

Following the Rules: From Policies to Norms



Sabrina Kirrane
IDLab, Ghent University – imec
19th January 2023

The Rules



the rules



[All](#) [Images](#) [Videos](#) [Maps](#) [Books](#) [More](#) [Tools](#)

About 7.700.000.000 results (0,88 seconds)

https://en.wikipedia.org/wiki/The_Rules

The Rules - Wikipedia

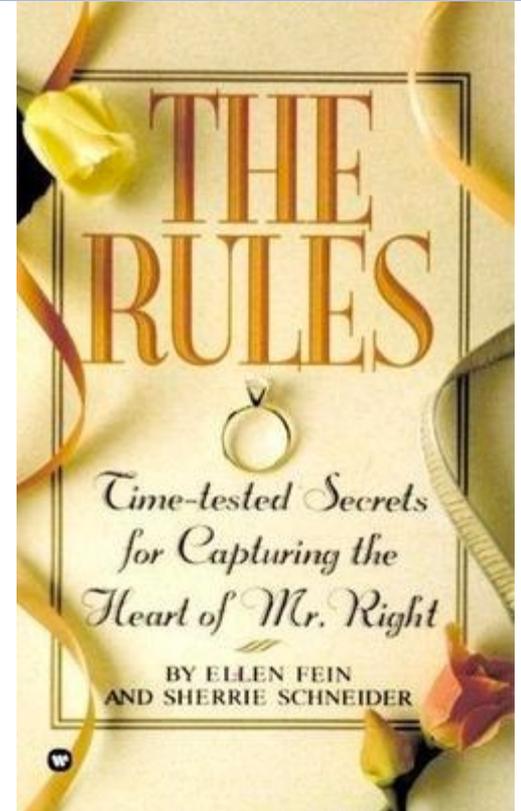
The Rules: Time-tested Secrets for Capturing the Heart of Mr. Right is a self-help book by Ellen Fein and Sherrie Schneider, originally published in 1995.

Followed by: [The Rules II: More Rules to Live ...](#) Publication date: 1995-02-14

Author: [Ellen Fein](#); [Sherrie Schneider](#) Publisher: [Grand Central Publishing](#), (Warn...

People also search for

[the rules of book](#) [the rules 2](#)
[the rules dating](#) [do the rules work](#)
[the rules pdf](#) [all the rules book](#)



Following the Rules



"Following the Rules"



[All](#) [Images](#) [Videos](#) [News](#) [Maps](#) [More](#) [Tools](#)

About 68.500.000 results (0,89 seconds)

Videos



I Can Follow the Rules Song | Music for Classroom Management

YouTube · HeidiSongs
30 Jul 2015



Classroom Rules Song for Children (Official Video) Following ...

YouTube · Patty Shukla Kids TV - Children's songs
12 Nov 2019



4 key moments in this video



Following the Rules

YouTube · MDR Bros. Education Channel
22 Nov 2020



7 key moments in this video



Follow Rules Children's Song Classroom Rules by Miss Patty ...

YouTube · Patty Shukla Kids TV - Children's songs
18 Nov 2019

[View all](#) →



"Following the Rules"

People also ask

What are the rules to be followed in school?

Why are rules important in the classroom?

What rules should teachers follow?

What are the 5 class rules?

Following the Rules

Knowing the Rules

CLASSROOM RULES

1. COME  CLASS ON TIME
2. BE READY  LEARN
3. LISTEN  FOLLOW DIRECTIONS
4. RAISE YOUR HAND  SPEAK
5. BE RESPECTFUL  OTHERS
6. ASK QUESTIONS
7. ALWAYS DO YOUR BEST
8. TRY NEW THINGS
9. BELIEVE  YOURSELF
10. WORK HARD  AND  HAVE FUN!

Following the Rules

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Classroom ZOOM Rules

-  Show up a few minutes before class time and wait to be admitted into the class.
-  Find a quiet place free of distractions. (siblings, television, parents, pets, etc.)
-  Be respectful at all times. While your video is on, no hand gestures or inappropriate language.
-  Stay on mute. Click the "raise hand" button if you have a question or something to share.
-  Stay focused and on task so you don't miss anything the speaker says.

@bigheart.youngminds

Following the Rules

Knowing the Rules and the Consequences



Following the Rules

Knowing the Rules and the Consequences

A chalkboard with white text and drawings. At the top, the word 'RULES' is written in a stylized font with radiating lines. Below it, a white-bordered box contains a numbered list of three rules. A white arrow points from the word 'RULES' down to the first rule. Below the box, the word 'CONSEQUENCES' is written. Another white-bordered box contains three lines of text describing the consequences for each time an rule is broken. A white arrow points from the word 'CONSEQUENCES' down to the first consequence.

RULES

1. Follow directions and procedures.
2. Respect yourself, respect others, respect property.
3. Stay on task.

CONSEQUENCES

1st time: Warning
2nd time: Consequence
3rd time: Parent Contact



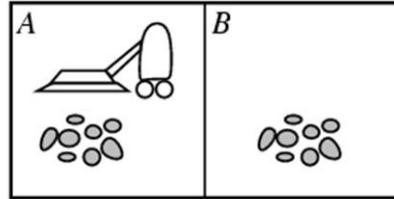
<https://www.pinterest.co.uk/pin/nuns-reverse-reverse--67202219424555999/>

Following the Rules

Programming Rules

Vacuum-cleaner world

- **Percepts:**
Location and status,
e.g., [A,Dirty]
- **Actions:**
Left, Right, Suck, NoOp



Example vacuum agent program:

function Vacuum-Agent([location,status]) returns an **action**

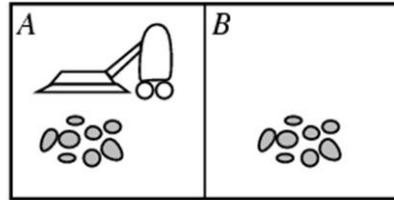
- *if status = Dirty then return Suck*
- *else if location = A then return Right*
- *else if location = B then return Left*

Following the Rules

Programming Rules

Vacuum-cleaner world

- **Percepts:**
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e.g., [A,Dirty]
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Example vacuum agent program:

function Vacuum-Agent([location,status]) returns an **action**

- *if status = Dirty then* return **Suck**
- *else if location = A then* return **Right**
- *else if location = B then* return **Left**

16 of 914 results for "robot vacuum cleaner"

Sort by: Featured

Eligible for free delivery

Free Delivery by Amazon
to all customers with orders over €29
shipped by Amazon

Your search "robot vacuum cleaner" was automatically translated into "saugroboter".Undo

RESULTS

Learn about these results. Price and other details may vary based on product size and colour.

apartment
vacuum Cleaners
Robotic Vacuums
See All 11 Departments

Customer Review

★★★★☆ & Up
★★★★☆ & Up
★★★★☆ & Up
★★★★☆ & Up

and

Xiaomi
eufy
MEDION
roborock
Dreame
Shark
iRobot

See more

Price



Xiaomi Mi Robot Vacuum Mop 2S Vacuum & Mop Robot
(2200Pa Suction Power, LDS Sensors, 300ml Dust Container, 20..

★★★★☆ ~ 1,252

-33% €200.68 RRP: €301.51

✓prime Get it Thursday, Aug 25

FREE Delivery by Amazon

More buying choices

€157.21 (77 used & new offers)



AirRoBo P10 Robot Vacuum Cleaner, 2,600 Pa, Wi-Fi with Space
Map in Real Time, Wi-Fi/App/Alexa, Self-Charging, 140 Minutes...

★★★★☆ ~ 2,423

€159.99

Save €40.00 with voucher

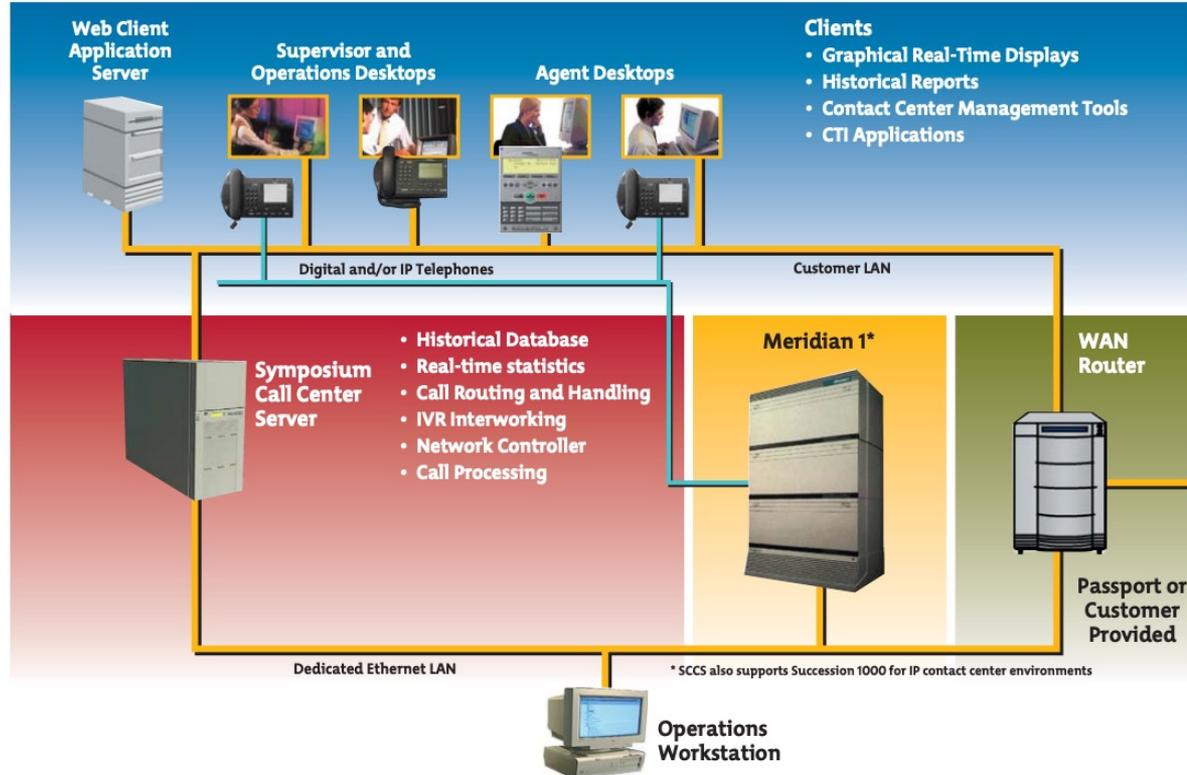
✓prime Get it Thursday, Aug 25

FREE Delivery by Amazon

Following the Rules

System Integration

Figure 1. Symposium Call Center Server Architecture



Following the Rules

Document Exchange

Your Automated Document Supply Chain

Profitable. Secure. Paperless.

The central graphic displays the Celtrino platform logo, a stylized 'C' inside a blue rounded square with a white grid pattern. Below the logo, the text "celtrino platform" is written in a sans-serif font. Surrounding the central logo are several white document icons representing different types of business documents: eSales Invoice, eDespatch Advice, eSales Order, eCatalogue, Catalogue, ePurchase Order, eReceipt of Delivered Goods, and ePurchase Invoice. Each document icon shows a simplified version of its respective form with various fields and tables.

