ATOMate It!

End-user Context-Sensitive Automation using Heterogeneous Information Sources on the Web

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ATOMate It!

How to regain some of the time that Web 2.0 took away

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1. motivation - can we beat overload by delegating to machines?

2. atomate - reactive automation driven by web feeds

3. study

4. related work

5. next steps

1. motivation

"...in an information-rich world, the wealth of information means a dearth of something else: a scarcity of [...] the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it"

(Simon 1971, p. 40-41)

In 2010:

In 2010:

peer/friend/citizen-produced content

In 2010:

peer/friend/citizen-produced content

socially and algorithmically recommended

In 2010:

peer/friend/citizen-produced content

socially and algorithmically recommended

more *interesting* content produced every day than we could possibly consume

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‘social maintenance’ - updating friends

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responding to others' needs

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more *interesting* content produced every day than we could possibly consume

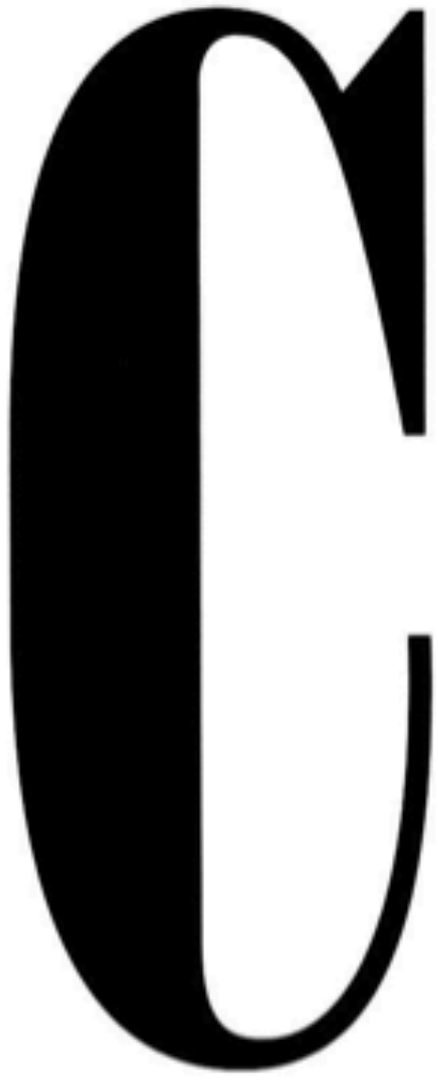
'social maintenance' - updating friends

keeping on top of the world

responding to others' needs

more responsibilities -- professional, personal, social than we could possibly perform

Agents that **Reduce Work and Information Overload**



P. Maes,
"Agents the Reduce Work and Information Overload"
Communications of the ACM
Volume 37 , Issue 7 (July 1994)

omputers are becoming the vehicle for an increasing range of everyday activities. Acquisition of news and information, mail and even social interactions and entertainment have become more and more computer based. At the same time, an increasing number of untrained users are interacting with computers, and this number will continue to rise as technologies such as hand-held computers and interactive television become popular.

Unfortunately, these technological developments are not in line with a change in the way people interact with computers. The currently dominant interaction metaphor of *direct manipulation* [21] requires the user to initiate all tasks explicitly and to monitor all events. This metaphor will have to change if untrained users are to make effective use of the computer and networks of tomorrow.

Techniques from the field of AI, in particular so-called "autonomous agents," can be used to implement a complementary style of interaction, which has been referred to as *indirect management* [9]. Instead of user-initiated interaction via commands and/or direct manipulation, the user is

