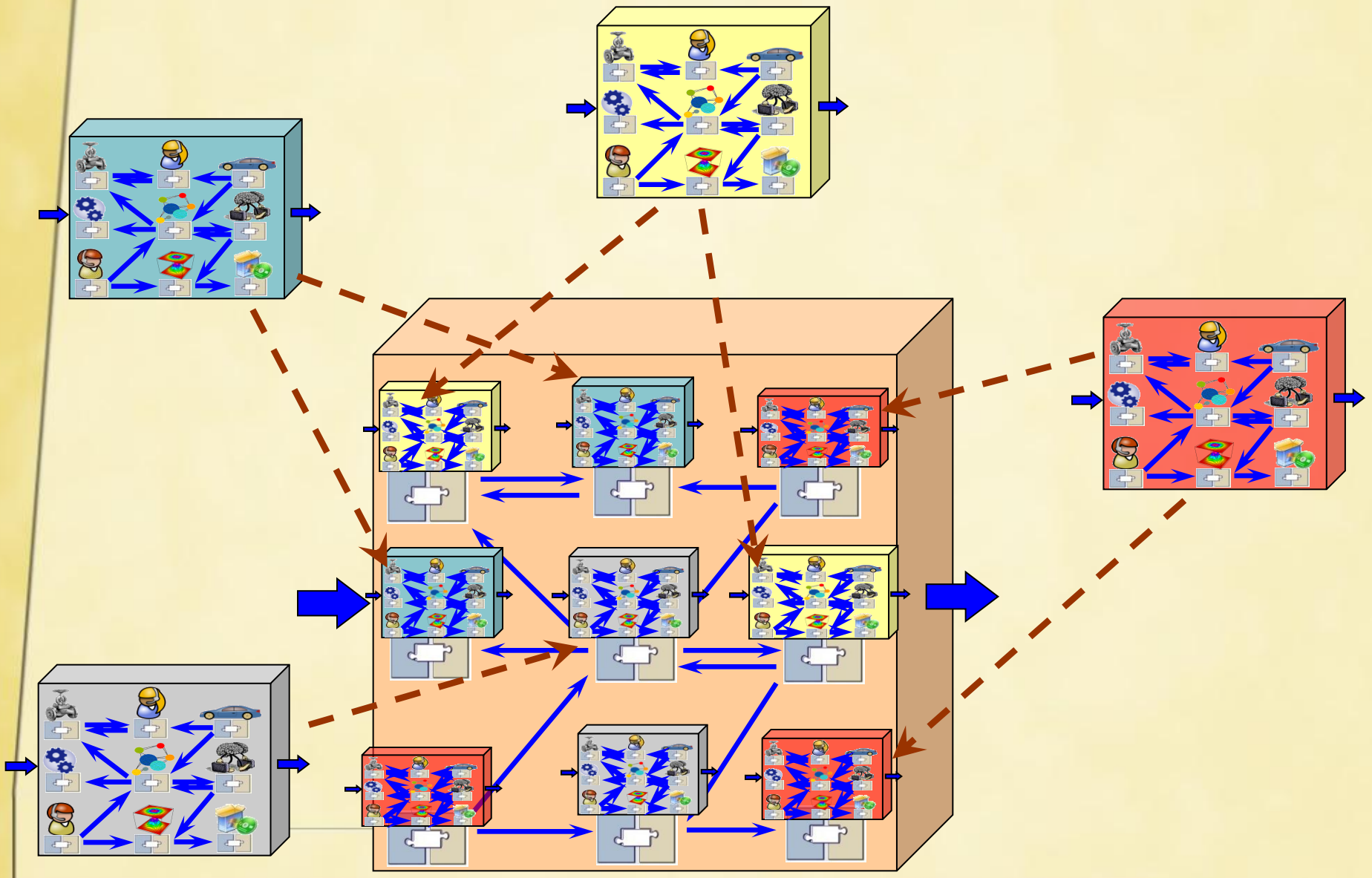
… or some processes and components may be placed and run within huge remote data centers (Cloud Computing)…



… and some parts of the system may be placed into mobile terminals under supervision of various mobile ecosystems…



… also various systems should enable integrating them to a more complex business logic with other systems



…and there should be an easy way to design, use, administrate and reconfigure the system