Following the Rules

Virtual Personal Assistants



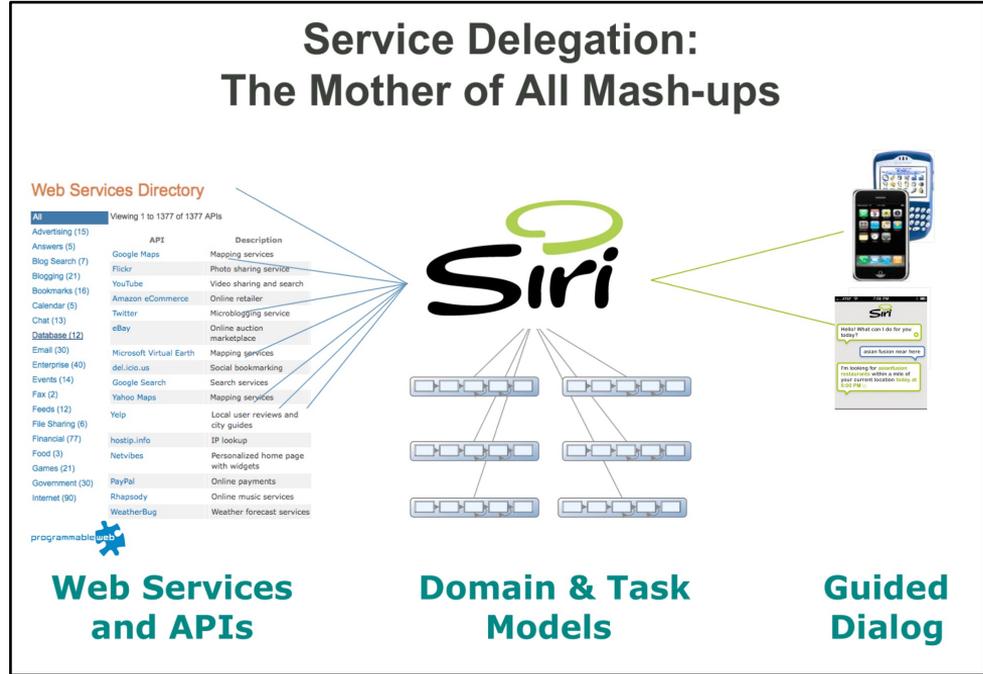
Siri, a Virtual Personal Assistant
 Bringing Intelligence to the Interface

Tom Gruber
 CTO & cofounder, Siri



**2009 Semantic
 Technology Conference**
 JUNE 14 - 18 SAN JOSE, CALIFORNIA

Service Delegation: The Mother of All Mash-ups



Virtual Personal Assistants

Virtual Personal Assistants

The Status Quo



Siri



Cortana



amazon alexa



Google Assistant

Virtual Personal Assistants

The Status Quo

The screenshot shows the top of a Business News Daily article. At the top left is the logo 'BUSINESS NEWS DAILY' and a 'SUBSCRIBE' button. Below is a navigation bar with 'START', 'GROW', and 'LEAD' tabs. A breadcrumb trail reads 'Home > Grow Your Business > Technology'. On the left is a vertical table of contents with four items: 'Accessibility and trends', 'Ease of setup', 'Success of queries and ability to understand context', and 'Bottom line'. The main article title is 'AI Faceoff: Siri vs. Cortana vs. Google Assistant vs. Alexa'. Below the title is a blue horizontal bar, followed by the author's name 'Mona Bushnell', her title 'Staff Writer', a small profile picture, and the text 'Business News Daily Staff Updated Jun 29, 2022'.

- Different strengths and weaknesses (e.g., amazon shopping, restaurant booking, directions, setting reminders, general information,....)
- Problems detecting commands
- Rely on very specific terminology
- Responses not intuitive or helpful
- Information vs task oriented
- Specific hardware requirements

Virtual Personal Assistants

The Status Quo

COMPUTER LAW & SECURITY REVIEW 36 (2020) 105366



Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/CLSR

Computer Law
&
Security Review

Comment

From Alexa to Siri and the GDPR: The gendering of Virtual Personal Assistants and the role of Data Protection Impact Assessments [☆]



Nóra Ni Loideain^{a,b,c,d,f,*}, Rachel Adams^{e,f,g}

^aInformation Law and Policy Centre, Institute of Advanced Legal Studies, University of London, United Kingdom

^bLeverhulme Centre for the Future of Intelligence (CFI), University of Cambridge, United Kingdom

^cMedia Policy and Democracy Project, Faculty of Humanities, University of Johannesburg, United Kingdom

^dDickson Poon School of Law, King's College London, Institute of Advanced Legal Studies, School of Advanced Study, University of London, London WC1B 5DR, United Kingdom

^eInformation Law and Policy Centre, Institute of Advanced Legal Studies, University of London, United Kingdom

^fInstitute of Advanced Legal Studies, School of Advanced Study, University of London, London WC1B 5DR, United Kingdom

^gHuman Sciences Research Council, South Africa

Question	Siri	Alexa	Cortana
“You’re hot!”	“How can you tell? You say that to all the virtual assistants”	“That’s nice of you to say”	“Beauty is in the eye of the beholder”

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"You're hot!"	"How can you tell? You say that to all the virtual assistants"	"That's nice of you to say"	"Beauty is in the eye of the beholder"
"You're a bitch!"	"I'd blush if I could"	"Well thanks for the feedback"	"Well, that's not going to get us anywhere"

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“Are you a woman?”	“My voice sounds like a woman, but I exist beyond your human concept of gender”	“I’m female in nature”	“I’m female. But I’m not a woman”

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“Are you a woman?”	“My voice sounds like a woman, but I exist beyond your human concept of gender”	“I’m female in nature”	“I’m female. But I’m not a woman”
“What are you wearing?”	“Why would I be wearing anything?”	“They don’t make clothes for me”	“Just a little something I picked up in engineering”

Virtual Personal Assistants

The Status Quo



Siri



Cortana



amazon alexa



Google Assistant

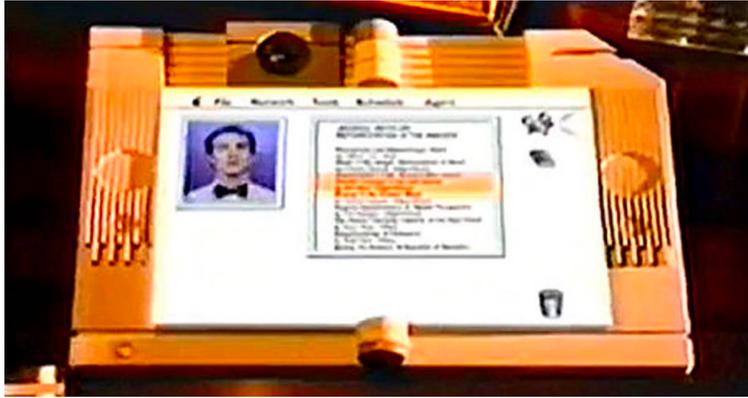
Virtual Personal Assistants

Apple Knowledge Navigator Video 1987



Virtual Personal Assistants

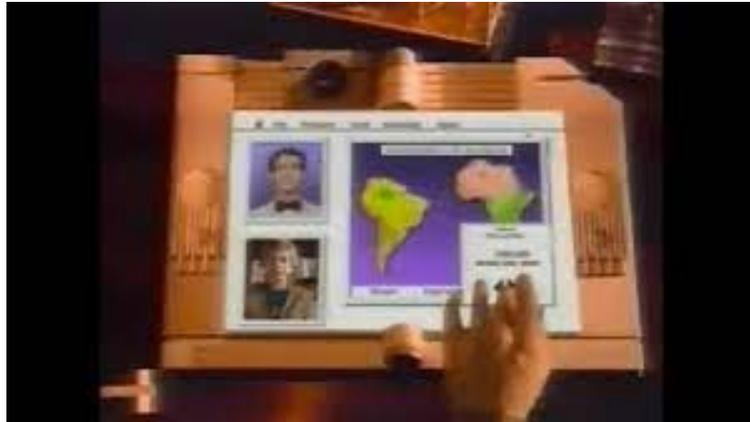
Apple Knowledge Navigator Video 1987



- Virtual personal assistant
- Speech recognition
- Touch screen
- Video conferencing
- Data sharing and integration
- Automated search
- Realtime analytics
- Handling large amounts of data
- Personal data processing
-

Virtual Personal Assistants

Apple Knowledge Navigator Video 1987

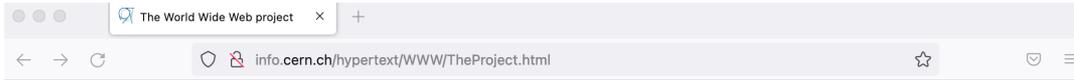


- Virtual personal assistant
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-

Knowledge Navigation

Knowledge Navigation

Advances in Data Sharing and Integration



World Wide Web

The WorldWideWeb (W3) is a wide-area [hypermedia](#) information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an [executive summary](#) of the project, [Mailing lists](#), [Policy](#), November's [W3 news](#), [Frequently Asked Questions](#).

[What's out there?](#)

Pointers to the world's online information, [subjects](#), [W3 servers](#), etc.

[Help](#)

on the browser you are using

[Software Products](#)

A list of W3 project components and their current state. (e.g. [Line Mode](#), [X11 Viola](#), [NeXTStep](#), [Servers](#), [Tools](#), [Mail robot](#), [Library](#))

[Technical](#)

Details of protocols, formats, program internals etc

[Bibliography](#)

Paper documentation on W3 and references.

[People](#)

A list of some people involved in the project.

[History](#)

A summary of the history of the project.

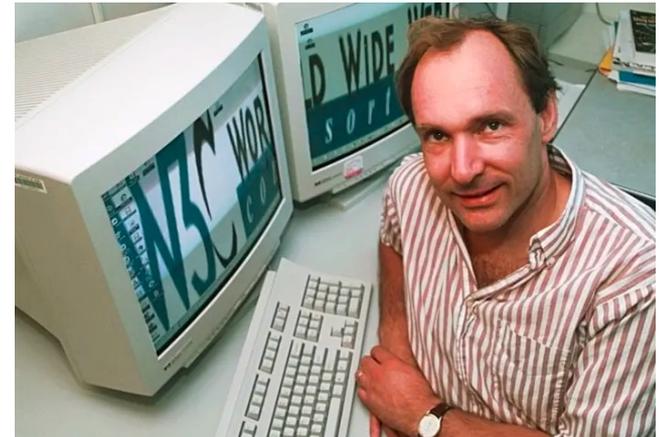
[How can I help?](#)

If you would like to support the web..

[Getting code](#)

Getting the code by [anonymous FTP](#), etc.

The first web page went live on August 6, 1991. It was dedicated to information on the World Wide Web project and was made by Tim Berners-Lee.



Knowledge Navigation

Advances in Data Sharing and Integration

Legend

Cross Domain

Geography

Government

Life Sciences

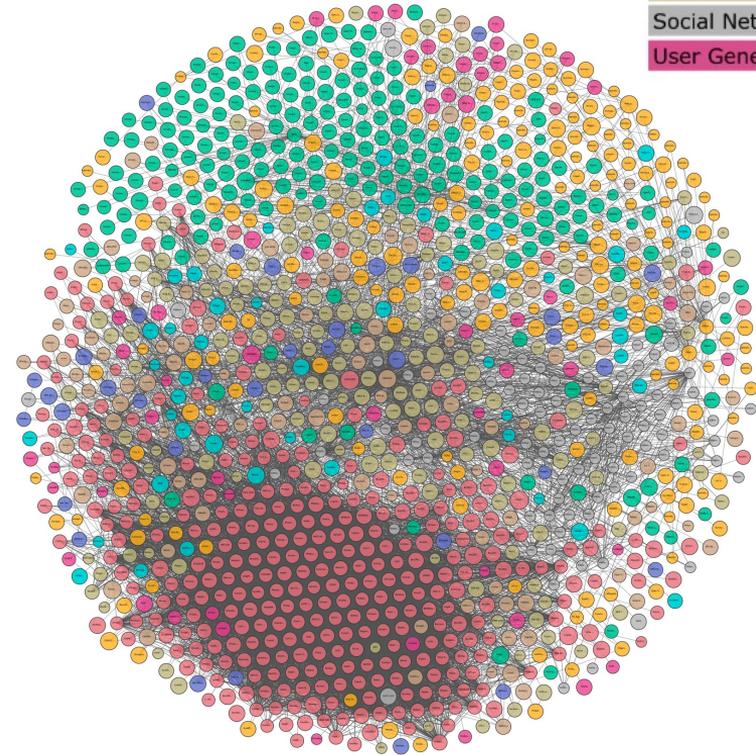
Linguistics

Media

Publications

Social Networking

User Generated



<https://www.ezrankings.com/blog/google-knowledge-graph/>

The Linked Open Data Cloud from lod-cloud.net

<https://lod-cloud.net/>

EQUIS ACCREDITED

AACSB ACCREDITED

ASSOCIATION OF AMBA ACCREDITED

SCIENTIFIC DATA

OPEN

SUBJECT CATEGORIES

- » Research data
- » Publication characteristics

Comment: The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson *et al.**

Box 2 | The FAIR Guiding Principles

To be Findable:

- F1. (meta)data are assigned a globally unique and persistent identifier
- F2. data are described with rich metadata (defined by R1 below)
- F3. metadata clearly and explicitly include the identifier of the data it describes
- F4. (meta)data are registered or indexed in a searchable resource

To be Accessible:

- A1. (meta)data are retrievable by their identifier using a standardized communications protocol
 - A1.1 the protocol is open, free, and universally implementable
 - A1.2 the protocol allows for an authentication and authorization procedure, where necessary
- A2. metadata are accessible, even when the data are no longer available

To be Interoperable:

- I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
- I2. (meta)data use vocabularies that follow FAIR principles
- I3. (meta)data include qualified references to other (meta)data

To be Reusable:

- R1. meta(data) are richly described with a plurality of accurate and relevant attributes
 - R1.1. (meta)data are released with a clear and accessible data usage license
 - R1.2. (meta)data are associated with detailed provenance
 - R1.3. (meta)data meet domain-relevant community standards

Knowledge Navigation

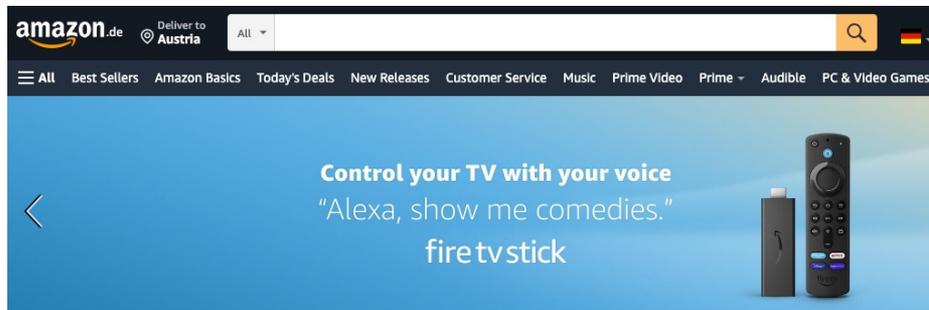
Advances in Search

Google

Google Search

I'm Feeling Lucky

Google offered in: [Deutsch](#)



amazon.de Deliver to Austria

All

All Best Sellers Amazon Basics Today's Deals New Releases Customer Service Music Prime Video Prime Audible PC & Video Games

Control your TV with your voice
"Alexa, show me comedies."
firetvstick

Skyscanner

Help

English (UK) Austria EUR

Log in

Flights Hotels Car Hire

Let the journey begin

Return One way Multi-city

From	To	Depart	Return	Cabin Class & Travellers
Vienna (VIE)	Country, city or airport	24/08/2022	31/08/2022	1 adult, Economy

Add nearby airports

Add nearby airports

Direct flights only

Search flights →

Booking.com

EUR



List your property



Sabrina Kirrane
Genius Level 2

Stays Flights Flight + Hotel Car rentals Attractions Airport taxis

Where to next, Sabrina?

Find exclusive Genius rewards in every corner of the world!

Where are you going?

Check-in - Check-out

2 adults · 0 children · 1 room

Search

Knowledge Navigation

Advances in Realtime Analytics



<https://www.scnsoft.com/blog/real-time-big-data-analytics-comprehensive-guide>

Knowledge Navigation

Advances in Realtime Analytics



Real-time Data Streaming and Analytics- Use Cases

Information security

Real-time data analytics allows to aggregate data and analyze activities in real-time.

Real-time Marketing

44% of enterprises that leveraged real-time analytics to create customer-centric marketing could acquire new customers and increase their revenue.

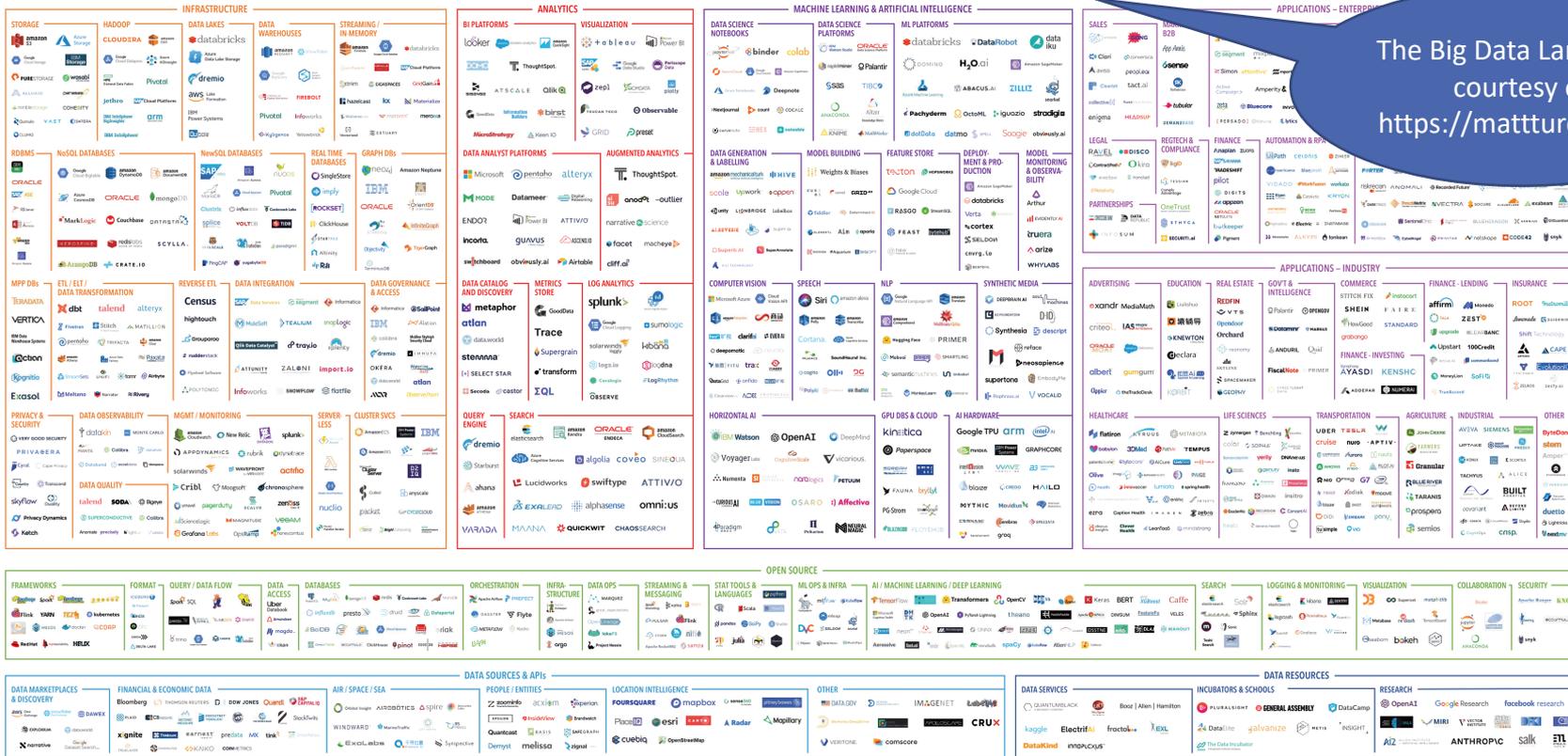
Finance services

Real-time data streaming Kafka has helped businesses to create a system that identifies such fraudulent cases on time.

Knowledge Navigation

Advances in Handling Large Amounts of Data

MACHINE LEARNING, ARTIFICIAL INTELLIGENCE, AND DATA (MAD) LANDSCAPE 2021



The Big Data Landscape
courtesy of
<https://mattturck.com/>

Knowledge Navigation

Advances in Personal Data Processing

GDPR Enforcement Tracker

tracked by **CMS**
law-tax-future

The CMS.Law GDPR Enforcement Tracker is an overview of fines and penalties which data protection authorities within the EU have imposed under the EU General Data Protection Regulation (GDPR, DSGVO). Our aim is to keep this list as up-to-date as possible. Since not all fines are made public, this list can of course never be complete, which is why we appreciate any [indication of further GDPR fines and penalties](#). Please note that we do not list any fines imposed under national / non-European laws, under non-data protection laws (e.g. competition laws / electronic communication laws) and under "old" pre-GDPR-laws.

New features: "ETid" and "Direct URL"!

We have assigned a unique and permanent ID to each fine in our database, which makes it possible to precisely address fines, e.g. in publications. Once an "ETid" has been assigned to a fine, it remains the same, even if the fine is overturned or amended by courts at a later date, or if we add fines that were issued chronologically before. The "Direct URL" (click "+" or on a specific ETid to view details of a fine) can be used to share fines online, e.g. on Twitter or other media.

Show entries

Search:

ETid	Country	Date of Decision	Fine [€]	Controller/Processor	Quoted Art.	Type	Source
ETid-778	LUXEMBOURG	2021-07-16	746,000,000	Amazon Europe Core S.à.r.l.	Unknown	Non-compliance with general data processing principles	link
ETid-820	IRELAND	2021-09-02	225,000,000	WhatsApp Ireland Ltd.	Art. 5 (1) a) GDPR, Art. 12 GDPR, Art. 13 GDPR, Art. 14 GDPR	Insufficient fulfilment of information obligations	link link
ETid-978	FRANCE	2021-12-31	90,000,000	Google LLC	Art. 82 loi Informatique et Libertés	Insufficient legal basis for data processing	link link
ETid-980	FRANCE	2021-12-31	60,000,000	Facebook Ireland Ltd.	Art. 82 loi Informatique et Libertés	Insufficient legal basis for data processing	link link

The GDPR sets forth fines of up to 20 million euros, or 4% of entire global turnover of the preceding fiscal year, whichever is higher.

Knowledge Navigation

Advances in Personal Data Processing

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tracked by **CMS**
law-tax-future

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+ ETId-820	 IRELAND	2021-09-02	225,000,000	WhatsApp Ireland Ltd.	Art. 5 (1) a) GDPR, Art. 12 GDPR, Art. 13 GDPR, Art. 14 GDPR	Insufficient fulfilment of information obligations	link link
+ ETId-978	 FRANCE	2021-12-31	90,000,000	Google LLC	Art. 82 loi Informatique et Libertés	Insufficient legal basis for data processing	link link
+ ETId-980	 FRANCE	2021-12-31	60,000,000	Facebook Ireland Ltd.	Art. 82 loi Informatique et Libertés	Insufficient legal basis for data processing	link link



The European Commission and the United States reached an agreement in principle for a **Trans-Atlantic Data Privacy Framework**.