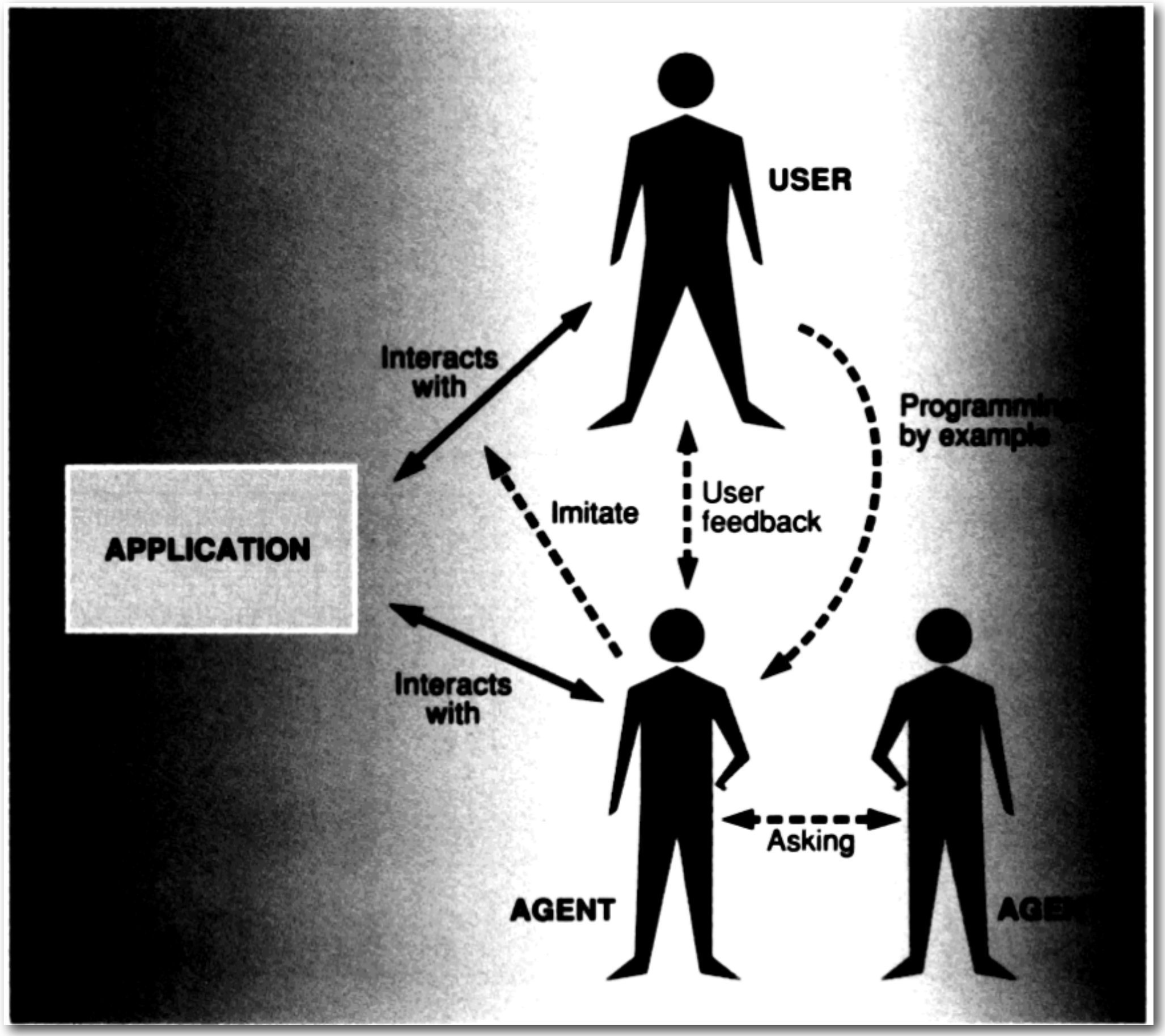
ferent ways: they hide the complexity of difficult tasks, they perform tasks on the user's behalf, they can train or teach the user, they help different users collaborate, and they monitor events and procedures.

The set of tasks or applications an agent can assist in is virtually unlimited: information filtering, information retrieval, mail management, meeting scheduling, selection of books, movies, music, and so forth.

This article focuses on a novel approach to building interface agents. It presents results from several prototype agents that have been built using this approach, including agents that provide personalized assistance with meeting scheduling, email handling, electronic news filtering and selection of entertainment.

Approaches to Building Agents

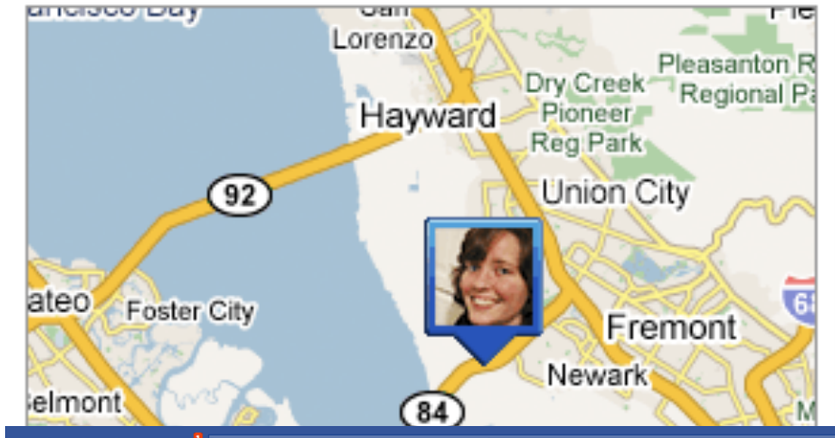
The idea of employing agents in the interface to delegate certain computer-based tasks was introduced by visionaries such as Nicholas Negroponte [19] and Alan Kay [8]. More recently, several computer manufacturers have adopted this idea to illustrate their vision of the interface of the future (cf., videos produced in 1990-1991 by Apple, Hew-