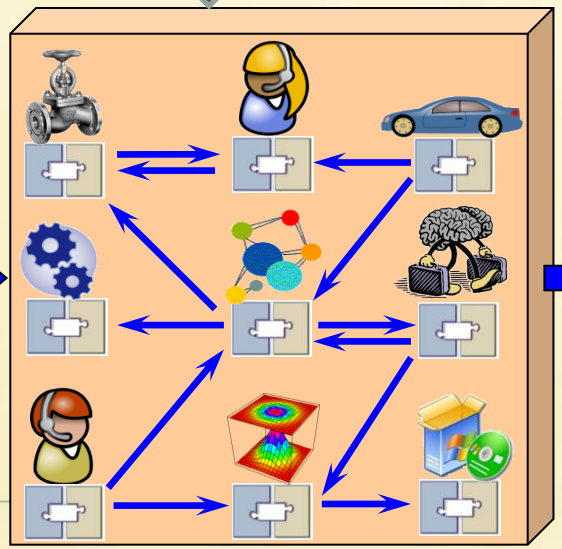
System Administrator

…

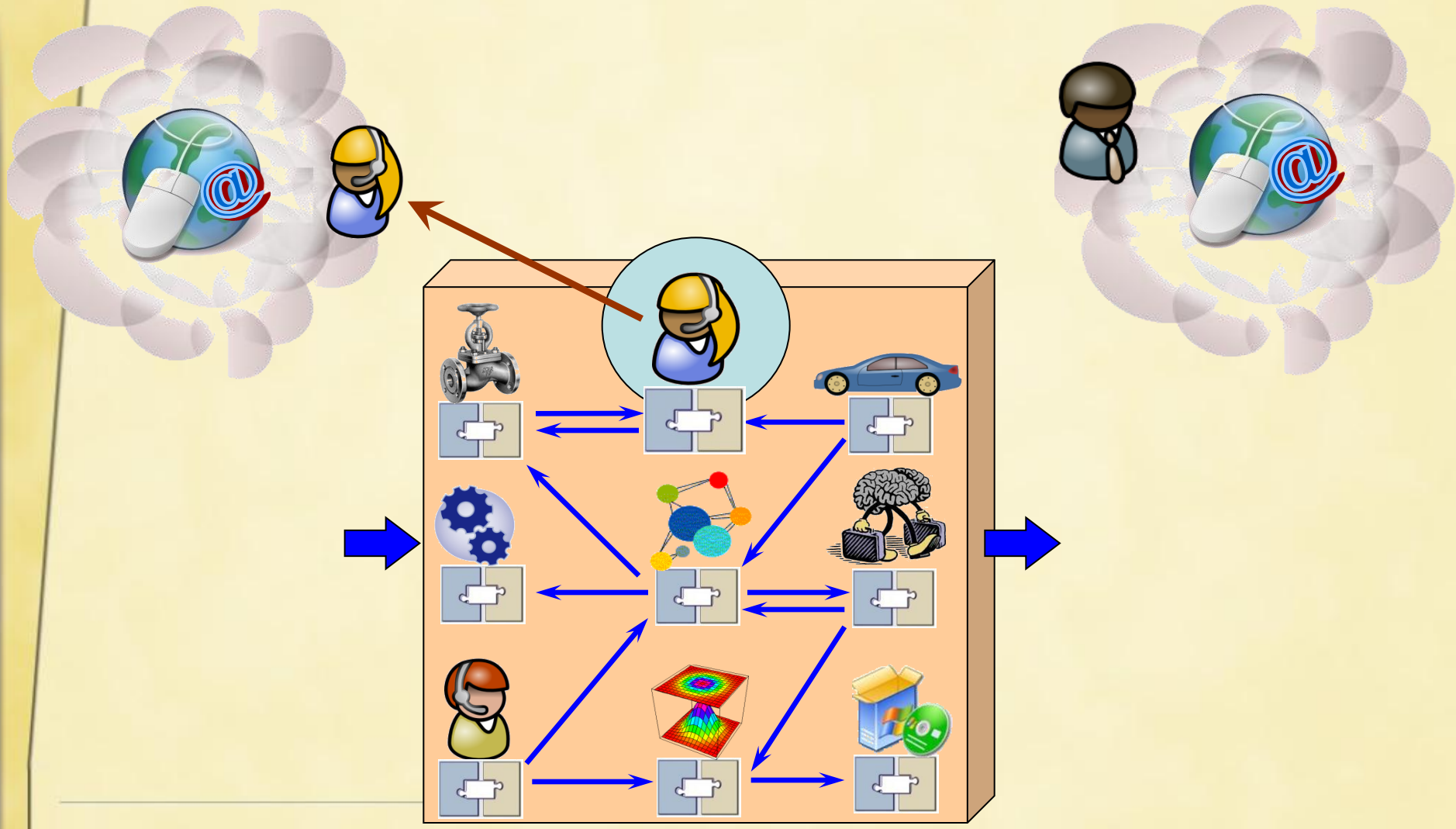
System Maintenance Engineer

System Architect

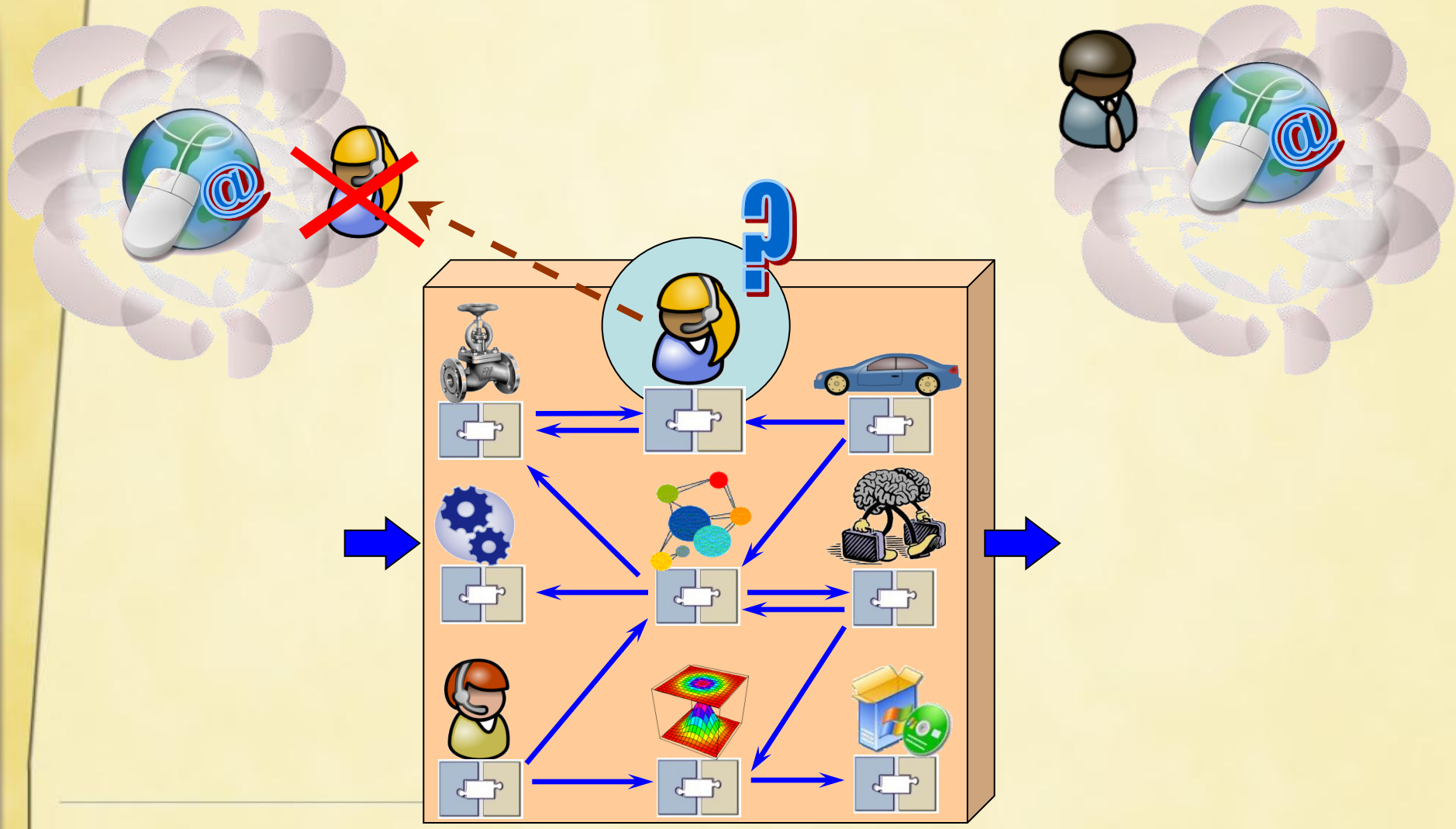
User



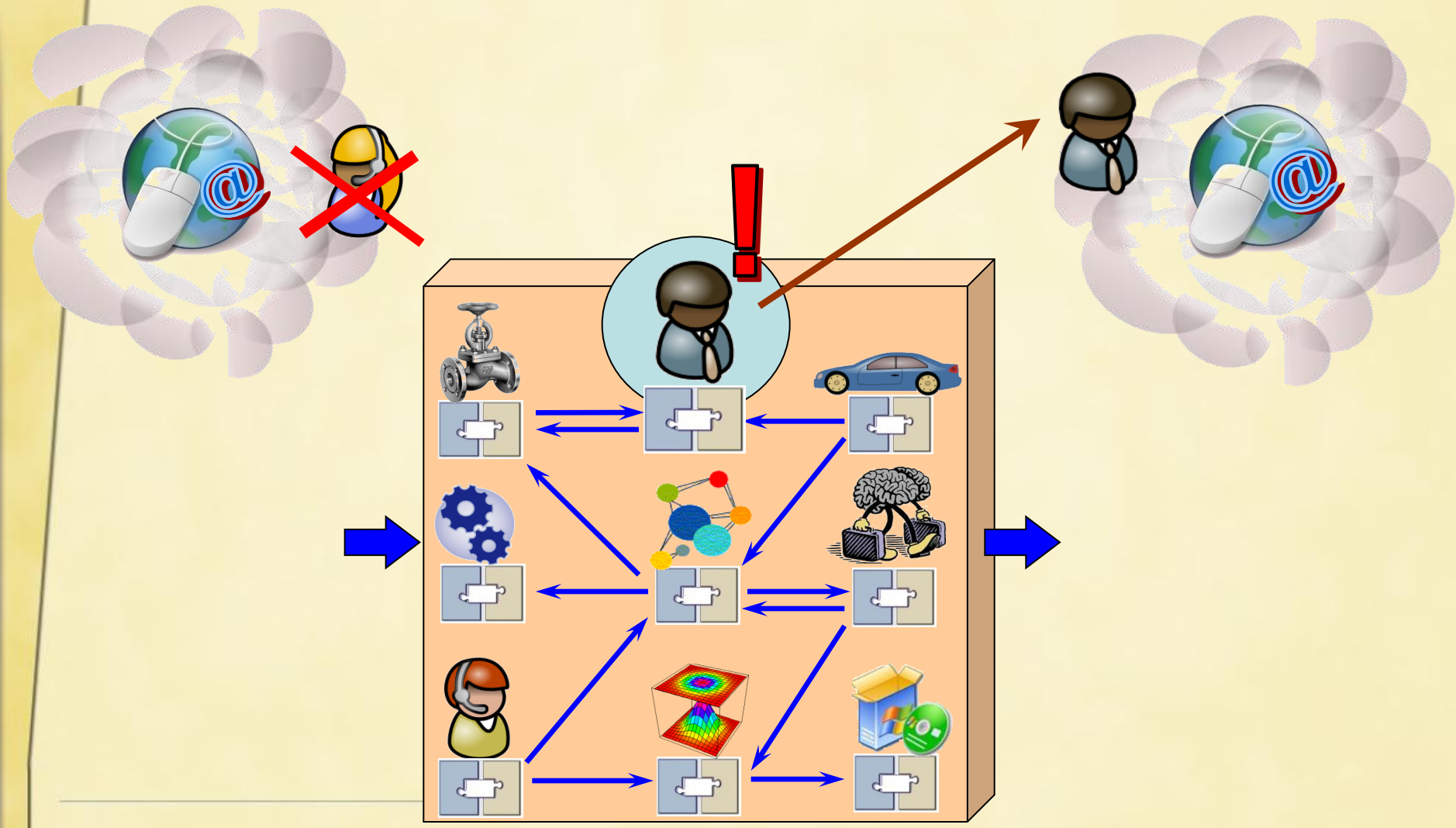
A system should be open and ready to reconfigure itself when needed (1)



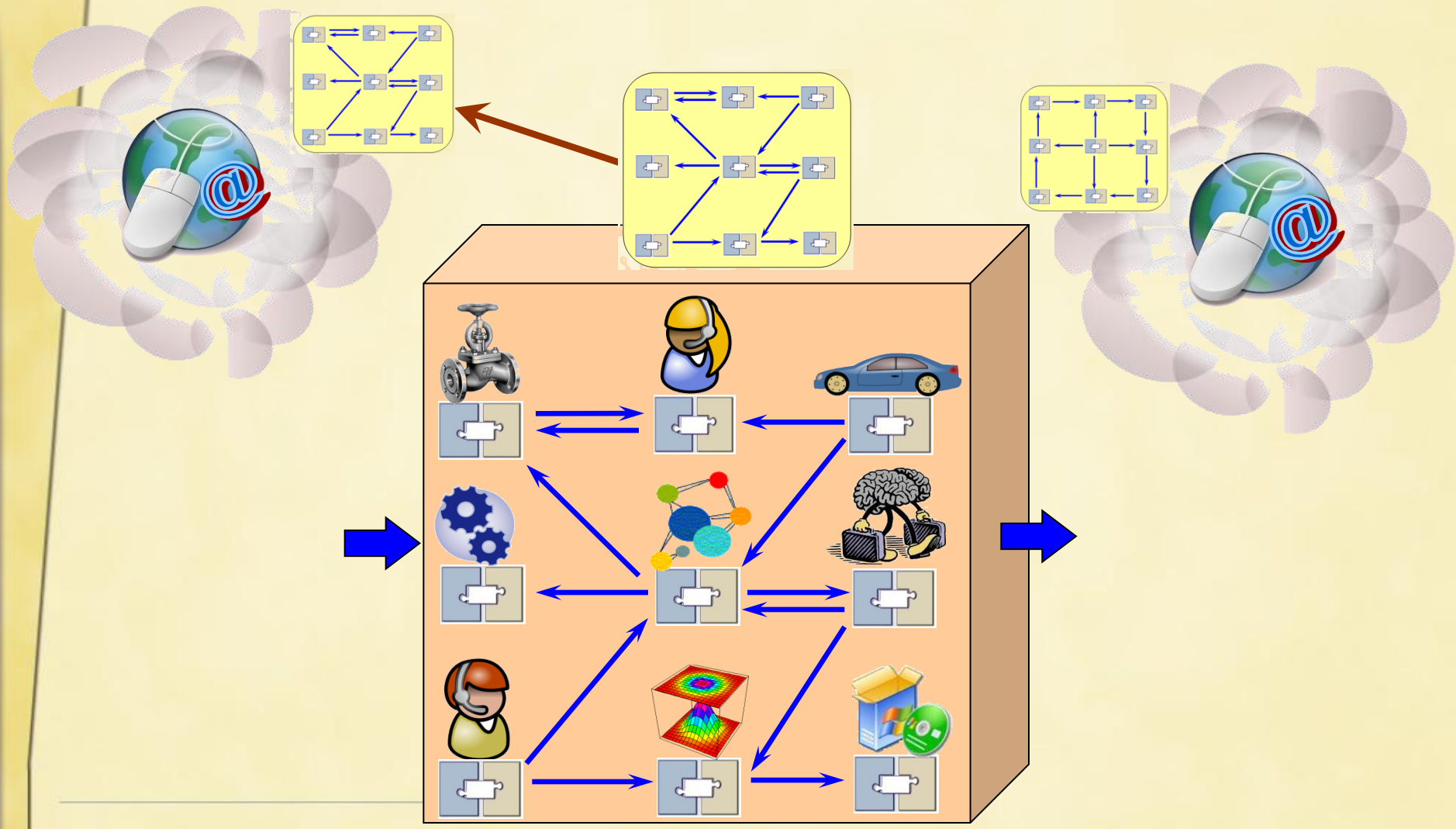
A system should be open and ready to reconfigure itself when needed (2)