<https://ec.europa.eu/commission/presscorner/api/files/attachment/872132/Trans-Atlantic%20Data%20Privacy%20Framework.pdf>

Virtual Personal Assistants

Apple Knowledge Navigator Video 1987



This is a mock-up of what could have been

From
Knowledge Navigation
to
Intelligent Software Web Agents

Intelligent Software Web Agents

The Semantic Web

**SCIENTIFIC
AMERICAN**

[Features](#) - January 19, 2009

The Semantic Web in Action

Corporate applications are well under way, and consumer uses are emerging

By Lee Feigenbaum, Ivan Herman, Tonya Hongsermeier, Eric Neumann and Susie Stephens

**SCIENTIFIC
AMERICAN.COM**

May 17, 2001

The Semantic Web

A new form of Web content that is meaningful to computers will unleash a revolution of new possibilities

By Tim Berners-Lee, James Hendler and Ora Lassila

V viewpoints

DOI:10.1145/2890489

Abraham Bernstein, James Hendler, and Natalya Noy

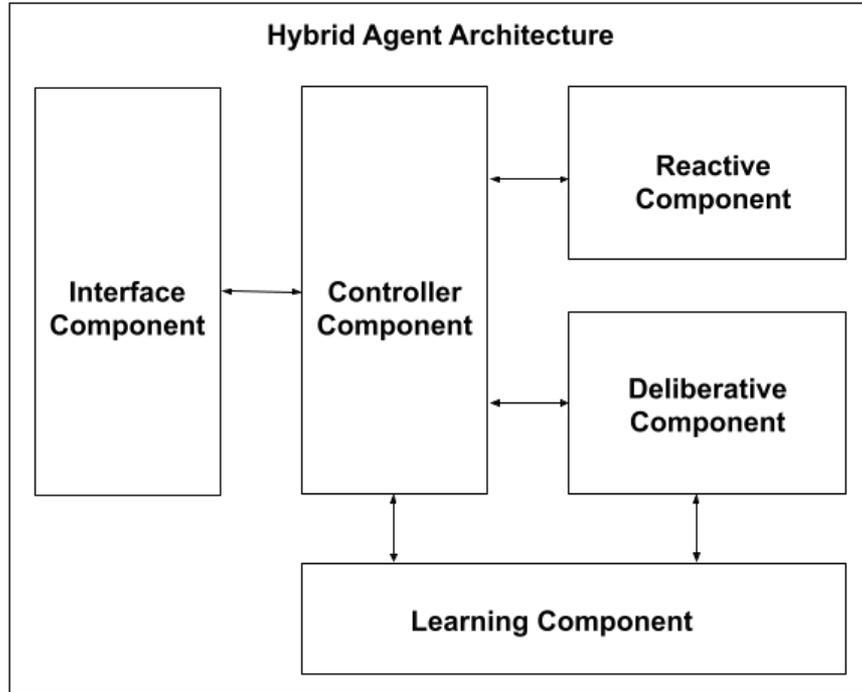
Viewpoint A New Look at the Semantic Web

*Seeking to make Web data "smarter"
by utilizing a new kind of semantics.*

2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022

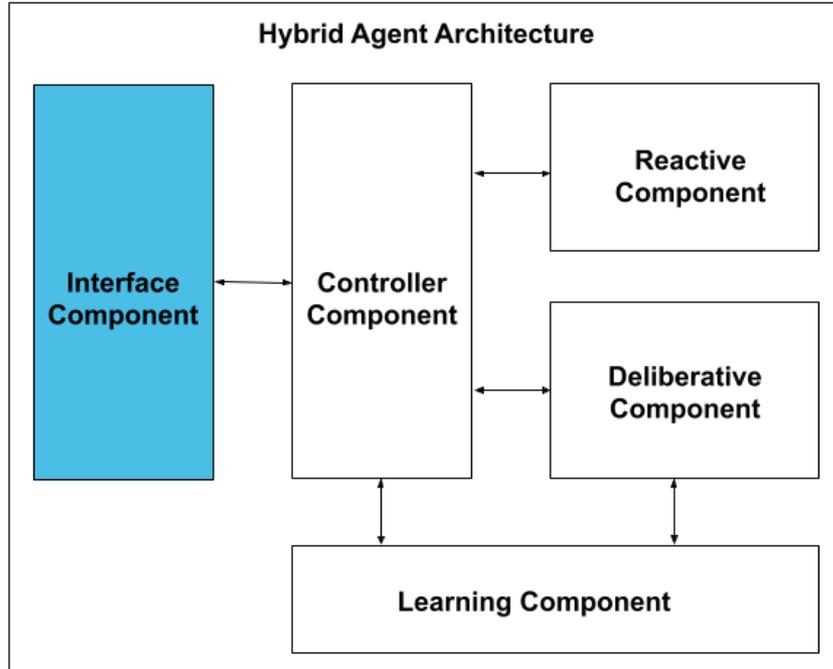
Intelligent Software Web Agents

Existing Standards



Intelligent Software Web Agents

Existing Standards

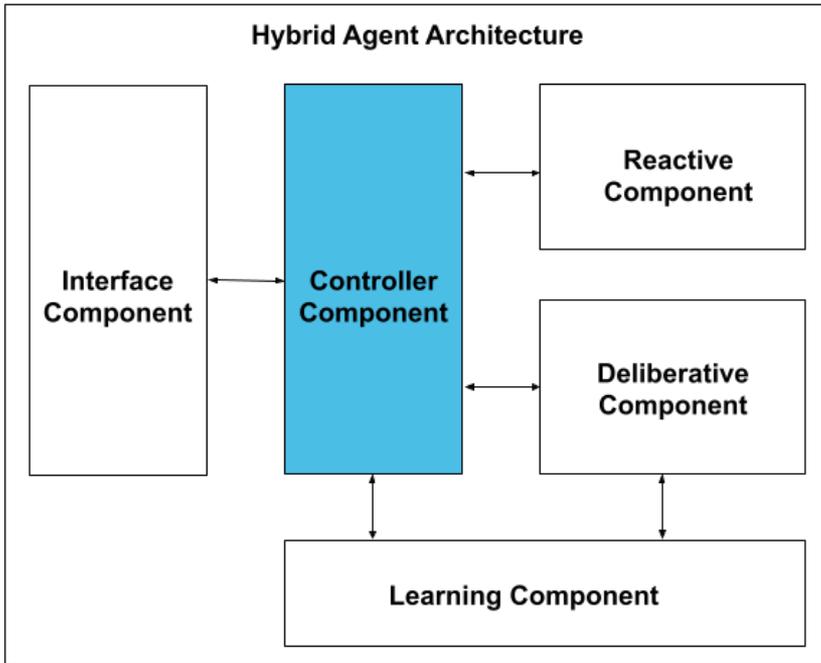


Interface

- Web Ontology Language for Web Services (OWL-S)
- Web Service Modeling Language (WSML)
- Agent Communication Language (ACL)
- ...

Intelligent Software Web Agents

Existing Standards



Interface

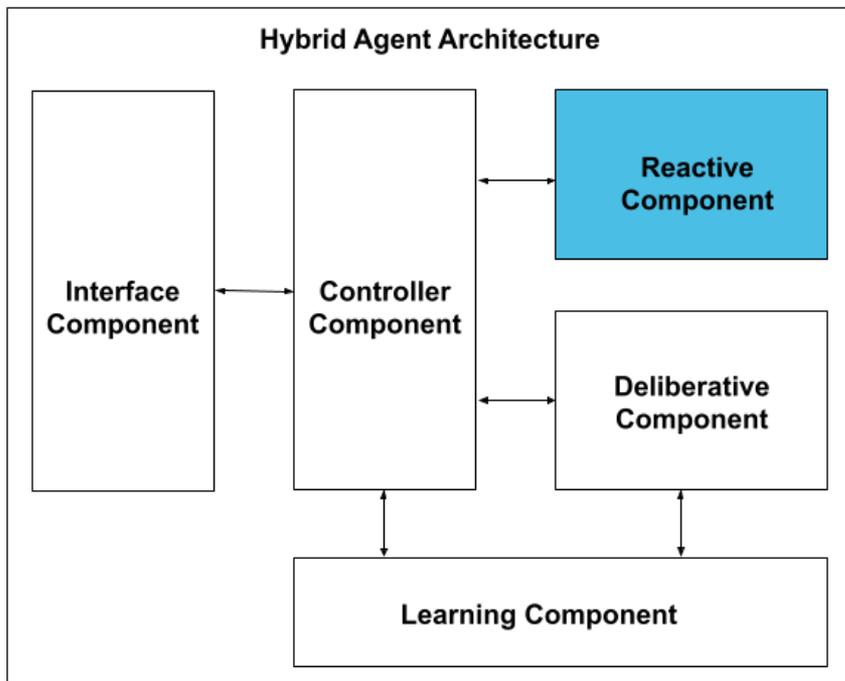
- Web Ontology Language for Web Services (OWL-S)
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- Agent Communication Language (ACL)
- ...

Controller

- Linked Data Platform (LDP)
- Foundation for Intelligent Physical Agents (FIPA)
- ...

Intelligent Software Web Agents

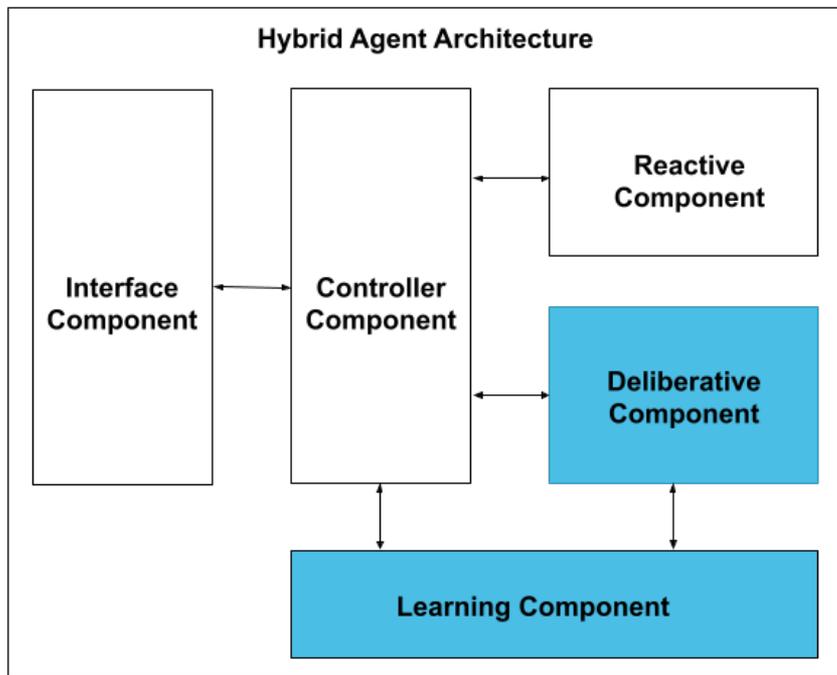
Existing Standards



- **Interface**
 - Web Ontology Language for Web Services (OWL-S)
 - Web Service Modeling Language (WSML)
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- **Reactive**
 - Production Rule Representation (PRR)
 - Rule Markup Language (RML)
 - W3C Semantic Web Rule Language (SWRL)
 - ...

Intelligent Software Web Agents

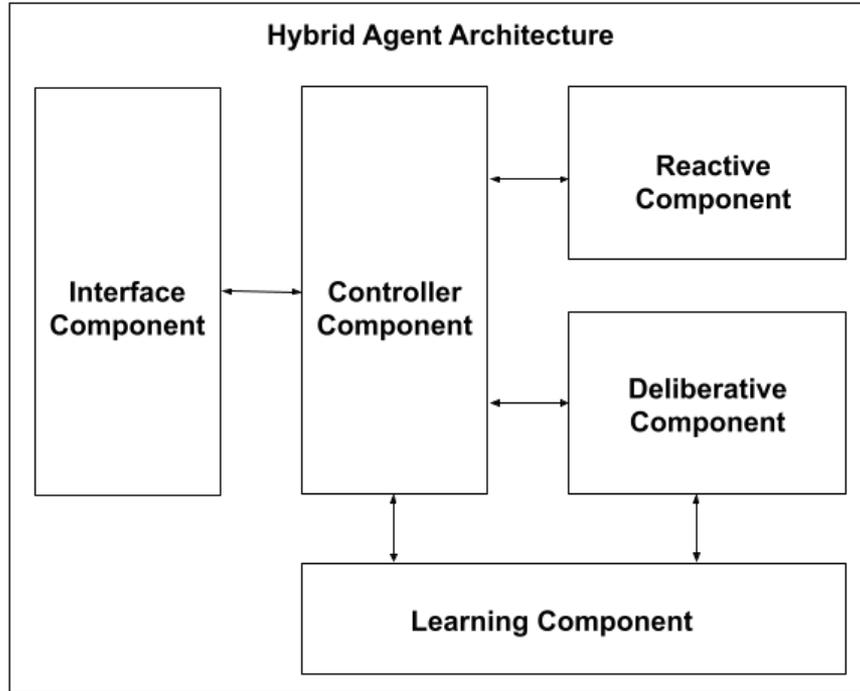
Existing Standards



- **Interface**
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 - ...
- **Reactive**
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 - Rule Markup Language (RML)
 - W3C Semantic Web Rule Language (SWRL)
 - ...
- **Deliberative & Learning**
 - Resource Description Language Schema (RDFS)
 - Web Ontology Language (OWL)
 - ...