USER
Interacts with
Programming by example
APPLICATION
Imitate
User feedback
Interacts with
Asking
AGENT

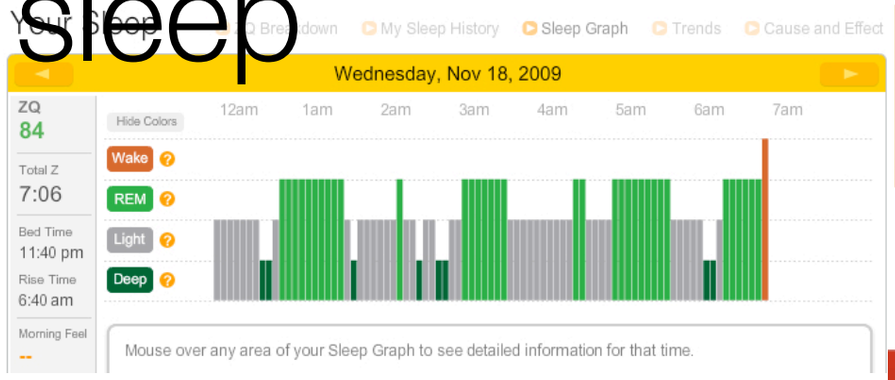
desktop activity

messages

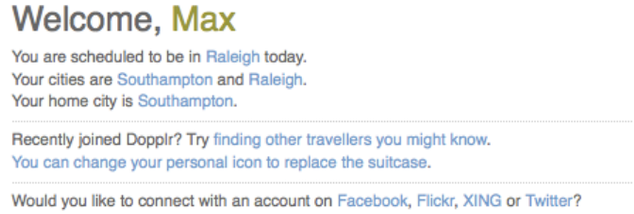
physical locations



sleep

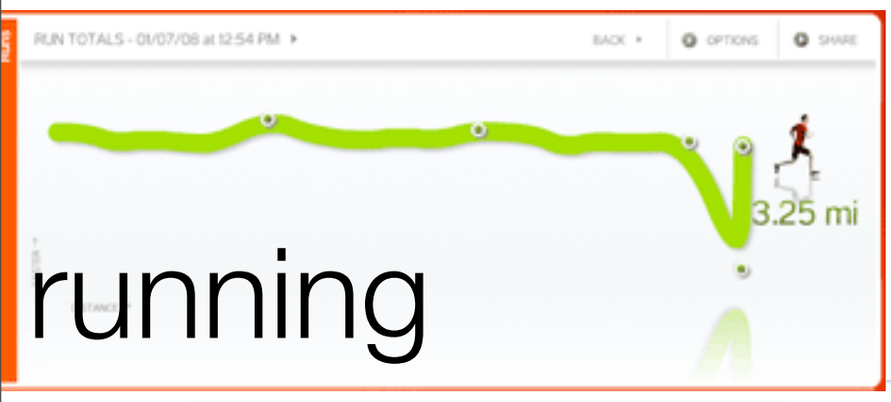


travels

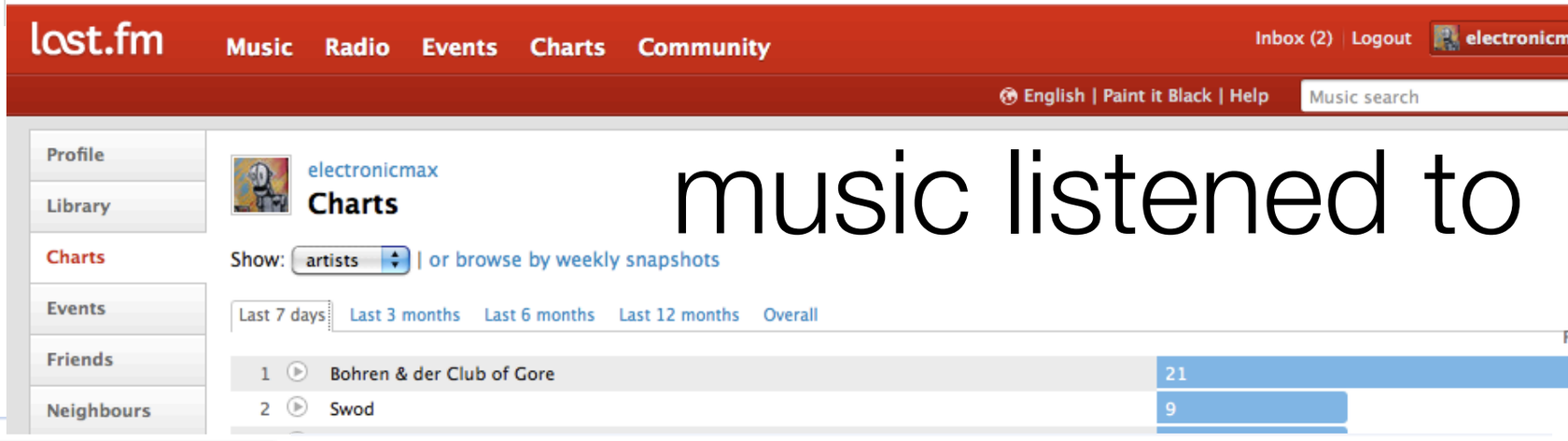


friends/enemies

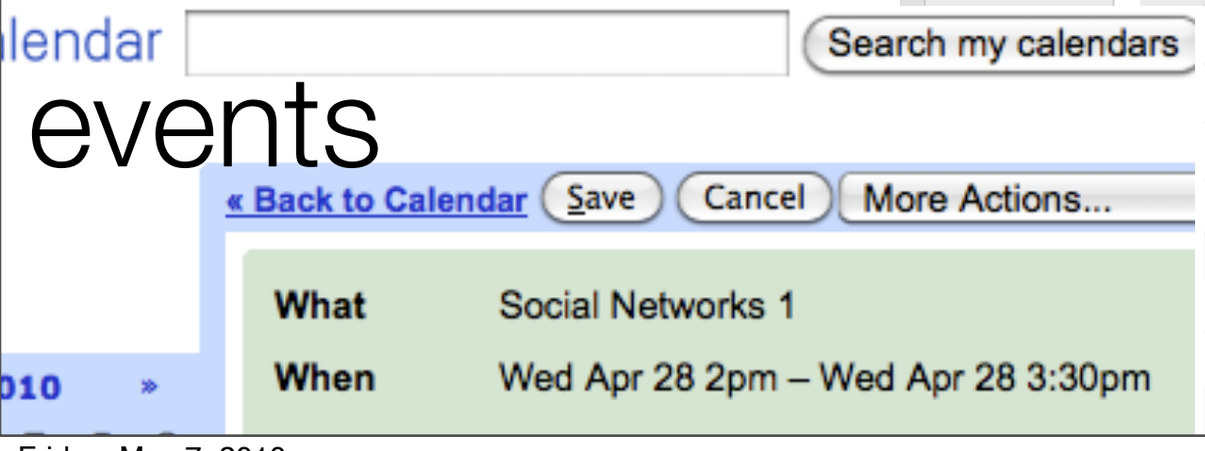
running



music listened to



events



documents

wouldn’t it be great if computers could use all this information to do stuff for us?

for example:

- remind me to take out the trash when I get home on Tuesdays...
- bug my friend who hasn't replied to me in 2 days...
- send me my grocery shopping list when I arrive at the grocery store
- remind friends about an event I am going to attend
- text me important emails when I am traveling

...how do we get there?

what we need

what we need

1. a way for users to express:
   what they want to happen,
   and **when**,
   in terms of **predicates** relating
      the **states** and **properties** of
         people, **places** + **things**
   in their world.

what we need

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   what they want to happen, actions
   and **when**,
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Controlled Natural Language Interface (CNLI) for Rules

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Controlled Natural Language Interface (CNLI) for Rules

2. a way to **retrieve** and **interpret** data from our many heterogeneous web sources as descriptions of these familiar **people**, **places** and **things.**