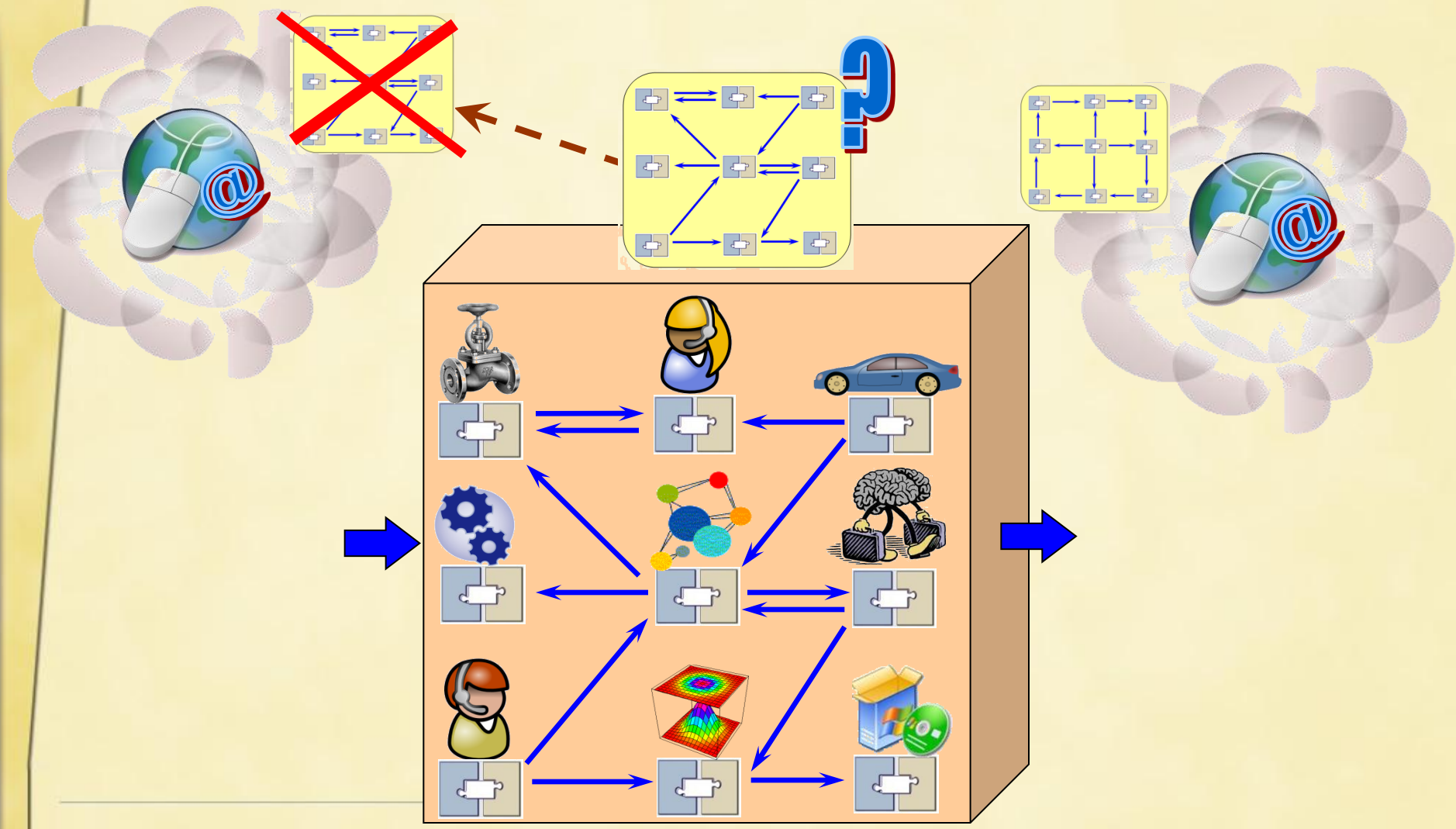
A system should be open and ready to reconfigure itself when needed (3)



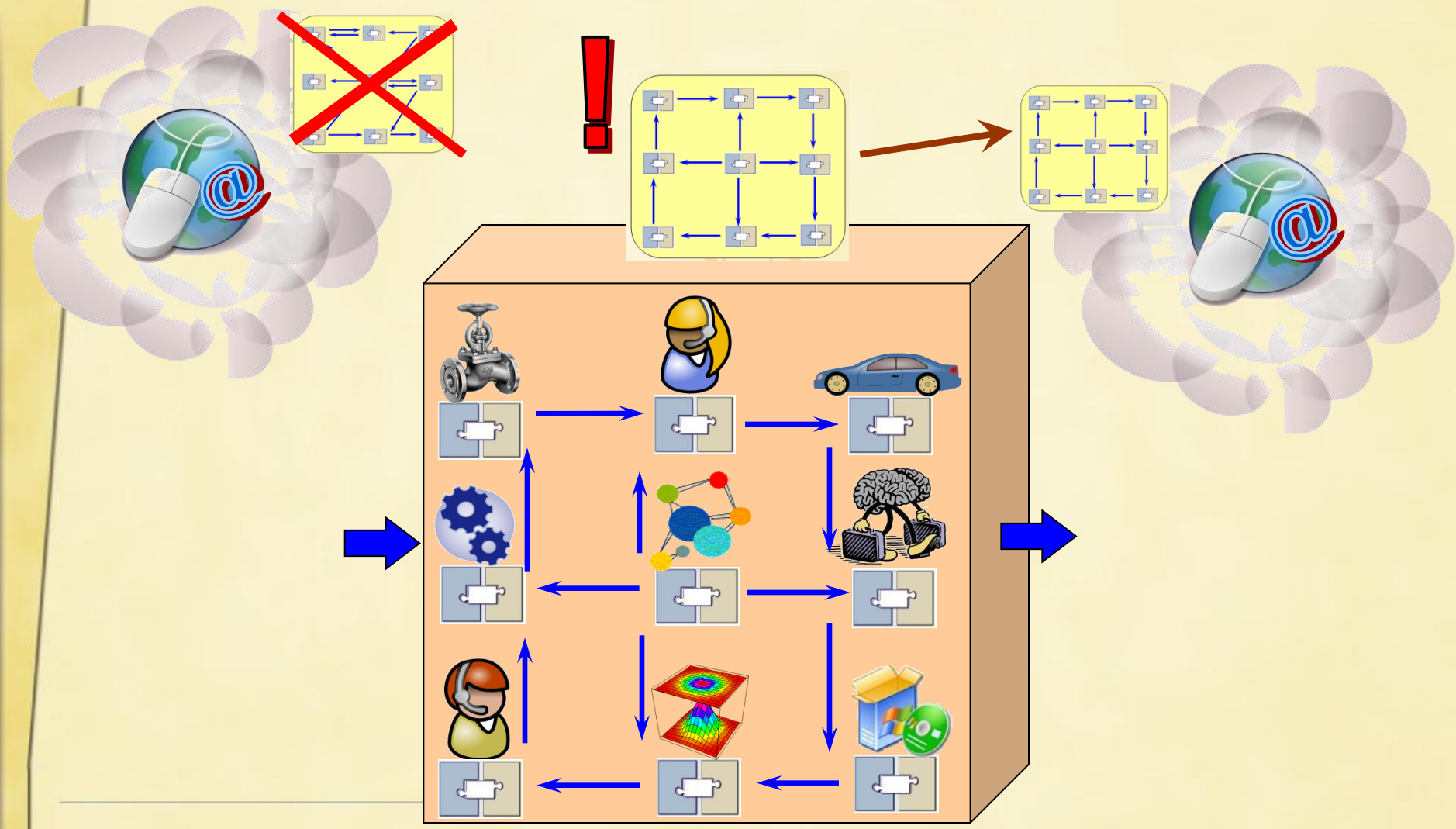
Even a business logic of a system can be imported and reconfigured on-the-fly (1)



Even a business logic of a system can be imported and reconfigured on-the-fly (2)



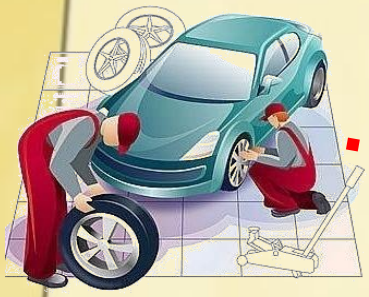
Even a business logic of a system can be imported and reconfigured on-the-fly (3)



Agents are needed !

… and semantics is needed !

Adding a ***"virtual representative"*** to every resource solves the global interoperability problem. Intelligent **agent** (a kind of "software robot") will act, communicate and collaborate on behalf of each Web resource



Semantic adapter

Semantic communication

Semantic business logic

GUN Concept (Industrial Ontologies Group)

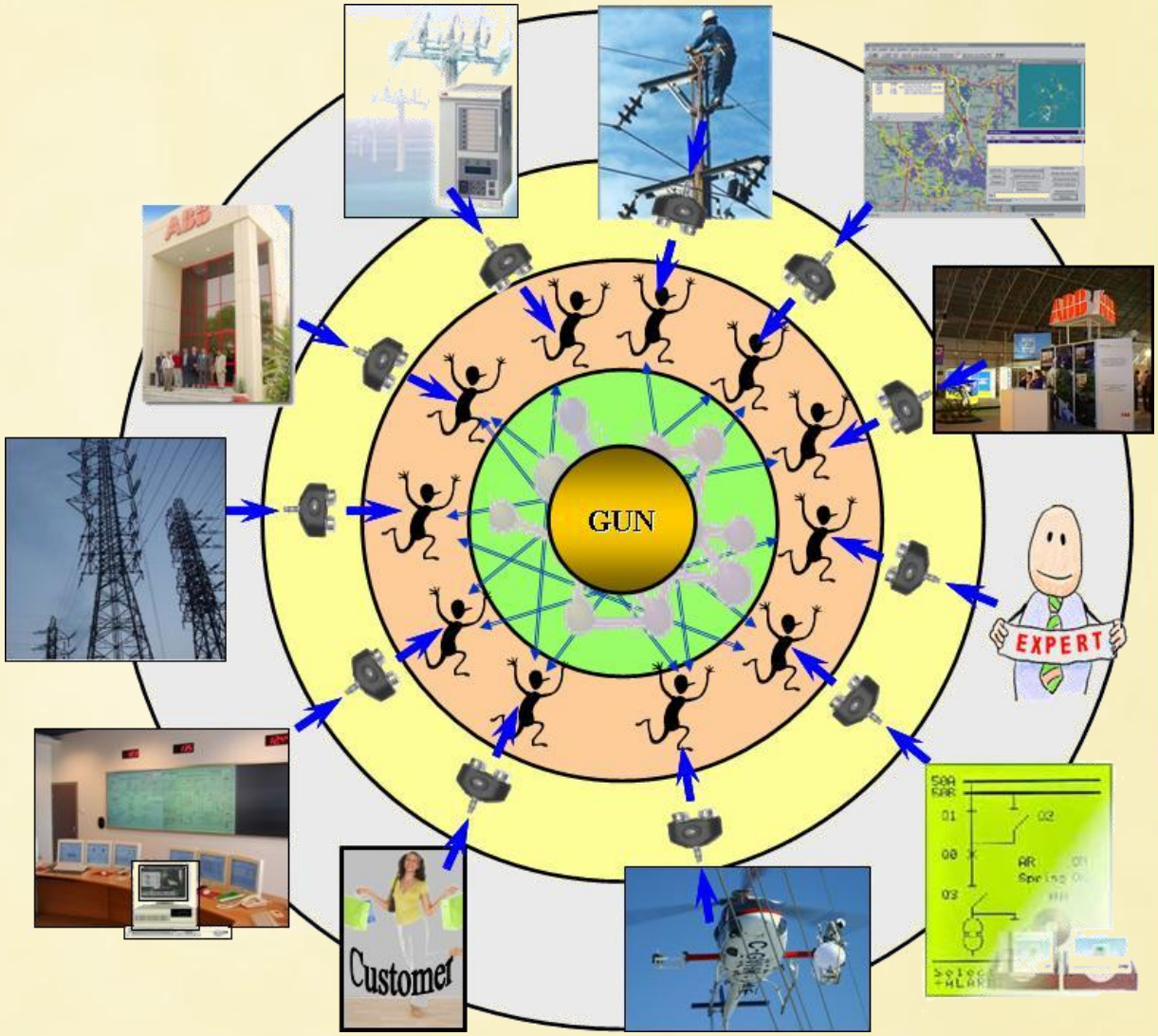
GUN – **G**lobal
Understanding
e**N**vironment