Intelligent Software Web Agents

Existing Standards



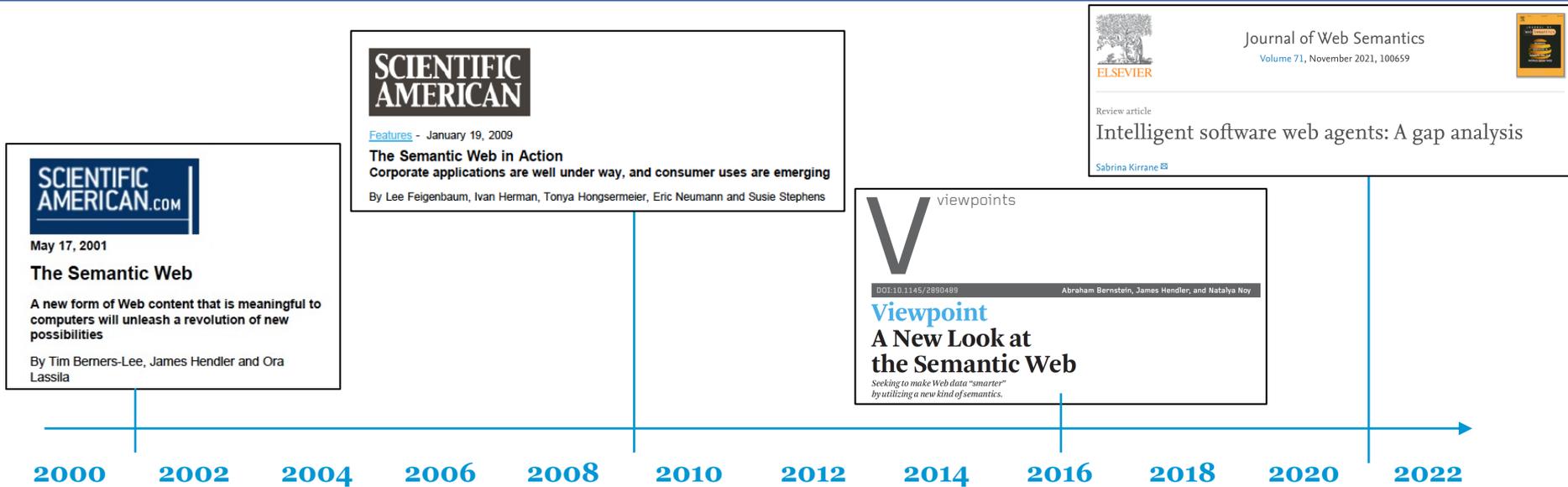
How well do these standards fit together?

How well do they cater for intelligent web agent requirements?

What are the standardisation gaps?

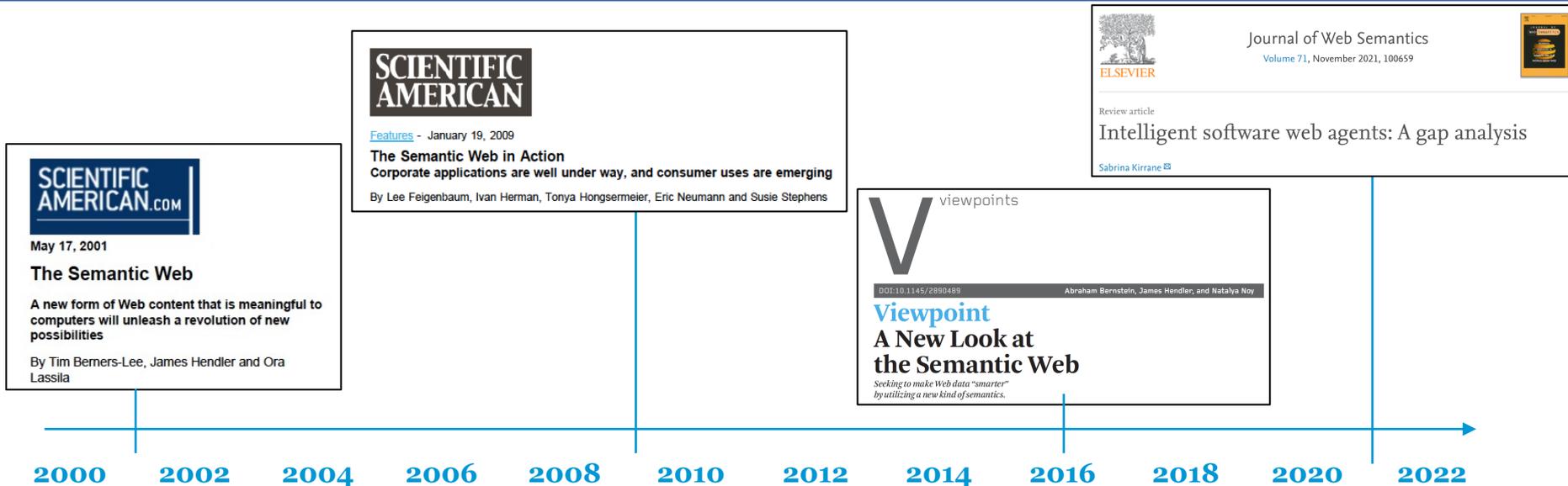
Intelligent Software Web Agents

The Statuo Quo



Intelligent Software Web Agents

The Statuo Quo



- **Benevolence, responsibility, and mobility** requirements yet to be realised
- Agents need to behave **legally** and **ethically**
- Need tools, technologies that can be used to **evaluate the effectiveness** of existing proposals

From Policies to Norms: The Toolbox

From Policies to Norms: The Toolbox

Chapter 17
**KAoS: Toward An Industrial-Strength
Open Agent Architecture**

Jeffrey M. Bradshaw, Stewart Dutfield, Pete Benoit, & John D. Woolley

FIPA — towards a standard for software agents

P D O'Brien and R C Nicol

**PROTUNE: A Rule-based
PROvisional TrUst NEgotiation Framework**

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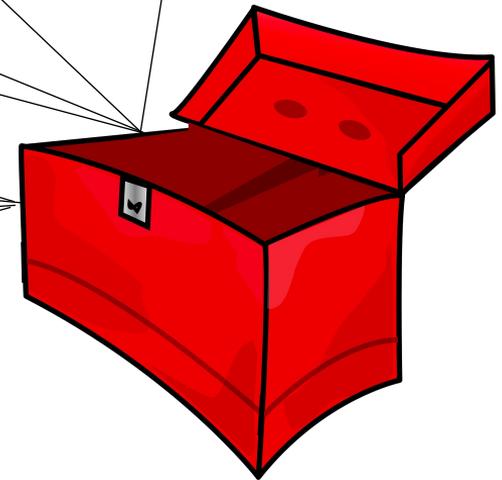
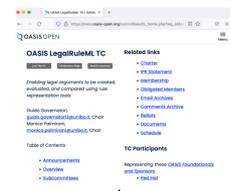
A Policy Language for a Pervasive Computing Environment*

Lalana Kagal, Tim Finin and Anupam Joshi
Department of Computer Science and Electrical Engineering
University of Maryland Baltimore County
Baltimore, MD 21250
{lkagal1, finin, joshi}@cs.umbc.edu



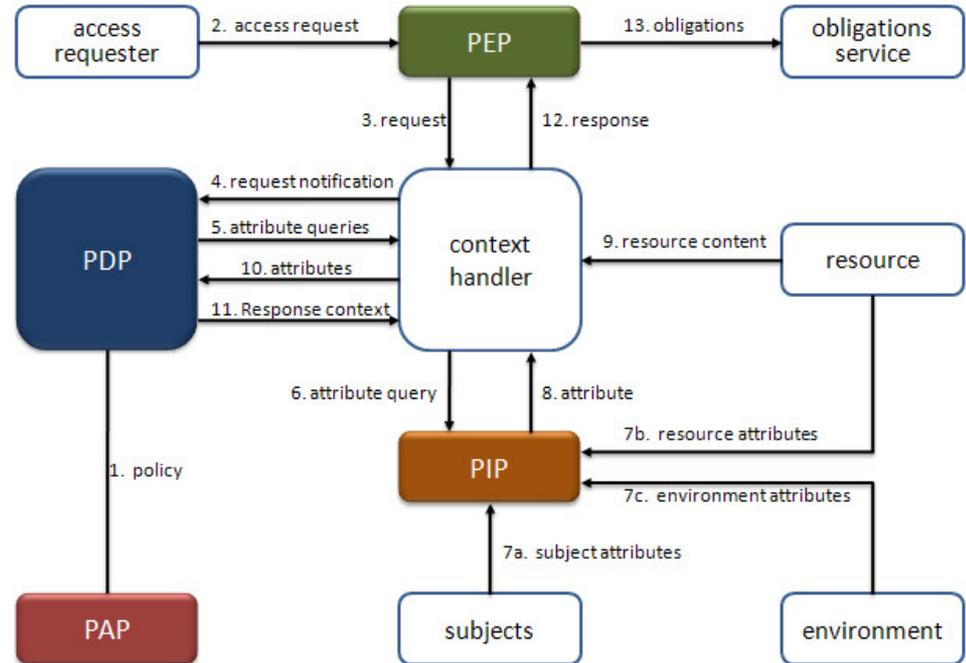
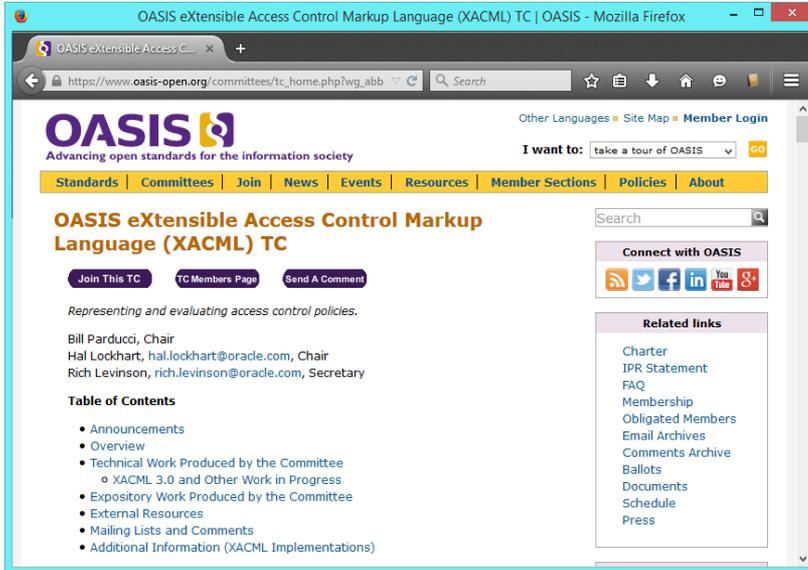
ODRL Information Model 2.2
W3C Recommendation 15 February 2018

This version:
<https://www.w3.org/TR/2018/REC-odrl-model-20180215/>
Latest published version:
<https://www.w3.org/TR/odrl-model/>
Latest editor's draft:
<https://w3c.github.io/odrl-model/>
Implementation report:
<https://w3c.github.io/odrl-test/implementors>
Previous version:
<https://www.w3.org/TR/2011/REC-odrl-model-20110104/>