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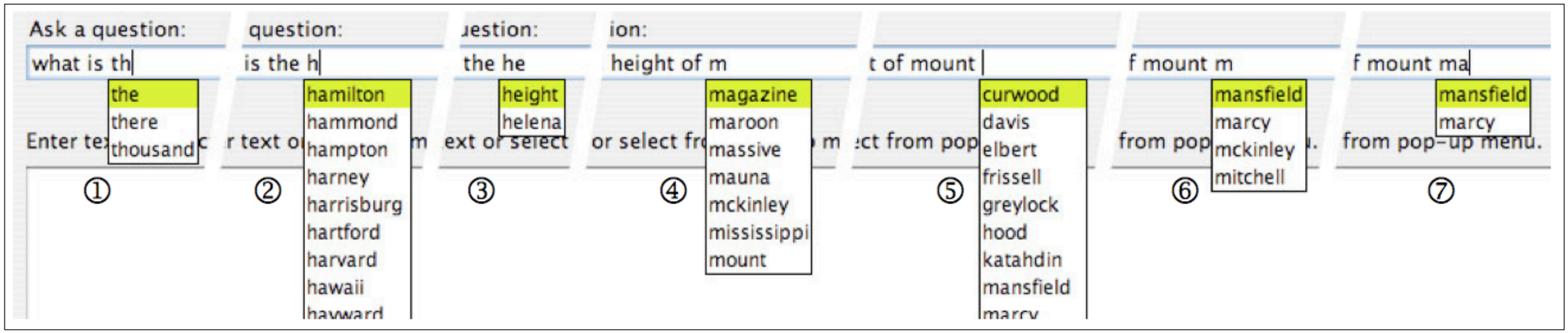
Controlled Natural Language Interface (CNLI) for Rules

2. a way to **retrieve** and **interpret** data from our many heterogeneous web sources as descriptions of these familiar **people**, **places** and **things.**

ATOM/RSS/REST APIs, End-user mashups + RDF

Controlled/Constrained Natural Language Interface

previous work: for the construction of RDF KBs and queries:



Abraham Bernstein and Esther Kaufmann and Christian Kaiser and Christoph Kiefer, *Ginseng: A Guided Input Natural Language Search Engine for Querying Ontologies*, Jena User Conference, 2008.

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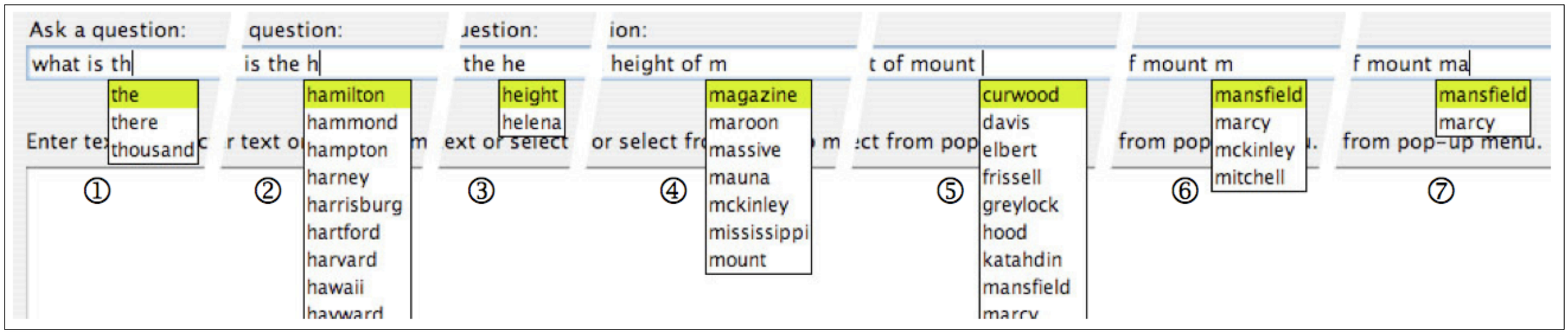