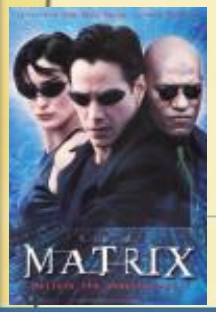
GUN

=

Global Environment
+
Global Understanding
=

Proactive Self-Managed Semantic Web of Everything





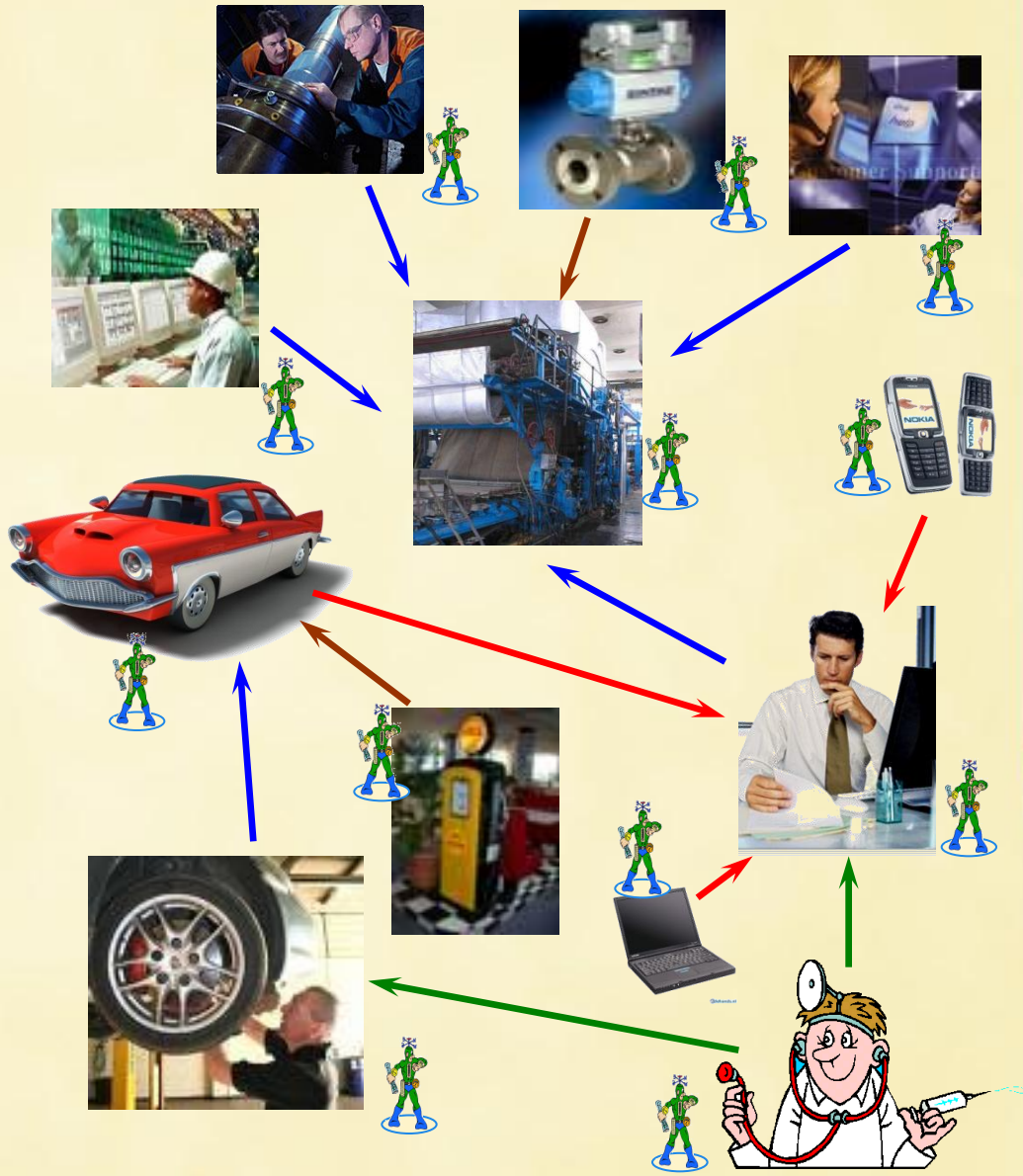
http://www.mit.jyu.fi/ai/OntoGroup/projects.htm
http://www.mit.jyu.fi/ai/Industrial_Ontologies_Group_booklet_print.doc

Global Understanding Environment (GUN)

GUN can be considered as a kind of Ubiquitous Eco-System for Ubiquitous Society, which will be such proactive, self-managed evolutionary Semantic Web of Things, People and Abstractions where all kinds of entities can understand, interact, serve, develop and learn from each other.

- Human-to-Human
- Human-to-Machine
- Machine-to-Human
- Machine-to-Machine
- Software-to-Human
- Software-to-Machine
- Software-to-Software
- Human-to-Software
- ...

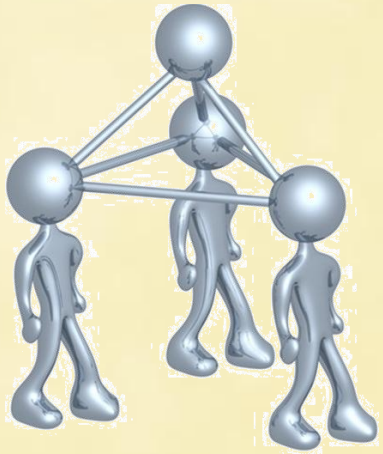
} Agent-to-Agent



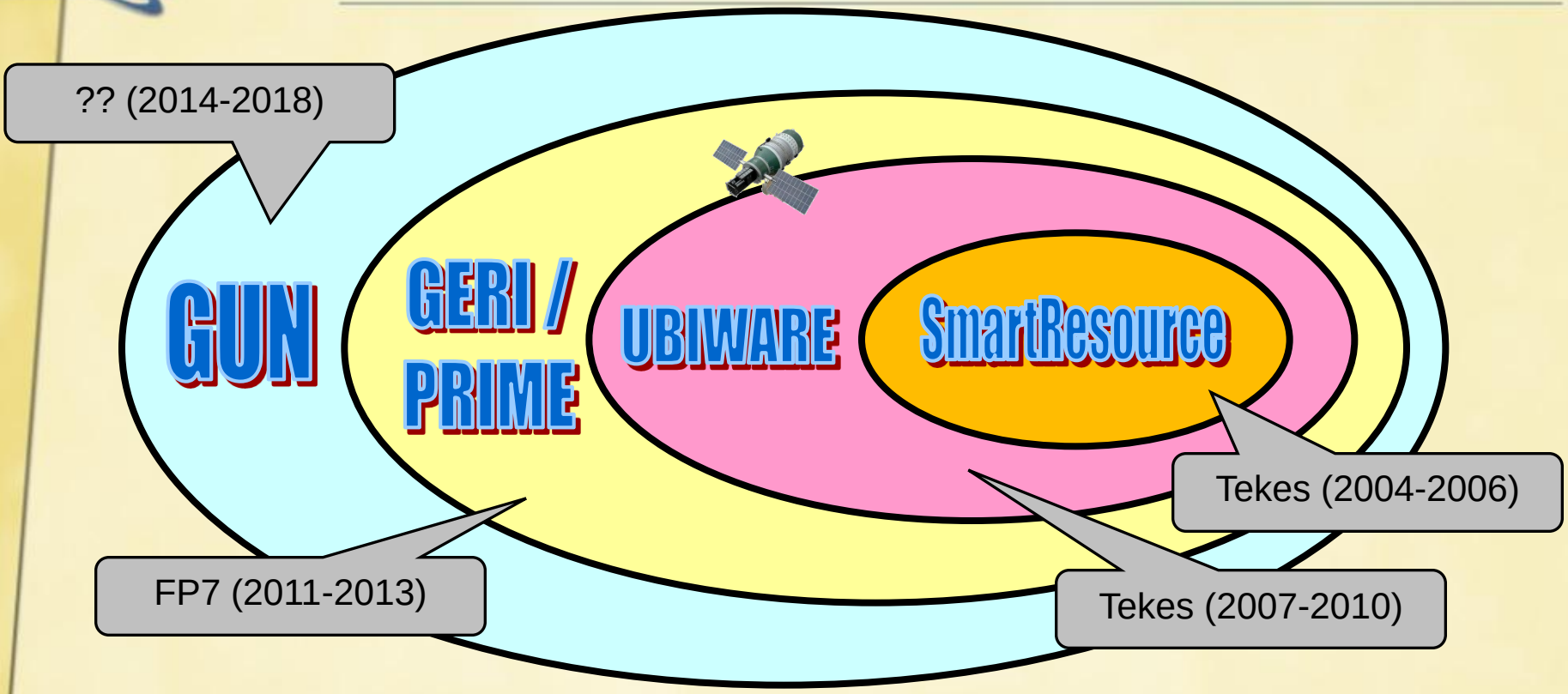
Ψ-Projection of GUN-Related Research

PSI - projection:

- **P**roactivity (agent technologies, Distributed AI, MAS, …)
- **S**emantics (Semantic Web, Semantic Technologies, …)
- **S**ervices (SaaS, SOA, SWS, Cloud Computing, …)
- **I**ntelligence (self-management, machine learning, data mining, knowledge discovery, pattern recognition, NLP, …)



Our Roadmap: GUN-GERI-UBIWARE-SmartResource



GUN (Global Understanding Environment) – Proactive Self-Managed Semantic Web of Things – Web 5.0 candidate - general ecosystem and final destination

GERI (Global Enterprise Resource Integration) – GUN subset related to industrial domains - is based on **PRIME** (Proactive Inter-Middleware) as UBIWARE extension