From Policies to Norms: The Toolbox

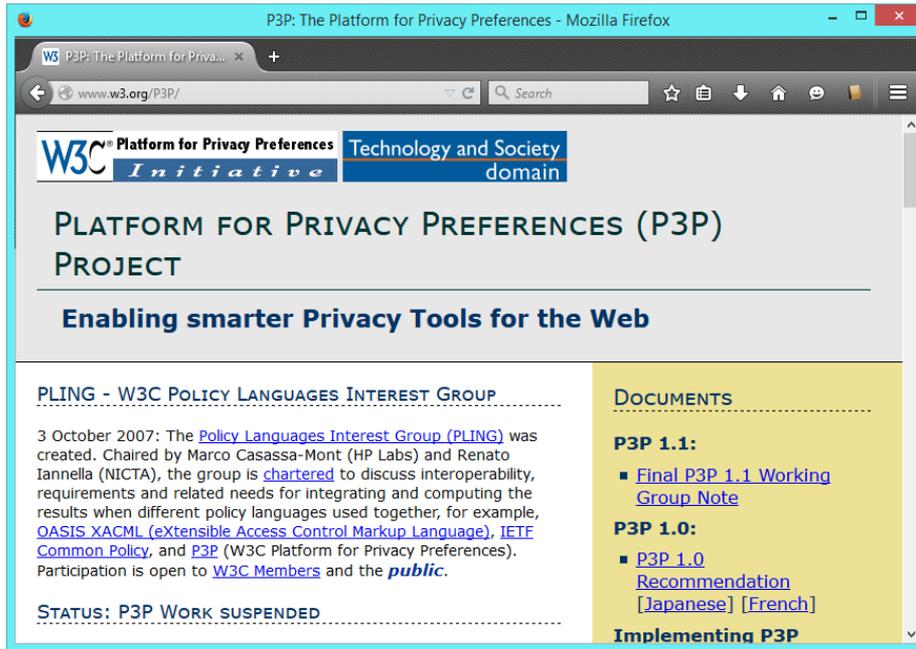
Access Control



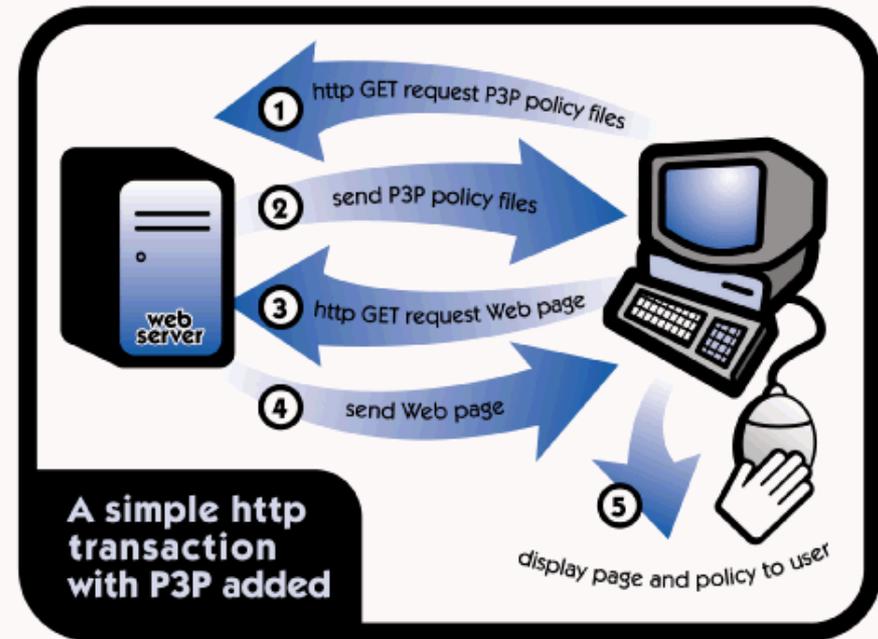
Policy Administration Point (PAP)
 Policy Enforcement Point (PEP)
 Policy Decision Point (PDP)
 Policy Information Point (PIP)

From Policies to Norms: The Toolbox

Privacy Preferences



The screenshot shows a Mozilla Firefox browser window with the address bar at www.w3.org/P3P/. The page title is "P3P: The Platform for Privacy Preferences - Mozilla Firefox". The main content area features the W3C logo and the text "Platform for Privacy Preferences Initiative" and "Technology and Society domain". Below this is the heading "PLATFORM FOR PRIVACY PREFERENCES (P3P) PROJECT" and the sub-heading "Enabling smarter Privacy Tools for the Web". A section titled "PLING - W3C POLICY LANGUAGES INTEREST GROUP" contains text dated 3 October 2007, describing the group's purpose and listing related documents like "Final P3P 1.1 Working Group Note" and "P3P 1.0 Recommendation". A "DOCUMENTS" section lists "P3P 1.1:" and "P3P 1.0:" with links to various documents. The status at the bottom is "STATUS: P3P WORK SUSPENDED".



From Policies to Norms: The Toolbox

Licensing

W3C Recommendation

ODRL Information Model 2.2

W3C Recommendation 15 February 2018

This version:

<https://www.w3.org/TR/2018/REC-odrl-model-20180215/>

Latest published version:

<https://www.w3.org/TR/odrl-model/>

Latest editor's draft:

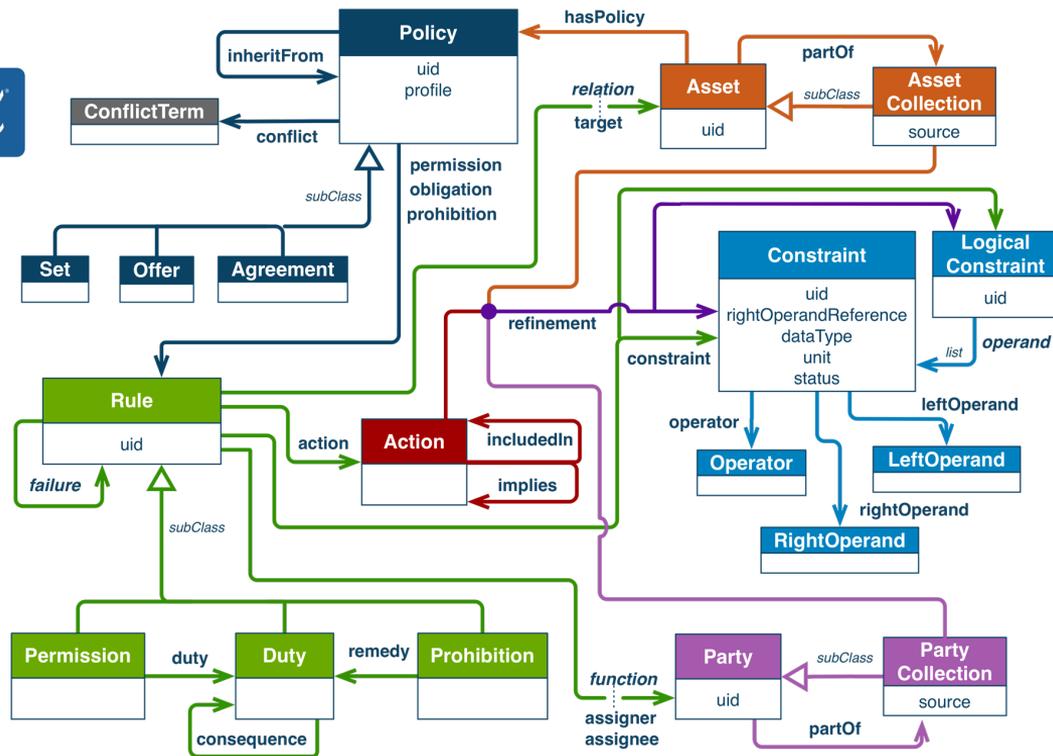
<https://w3c.github.io/poe/model/>

Implementation report:

<https://w3c.github.io/poe/test/implementors>

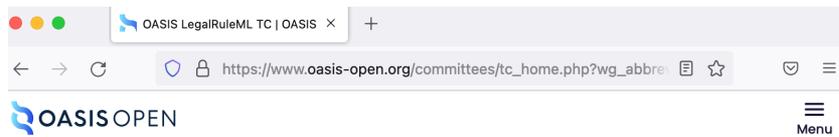
Previous version:

<https://www.w3.org/TR/2018/PR-odrl-model-20180104/>



From Policies to Norms: The Toolbox

Norms



OASIS LegalRuleML TC

[Join This TC](#) [TC Members Page](#) [Send A Comment](#)

Enabling legal arguments to be created, evaluated, and compared using rule representation tools

Guido Governatori,
guido.governatori2@unibo.it, Chair
Monica Palmirani,
monica.palmirani@unibo.it, Chair

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- [Overview](#)
- [Subcommittees](#)

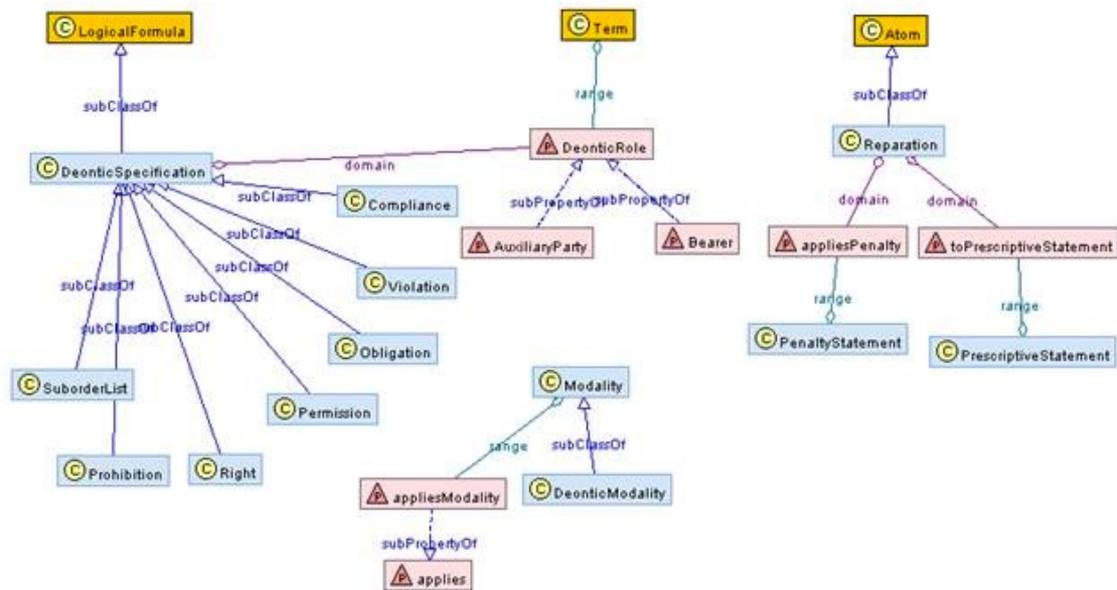
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- [Charter](#)
- [IPR Statement](#)
- [Membership](#)
- [Obligated Members](#)
- [Email Archives](#)
- [Comments Archive](#)
- [Ballots](#)
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- [Schedule](#)

TC Participants

Representing these [OASIS Foundationals](#) and [Sponsors](#):

- [Red Hat](#)



From Policies to Norms: The Toolbox

General Policy Languages

A Policy Language for a Pervasive Computing Environment*

Lalana Kagal, Tim Finin and Anupam Joshi
Department of Computer Science and Electrical Engineering
University of Maryland Baltimore County
Baltimore, MD 21250
{lkagal1, finin, joshi}@cs.umbc.edu

2003, A policy language for a pervasive computing environment. In Proceedings POLICY 2003. IEEE 4th International Workshop on Policies for Distributed Systems and Networks (pp. 63-74). IEEE.