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express behaviors as *rules*

when <something happens> do <action>

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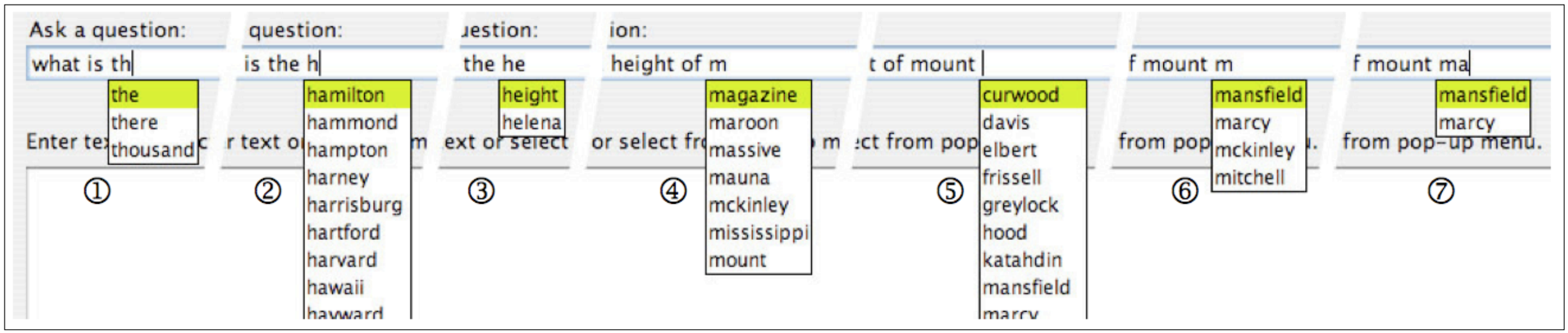

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query

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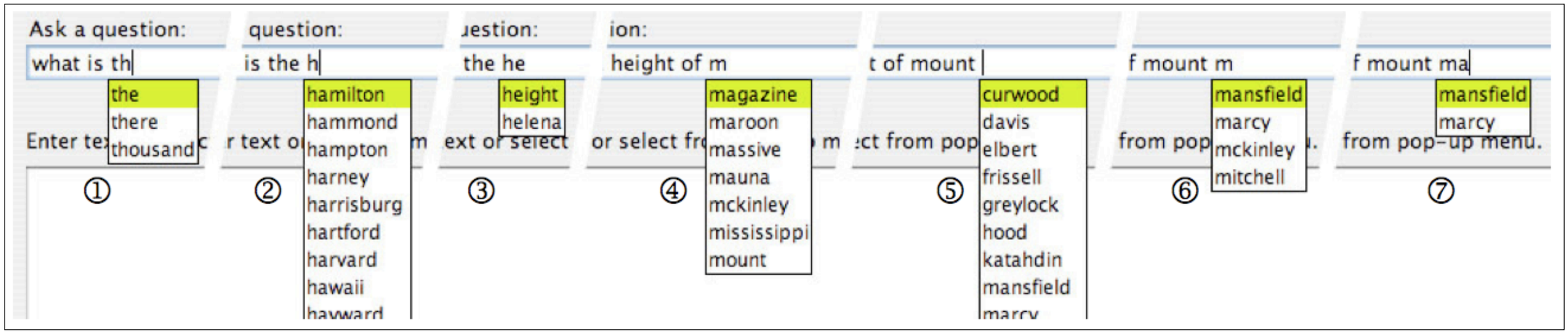

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query

statement

Data streams: ATOM/RSS/REST APIs,
End-user mashup for alignment + RDF

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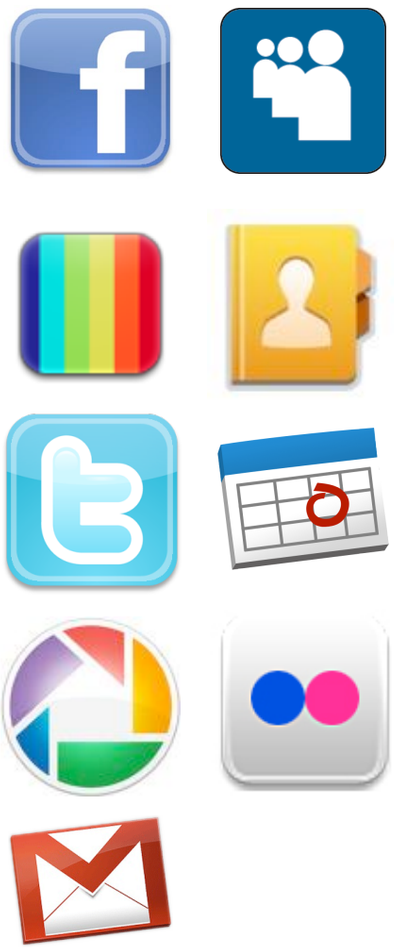
End-user mashup for alignment + RDF