UBIWARE – middleware for GERI

SmartResource – semantic technology, pilot tools and standards for UBIWARE

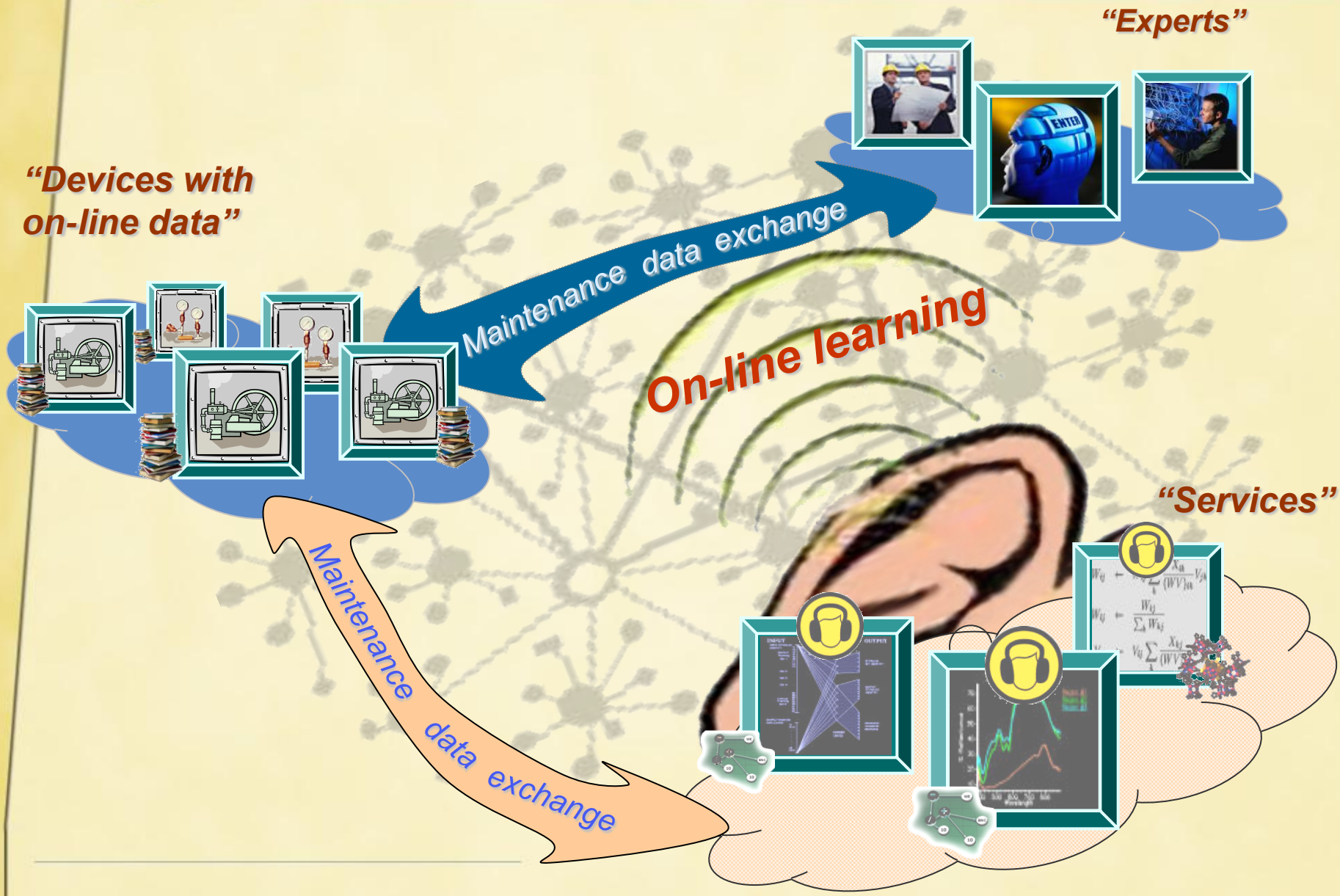
SmartResource project - our first step to GUN

SmartResource

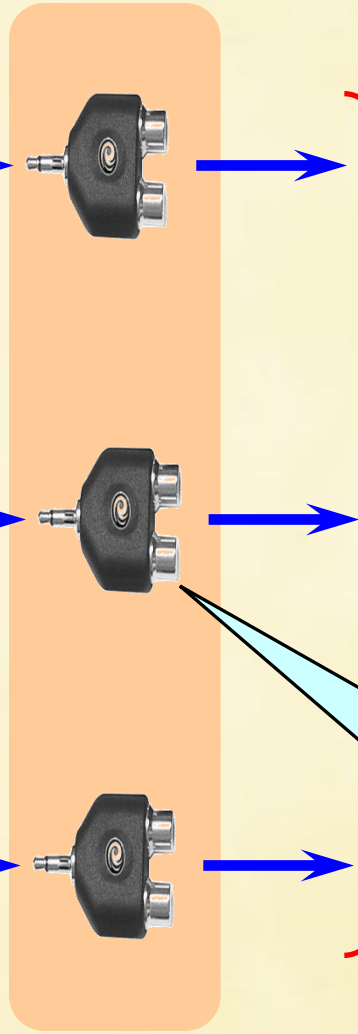
Tekes Project (2004-2006)

- SmartResource: "Proactive Self-Maintained Resources in Semantic Web" Tekes project (2004-2006) performed by Industrial Ontologies Group: http://www.mit.jyu.fi/ai/OntoGroup/SmartResource.htm .
- One of the most essential results of the SmartResource project was creation of the "Smart Resource Technology" for designing complex software systems. The technology allows considering each traditional system component as a "smart resource", i.e. proactive, agent-driven, self-managing. Such approach has shown certain advantages comparably to other software technologies, e.g. OOSE, SOA, Component-Based SE, Agent-Driven SE, Semantic SE, etc.

Smart Maintenance Environment



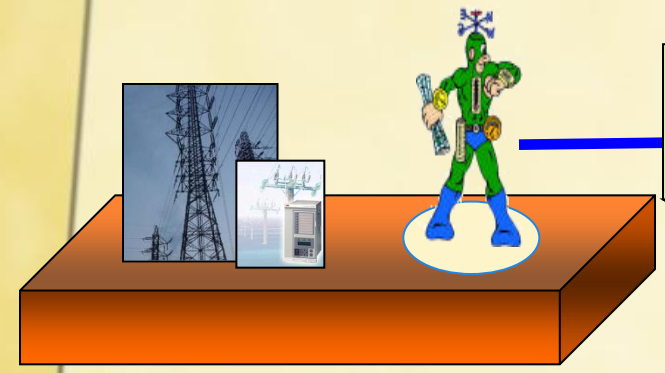
Challenge 1: General Adaptation Framework



Semantic Agent Programming Language (RDF-based)