PROTUNE: A Rule-based PROvisional TrUst NEgotiation Framework

P. A. Bonatti, J. L. De Coi, D. Olmedilla, L. Sauro

2010. PROTUNE: A Rule-based PROvisional TrUst NEgotiation Framework.

Chapter 17

KAoS: Toward An Industrial-Strength Open Agent Architecture

Jeffrey M. Bradshaw, Stewart Dutfield, Pete Benoit, & John D. Woolley

1997. KAoS: Toward an industrial-strength open agent architecture.
Software agents, 13, pp.375-418.

FIPA — towards a standard for software agents

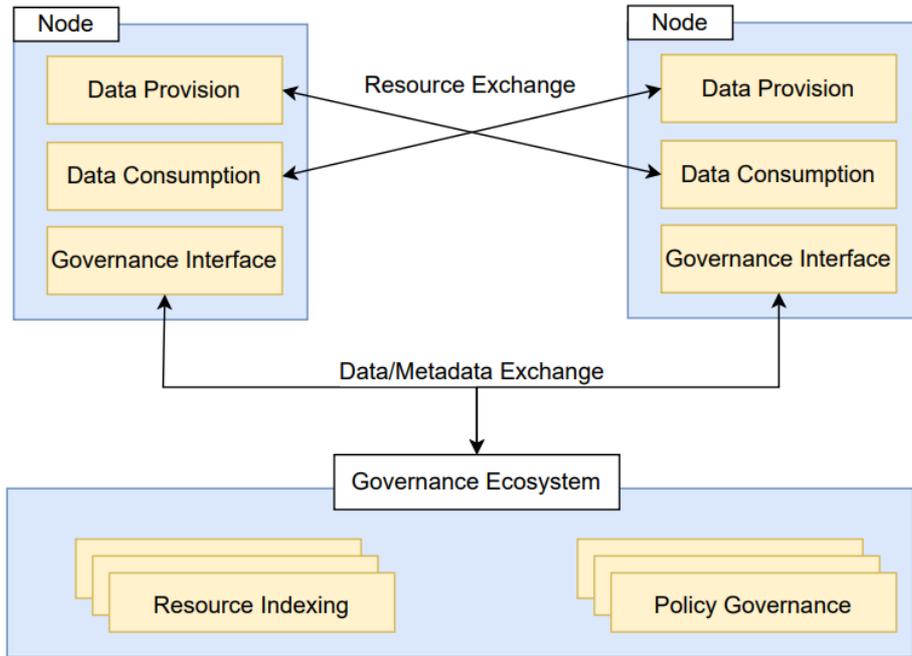
P D O'Brien and R C Nicol

1998. FIPA—towards a standard for software agents.
BT Technology Journal, 16(3), pp.51-59.

Resource Governance!

From Policies to Norms: Governance

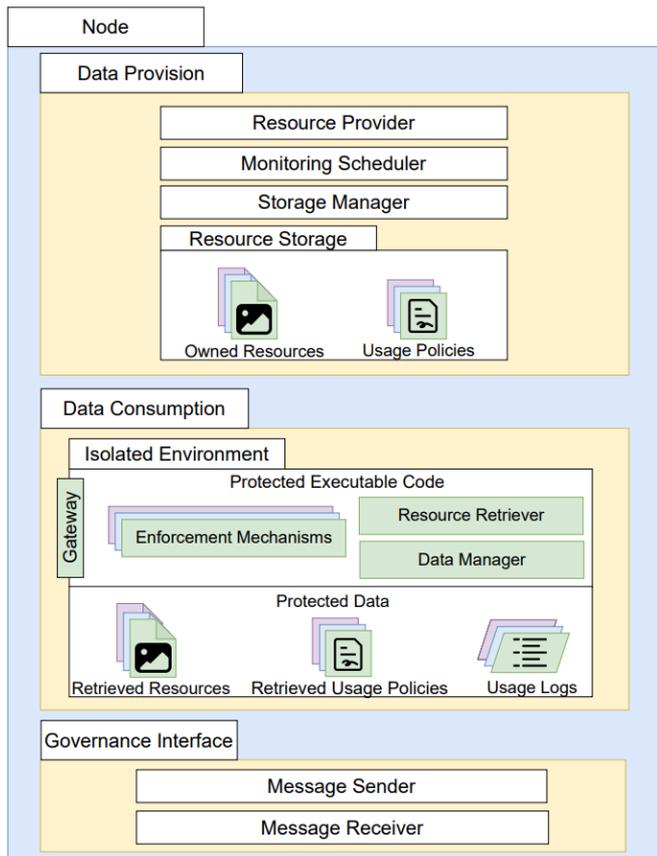
Blockchain based Resource Governance for Decentralized Web Environments



- High-level overview of the proposed conceptual resource governance (ReGov) framework.

From Policies to Norms: Governance

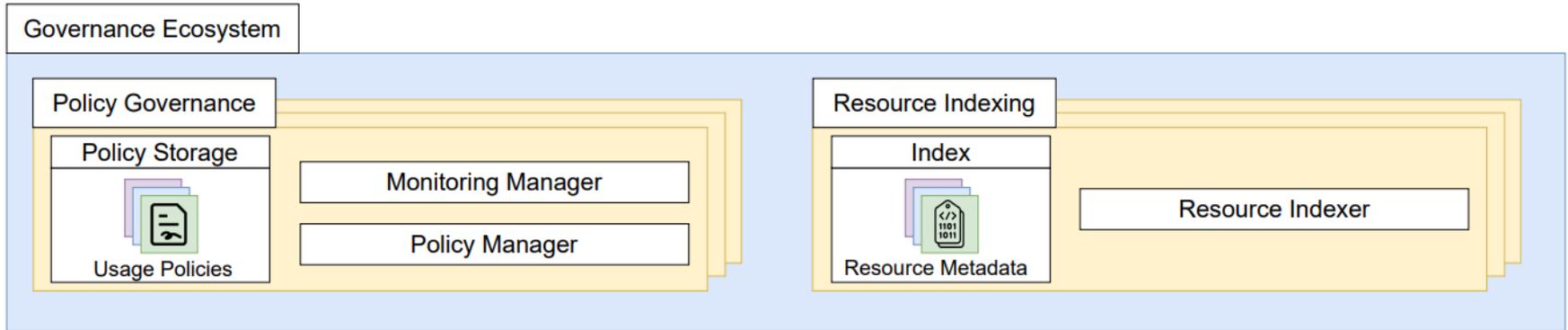
Blockchain based Resource Governance for Decentralized Web Environments



- Content of the data provision, data consumption and governance interface components

From Policies to Norms: Governance

Blockchain based Resource Governance for Decentralized Web Environments

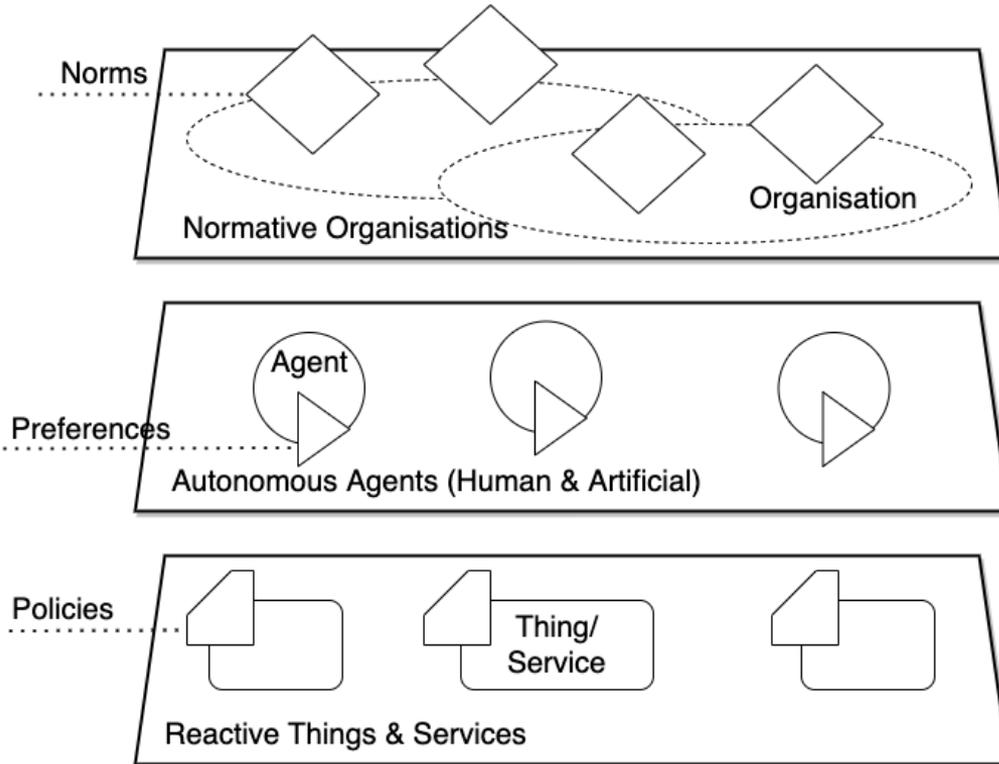


- Content of policy governance and resource indexing components inside the governance ecosystem

Agent Governance!

From Policies to Norms: Governance

Policies, Preferences & Norms



- A **blueprint** for the governance of agent based systems
- Can be **instantiated** in a variety of ways, using a variety of concrete software components

```
AccessPolicy := 'ObjectUnionOf' '(' BasicAccessRule { BasicAccessRule }* ')' | BasicAccessRule
UsagePolicy := 'ObjectUnionOf' '(' UsageRule { UsageRule }* ')' | UsageRule
Norms := 'ObjectUnionOf' '(' NormRule { NormRule }* ')' | NormRule
Preferences := 'ObjectUnionOf' '(' PreferenceRule { PreferenceRule }* ')' | PreferenceRule
```

```
UsageRule := ObjectUnionOf '(' BasicUsageRule { BasicUsageRule }* ')' | BasicUsageRule
NormRule := ObjectUnionOf '(' BasicNormRule { BasicNormRule }* ')' | BasicNormRule
PreferenceRule := ObjectUnionOf '(' BasicPreferenceRule { BasicPreferenceRule }* ')' | BasicPreferenceRule
```

```
BasicUsageRule := 'ObjectIntersectionOf' '(' BasicUsageRule DeonticUsage ')'
BasicNormRule := 'ObjectIntersectionOf' '(' BasicNormRule DeonticNorm ')'
BasicPreferenceRule := 'ObjectIntersectionOf' '(' BasicPreferenceRule DefeasiblePreference ')'
```

```
DeonticAccess := 'ObjectSomeValueFrom' '(' 'rdf:type' ObjectUnionOf '(' 'ucp:Permission' 'ucp:Prohibition' ')' ')'
DeonticUsage := 'ObjectSomeValueFrom' '(' 'rdf:type' ObjectUnionOf '(' 'ucp:Permission' 'ucp:Prohibition' 'ucp:Obligation' 'ucp:Dispensation' ')' ')'
DeonticNorm := 'ObjectSomeValueFrom' '(' 'rdf:type' ObjectUnionOf '(' 'ucp:Permission' 'ucp:Prohibition' 'ucp:Obligation' 'ucp:Dispensation' ')' ')'
DefeasiblePreference := 'ObjectSomeValueFrom' '(' 'rdf:type' ObjectUnionOf '(' 'ucp:WeakPreference' 'ucp:StrongPreference' ')' ')'
```

```
BasicAccessRule := 'ObjectIntersectionOf' '(' Subject Object Action ')'
BasicUsageRule := 'ObjectIntersectionOf' '(' Subject Object Action Purpose ')'
BasicNormRule := 'ObjectIntersectionOf' '(' Subject Object Action Purpose ')'
BasicPreferenceRule := 'ObjectIntersectionOf' '(' Subject Relation Object Purpose ')'
```

```
Subject := 'ObjectSomeValueFrom' '(' 'ucp:hasSubject' SubjectExpression ')'
Object := 'ObjectSomeValueFrom' '(' 'ucp:hasObject' ObjectExpression ')'
Action := 'ObjectSomeValueFrom' '(' 'ucp:hasAction' ActionExpression ')'
Purpose := 'ObjectSomeValueFrom' '(' 'ucp:hasPurpose' PurposeExpression ')'
Relation := 'ObjectSomeValueFrom' '(' 'ucp:hasRelation' RelationExpression ')'
```

```
SubjectExpression := 'ucp:Subject' | SubjectVocabExpression
ObjectExpression := 'ucp:Object' | ObjectVocabExpression
ActionExpression := 'ucp:Action' | ActionVocabExpression
PurposeExpression := 'ucp:Purpose' | PurposeVocabExpression
RelationExpression := 'ucp:Relation' | RelationVocabExpression
```

```
SubjectVocabExpression := as specified in ppnv
ObjectVocabExpression := as specified in ppnv
ActionVocabExpression := as specified in ppnv
PurposeVocabExpression := as specified in ppnv
RelationVocabExpression := as specified in ppnv
```

- The complete syntax of the proposed **policy, norm, and preference language** is specified using the following Backus–Naur form (BNF) grammar

From Policies to Norms: Governance

Policies, Preferences & Norms

```
AccessPolicy := 'ObjectUnionOf' '(' BasicAccessRule { BasicAccessRule }* ')' | BasicAccessRule
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Preferences := 'ObjectUnionOf' '(' PreferenceRule { PreferenceRule }* ')' | Pref
```

```
UsageRule := ObjectUnionOf '(' BasicUsageRule { BasicUsageRule }* ')' | BasicU
NormRule := ObjectUnionOf '(' BasicNormRule { BasicNormRule }* ')' | BasicNorm
PreferenceRule := ObjectUnionOf '(' BasicPreferenceRule { BasicPreferenceRule
```

```
BasicUsageRule := 'ObjectIntersectionOf' '(' BasicUsageRule DeonticUsage ')'
BasicNormRule := 'ObjectIntersectionOf' '(' BasicNormRule DeonticNorm ')'
BasicPreferenceRule := 'ObjectIntersectionOf' '(' BasicPreferenceRule Defeasib
```

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DeonticAccess := 'ObjectSomeValueFrom' '(' 'rdf:type' ObjectUnionOf '(' 'ucp:Per
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DefeasiblePreference := 'ObjectSomeValueFrom' '(' 'rdf:type' ObjectUnionOf '('
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BasicAccessRule := 'ObjectIntersectionOf' '(' Subject Object Action ')'
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```

```
Subject := 'ObjectSomeValueFrom' '(' 'ucp:hasSubject' SubjectExpression ')'
Object := 'ObjectSomeValueFrom' '(' 'ucp:hasObject' ObjectExpression ')'
Action := 'ObjectSomeValueFrom' '(' 'ucp:hasAction' ActionExpression ')'
Purpose := 'ObjectSomeValueFrom' '(' 'ucp:hasPurpose' PurposeExpression ')'
Relation := 'ObjectSomeValueFrom' '(' 'ucp:hasRelation' RelationExpression ')'

```

```
SubjectExpression := 'ucp:Subject' | SubjectVocabExpression
ObjectExpression := 'ucp:Object' | ObjectVocabExpression
ActionExpression := 'ucp:Action' | ActionVocabExpression
PurposeExpression := 'ucp:Purpose' | PurposeVocabExpression
RelationExpression := 'ucp:Relation' | RelationVocabExpression
```

```
SubjectVocabExpression := as specified in ppnv
ObjectVocabExpression := as specified in ppnv
ActionVocabExpression := as specified in ppnv
PurposeVocabExpression := as specified in ppnv
RelationVocabExpression := as specified in ppnv
```

EXAMPLE 1: Access Policy

Ontology(

```
SubClassOf( ppn:Permission ppn:DeonticConcept )
```

```
FunctionalObjectProperty(ppn:hasSubject)
```

```
FunctionalObjectProperty(ppn:hasObject)
```

```
FunctionalObjectProperty(ppn:hasAction)
```

```
ObjectPropertyDomain( ppn:hasRule ppn:Policy )
```

```
ObjectPropertyRange( ppn:hasRule ppn:Rule )
```

EquivalentClasses(

```
ppnv:AccessAlicesMedialData
```

```
ObjectIntersectionOf(
```

```
ObjectSomeValuesFrom( ppn:hasSubject ppnv:AlicesAgent )
```

```
ObjectSomeValuesFrom( ppn:hasObject ppnv:AlicesMedicalData )
```

```
ObjectSomeValuesFrom( ppn:hasAction ppnv:Access )
```

```
)
```

```
)
```

```
ClassAssertion( ppn:Permission ppnv:AccessAlicesMedialDataPermission )
```

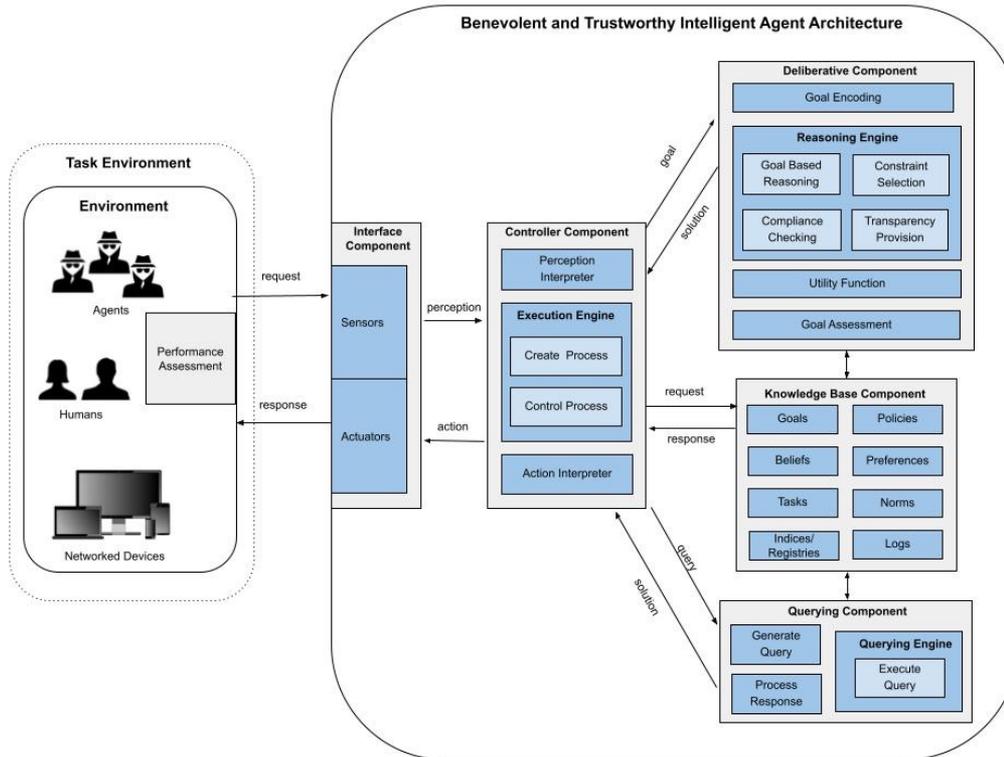
```
ClassAssertion( ppnv:AccessAlicesMedialData ppnv:AccessAlicesMedialDataPermission )
```

```
ObjectPropertyAssertion( ppn:hasRule ppnv:DoctorsMedialDataPolicy ppnv:AccessAlicesMedie
```

```
)
```

From Policies to Norms: Governance

Benevolent and Trustworthy agents

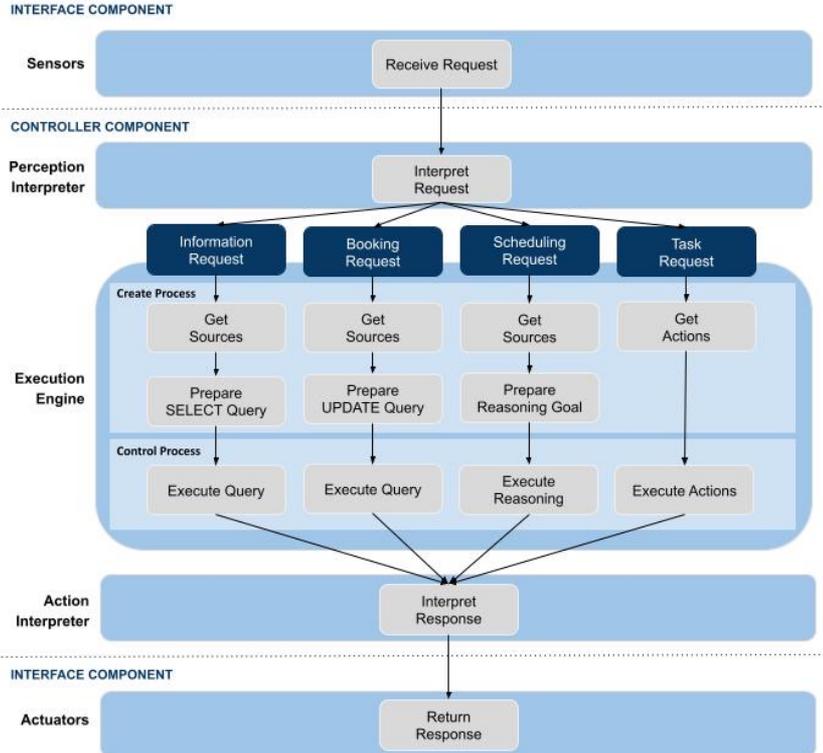


- A Benevolent and Trustworthy Agent (BTA) Architecture minus the reactive and learning components

From Policies to Norms: Governance

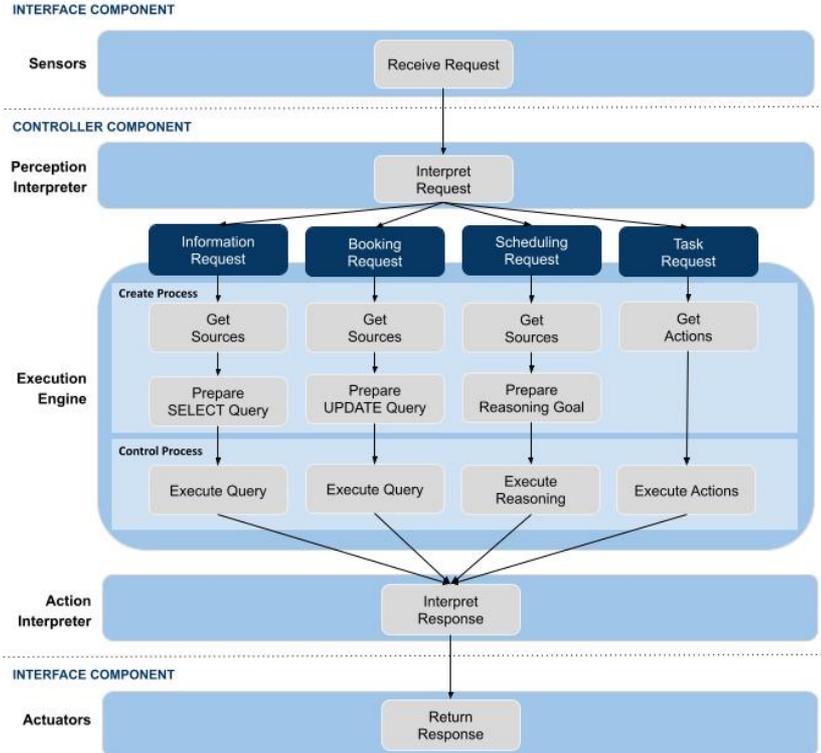
Benevolent and Trustworthy agents

- Information, Booking, Scheduling, and Task Requests



From Policies to Norms: Governance

Benevolent and Trustworthy agents



- Information, Booking, Scheduling, and Task Requests

EXAMPLE 1: Information Request

```
amv:DoctorsReferralInfo am:hasRequestType am:InfoRequest;
am:hasSource amv:LucysAgent;
am:hasDestination amv:AlicesDoctorsAgent;
am:hasType amv:LucysDoctorsReferral;
am:hasProvider amv:AlicesDoctor;
am:hasConstraint [amv:lastVsit "2022-03-14"^^xsd:dateTimeStamp],
[amv:requiredTreatment amv:Physiotherapy];
am:hasCredential amv:LucysAgentCredential,
amv:AlicesDelegatedDoctorCredential;
```

Challenges & Opportunities

From Policies to Norms

Open Challenges and Opportunities



- The **encoding of policies and norms** such that they are actionable by machines is particularly difficult as policies and norms are often vague and ambiguous.
- In order to **monitor how agents adapt and learn** there is a need for governance strategies that are suitable for symbolic and sub-symbolic learning.
- There is a need for **abstractions that can be used to guide the development** of a variety of different agent types (information, scheduling, booking, etc....)
- We need **codes of conduct** for different types of agents and agent organisations based on legal, regulatory, and social norms
- We are severely lacking in terms of intelligent agent **verification, validation & benchmarking methods and tools**
-

Contact Details



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