Universal reusable semantically-configurable adapters

Challenge 2: General Proactivity Framework



Role "Feeder" description

Role "SCADA" description

Role "Maintenance worker" description

W3C WORLD WIDE WEB consortium

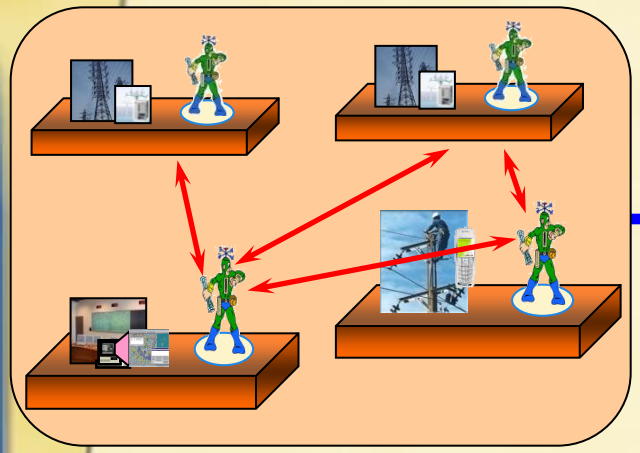
Semantic Web Activity

RDF

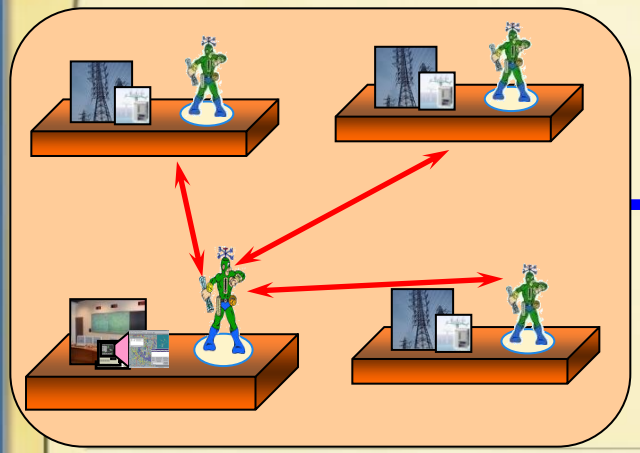
S-APL

Universal reusable semantically-configurable behaviors

Challenge 3: General Networking Framework



Scenario "Predictive maintenance" description



Scenario "Data integration" description

W3C WORLD WIDE WEB consortium

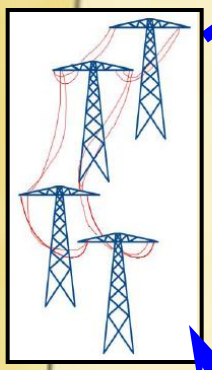
Semantic Web Activity

RDF

S-APL

Universal reusable semantically-configurable scenarios for business processes

Resource Maintenance Lifecycle and Semantic History Collection



Resource history collection

States

Condition Monitoring

Symptoms

Fault detection, alarms

Measurement

Predictive Measurement

Predictive Monitoring

Data Warehousing

Conditions Warehousing

History

S-APL

Industrial Resource

Diagnostics

Diagnoses Warehousing

Maintenance

Predictive Maintenance

Predictive Diagnostics

Plan Warehousing

Fault isolation

Maintenance Plan

Maintenance Planning

Diagnoses

Fault identification, localization

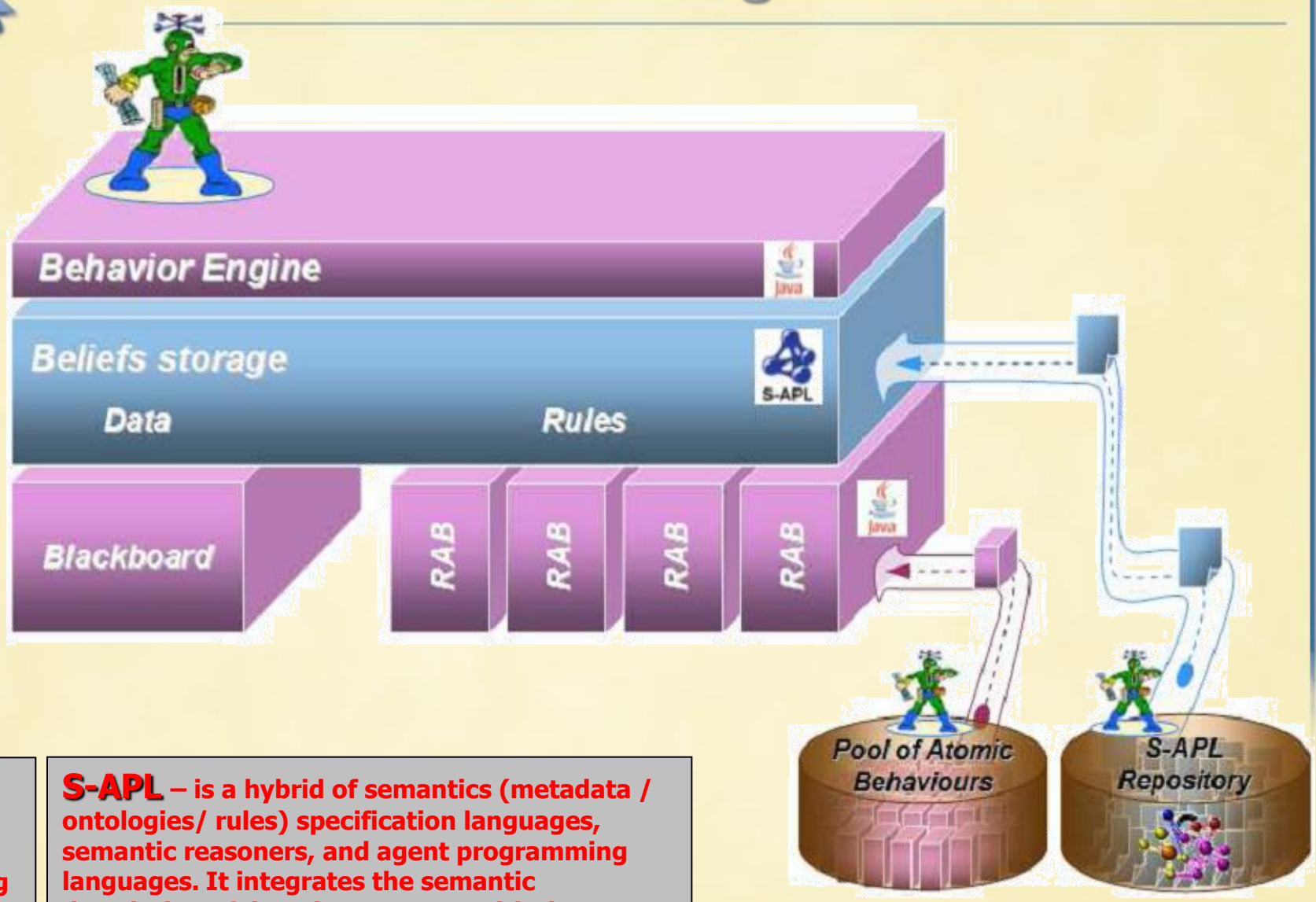
UBIWARE Project – greater step towards GUN

"Smart Semantic Middleware for Ubiquitous Computing"

- *Due to heterogeneity of provided services and supported components, UBIWARE is based on integration of several technologies: Semantic Web, Distributed Artificial Intelligence and Agent Technologies, Ubiquitous Computing, SOA (Service-Oriented Architecture), Web X.0, P2P and related concepts.*
- *The research and design on UBIWARE is started by* Industrial Ontologies Group *within UBIWARE project: "Smart Semantic Middleware for Ubiquitous Computing" (June 2007 – December 2010) funded by Tekes and industrial companies.*
- *Project web page:*

http://www.mit.jyu.fi/ai/OntoGroup/UBIWARE_details.htm

Current UBIWARE Agent Architecture



S-APL

S-APL – Semantic Agent Programming Language (RDF-based)

S-APL – is a hybrid of semantics (metadata / ontologies/ rules) specification languages, semantic reasoners, and agent programming languages. It integrates the semantic description of domain resources with the semantic prescription of the agents' behaviors

http://users.jyu.fi/~akataso/sapl.html

Latest Innovations Invented by Industrial Ontologies Group in UBIWARE

- OntoNuts

OntoNuts – is the ontology-based instrument to reconfigure and enhance complex distributed systems by automated discovery and linking external sources of heterogeneous and dynamic data and capabilities during system runtime

- 4i ("for eye") technology

4i – is smart ontology-based visualization technology able to automatically discover and utilize external visualization service providers and dynamically create and visualize mashups from external data sources in a context-driven way

- Smart Comments

Smart Comments – is smart ontology-based technology for end-user-driven control and configuration management of the application in runtime based on smart mapping of appropriate tags from natural language comments provided by a SW engineer and the source code.

New semantics of RDF Statement in S-APL (object - executable resource)

Semantics of such statement means that the value of the **Property_m** of the **Resource_i** can be obtained as a result of execution of the procedure (query, service, function, etc.) represented as **Resource_ j**

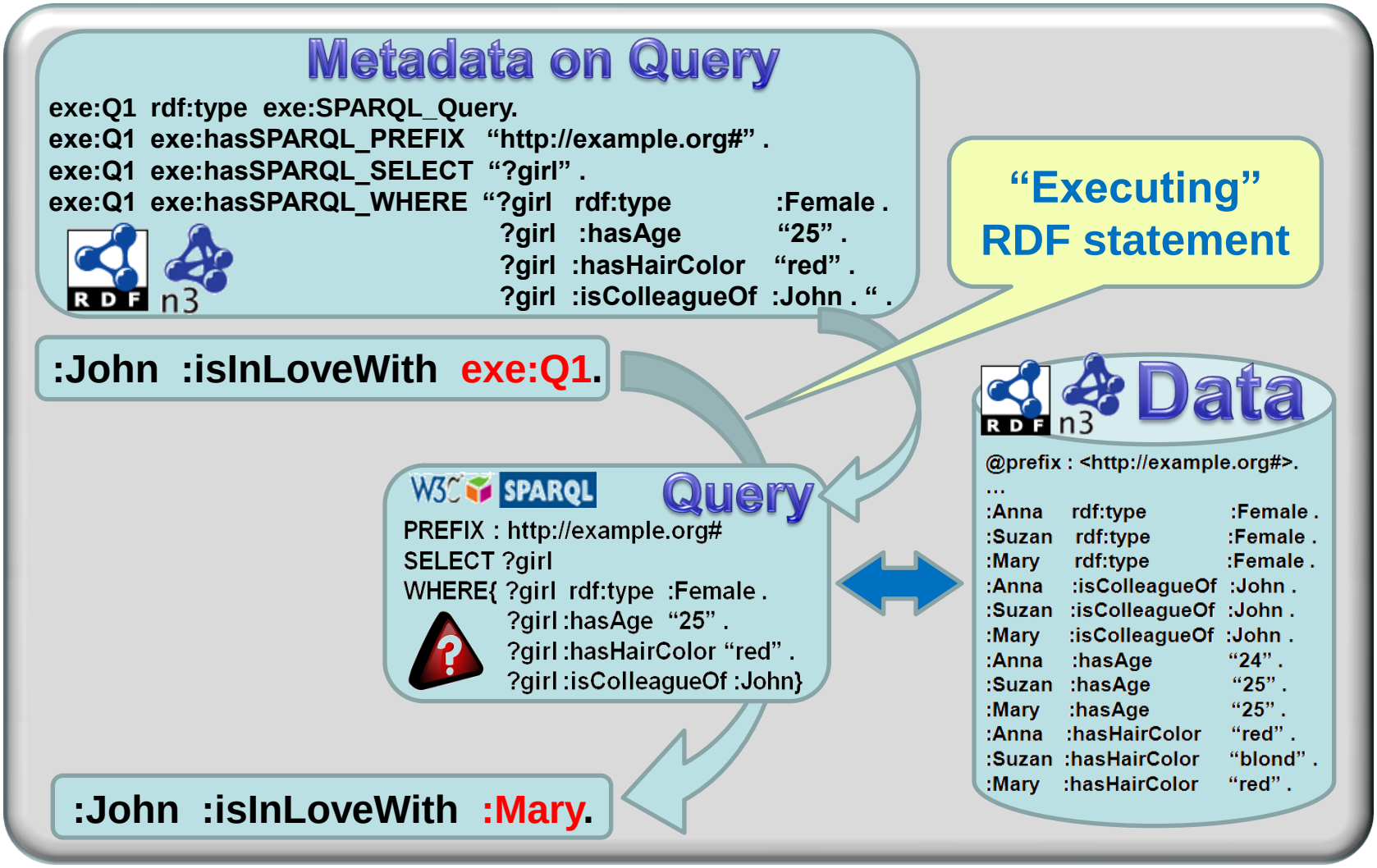
executable property

Semantic Agent Programming Language
(Designed by Industrial Ontologies Group)

S-APL

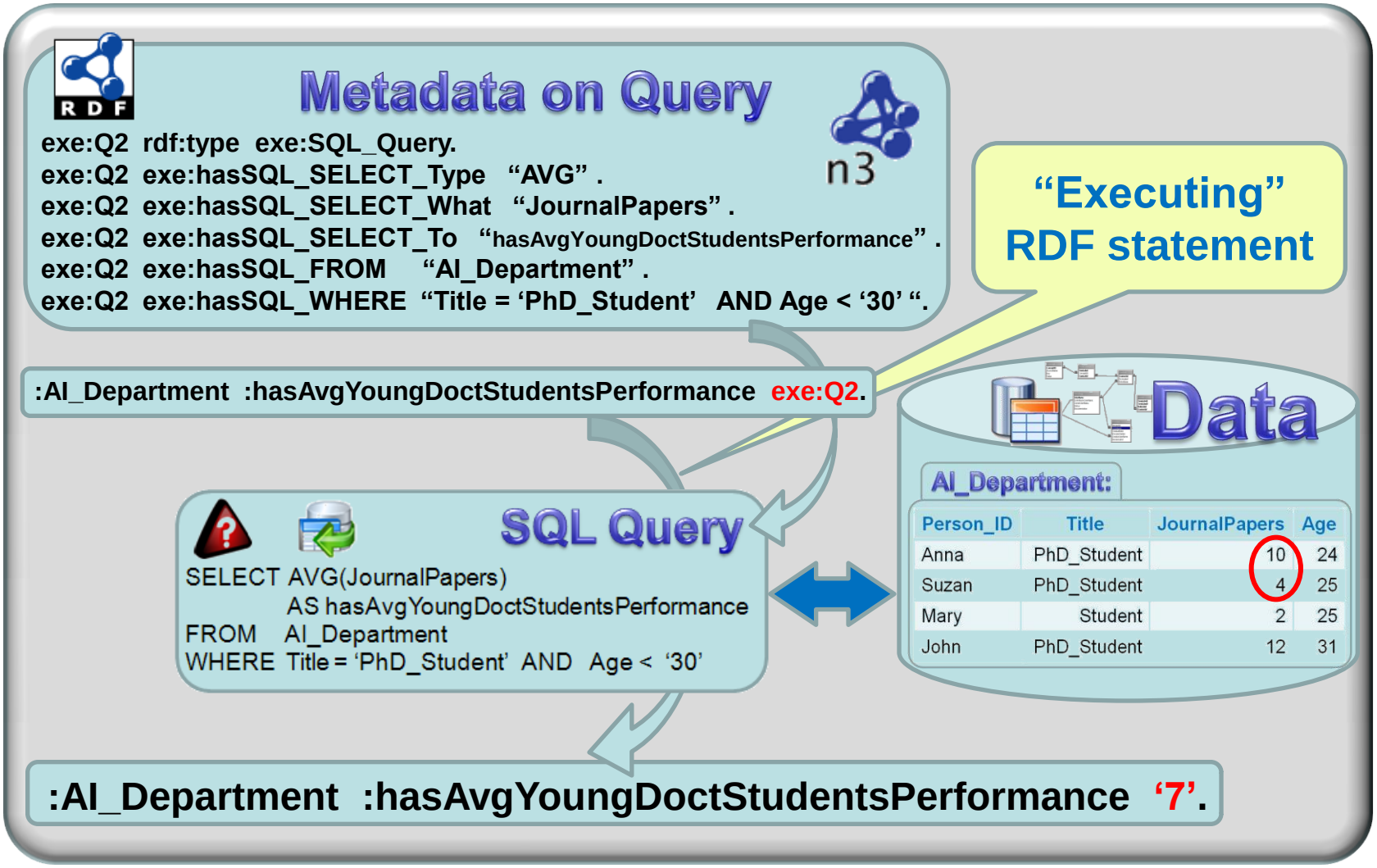
“Executable Knowledge”

example 1



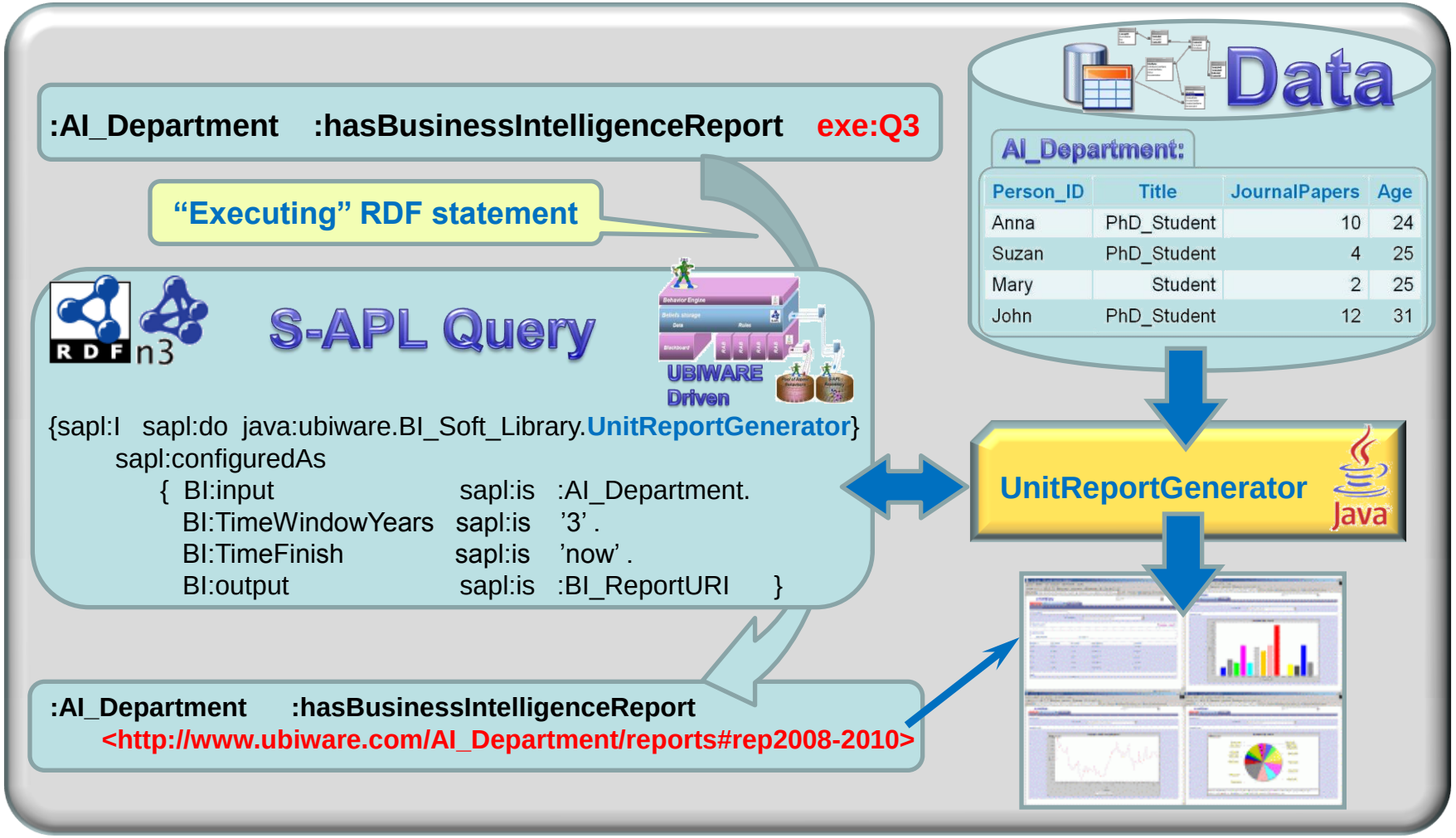
“Executable Knowledge”

example 2



“Executable Knowledge”

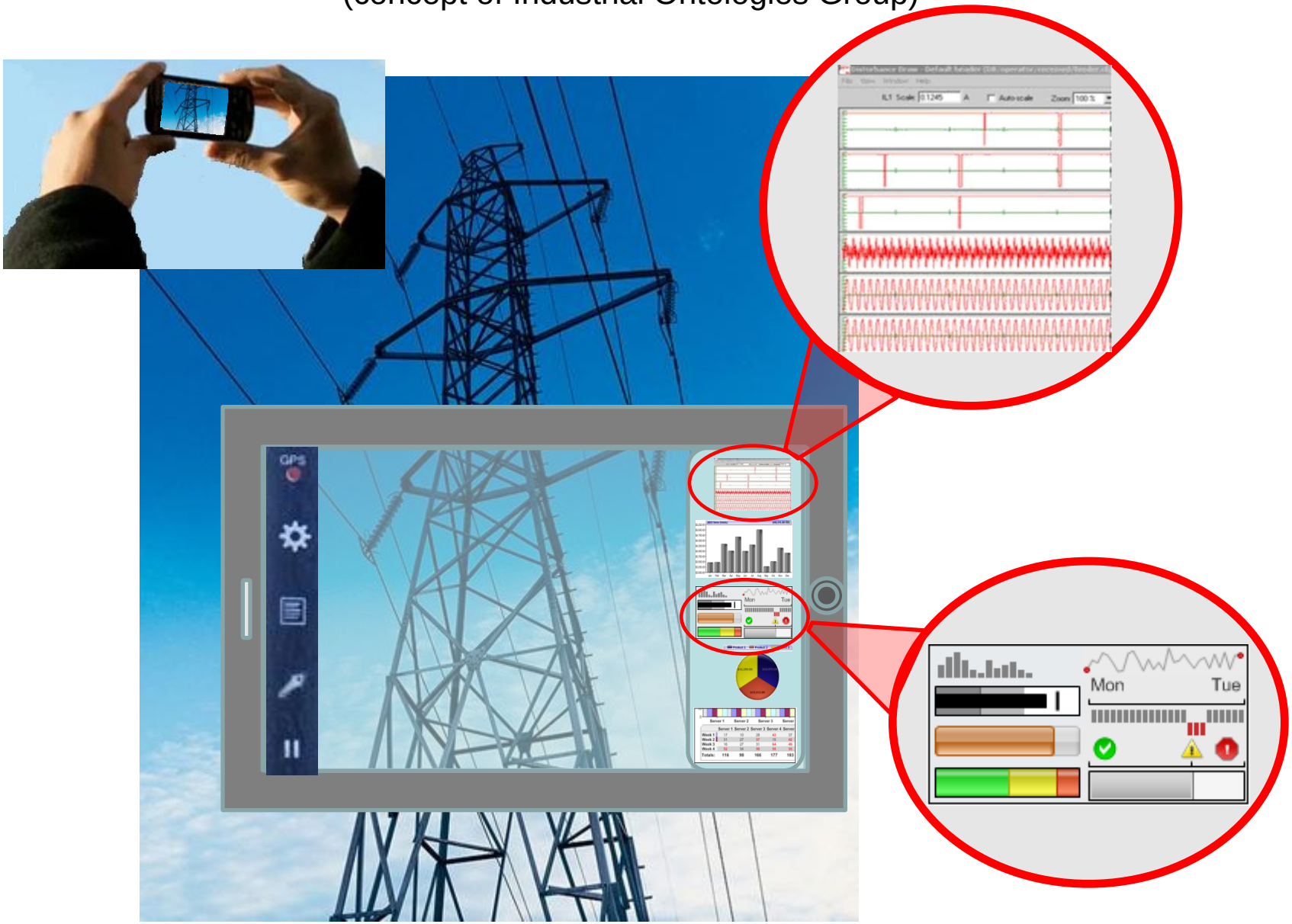
example 3



“Executable” Mixed Reality:

Business Intelligence on Top of Linked Data

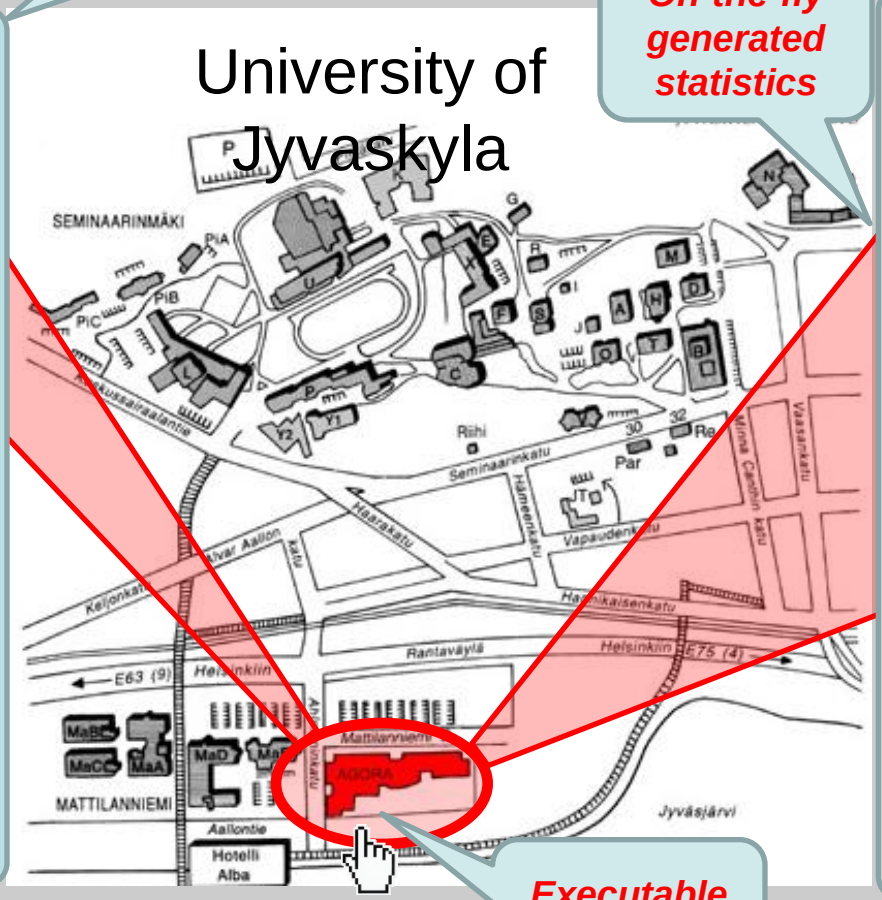
(concept of Industrial Ontologies Group)



Contexts for BI services

Contexts

- Education
- Research
- Innovations
- Intern. Activities
- Projects



On-the-fly generated statistics

Dept of Mathematical Information Technology
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Prof. Tuomo Rossi
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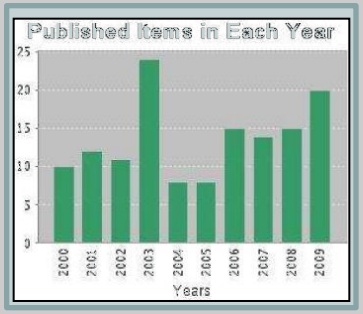
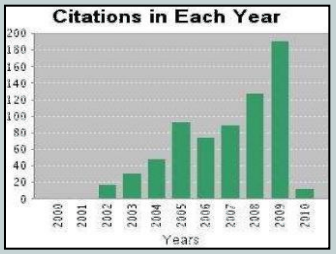
Total staff (2009):	78 (person years)
Total annual funding (Euro) (2009):	5,620,360
Budget	3,233,275
External	2,387,085
Number of students:	694

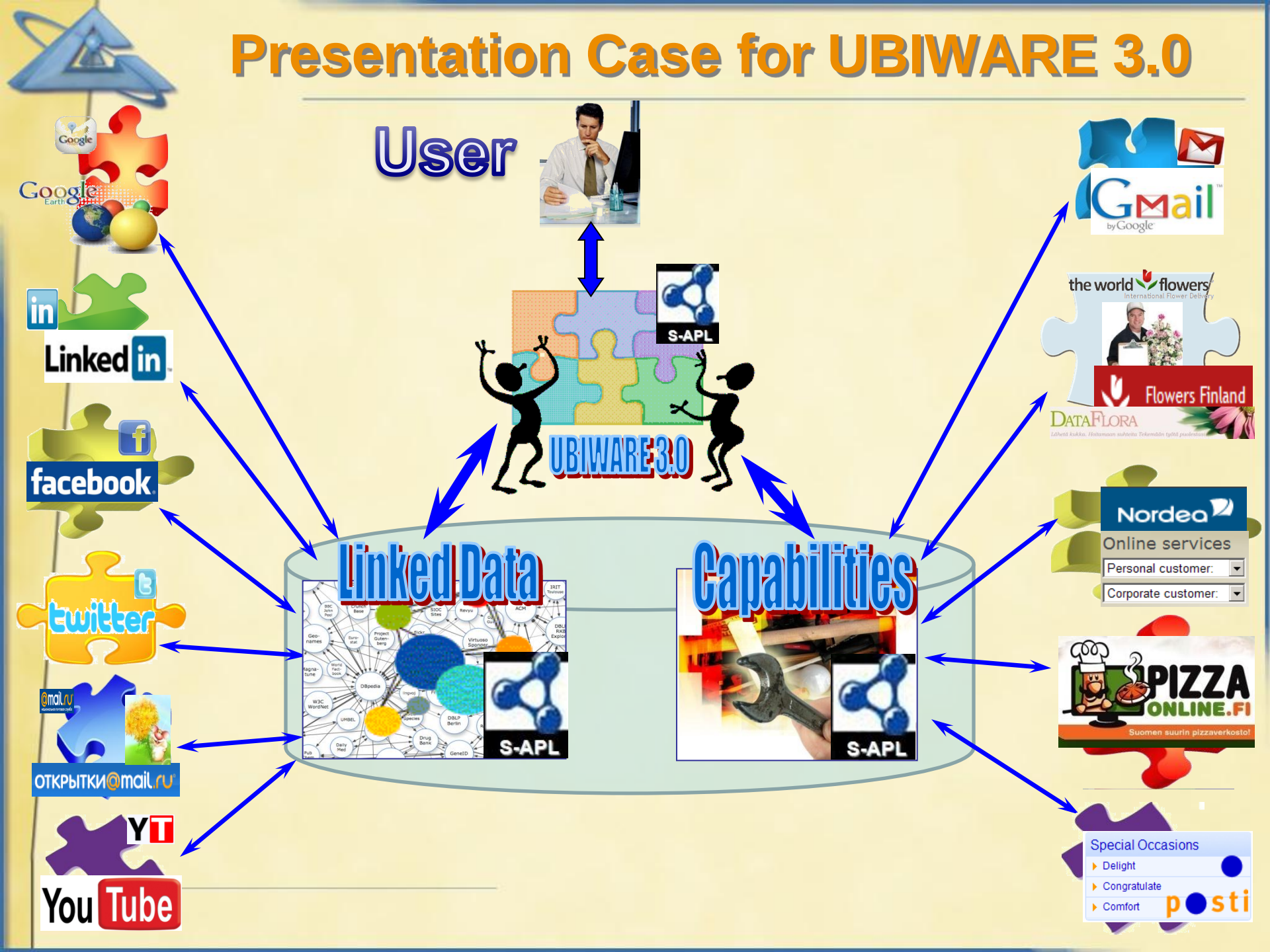




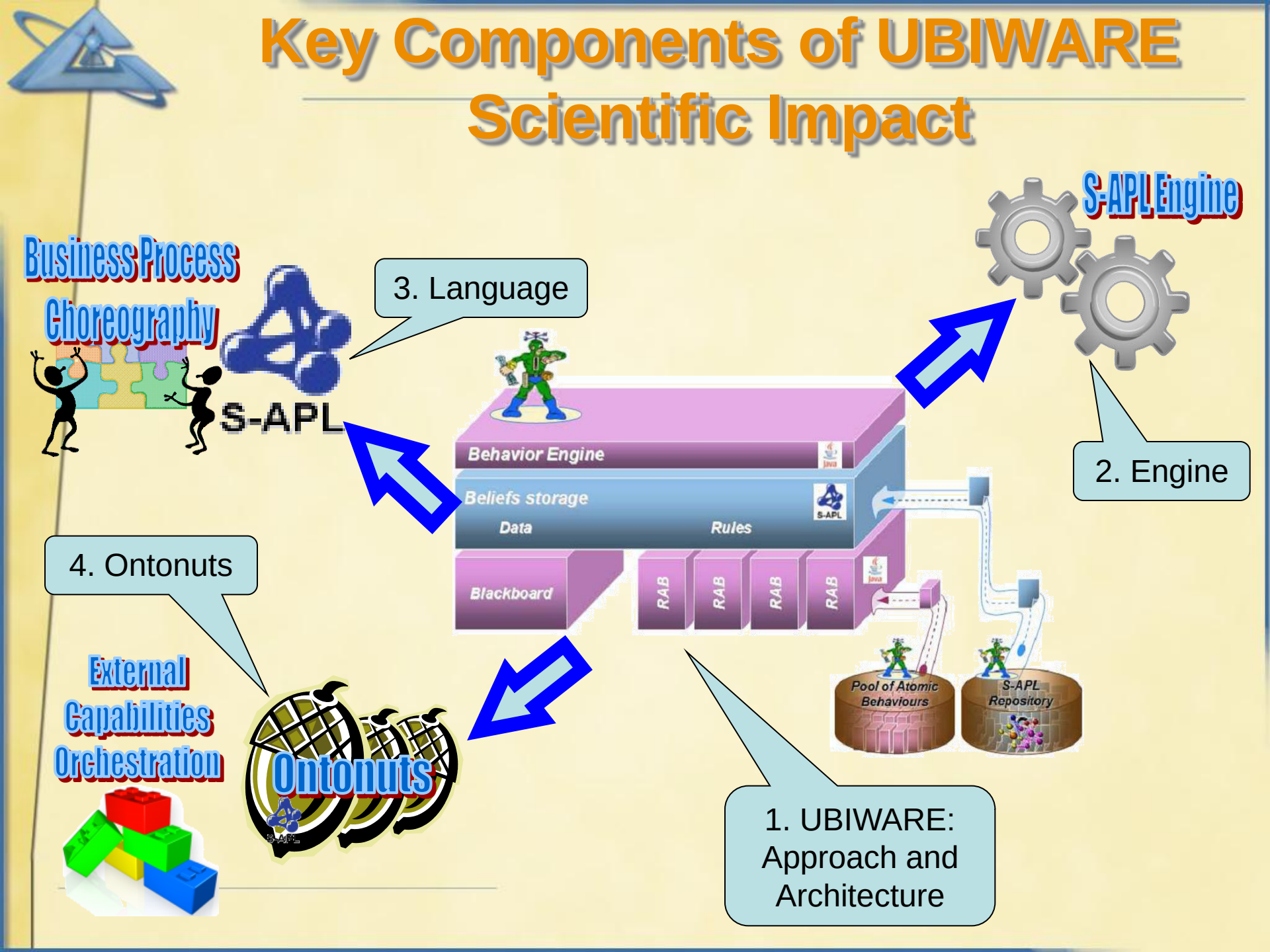
Number of publications 2009: 20
Average Citations per Item: 5.05
h-index : 14

Executable Focus

Presentation Case for UBIWARE 3.0



Key Components of UBIWARE
Scientific Impact



Conclusion (EaaS4E – beyond Cloud Computing)

- While the academic and business communities are exited with the new **Cloud Computing** and SOA slogan: "**EaaS: Everything-as-a-Service !**", our group since 2003 is actively working on **GUN Computing and Web 5.0**, which much more challenging slogan (based on "ψ-projection" technological vision) is: "**EaaS4E: EaaS for Everything**", meaning "**Really Everything-as-a-Proactive, Semantic and Self-Configurable Web Service Provider and Consumer!**".