Data streams: ATOM/RSS/REST APIs,
End-user mashup for alignment + RDF

Data streams: ATOM/RSS/REST APIs,
End-user mashup for alignment + RDF

people

- david karger
- max van kleek
- brennan moore
- paul andré

places

- www2010 ballroom
- www2010 302
- starbucks
- home
- office

messages

- emails
- texts
- IMs

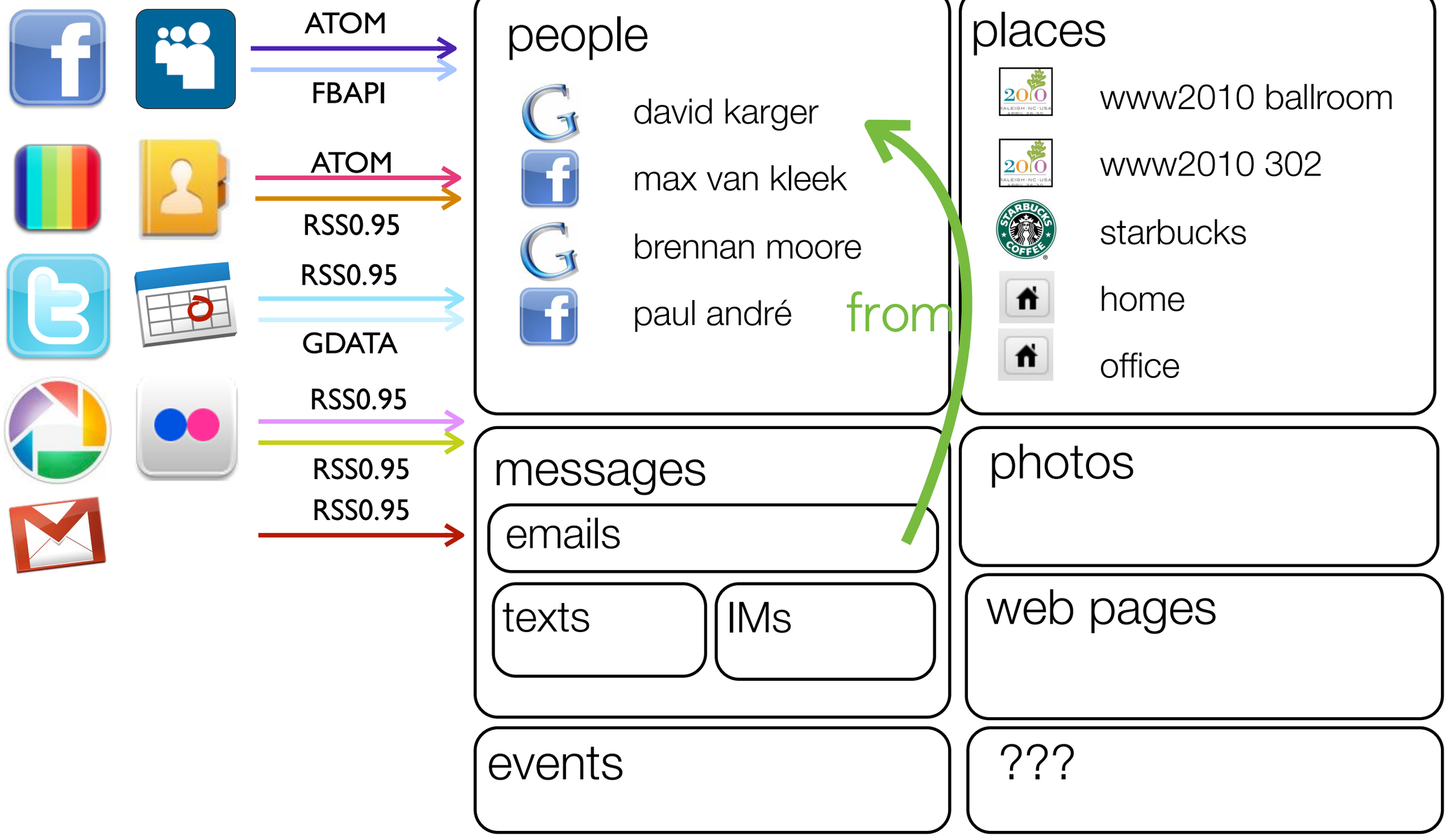
photos

web pages

events

???

Data streams: ATOM/RSS/REST APIs,
End-user mashup for alignment + RDF



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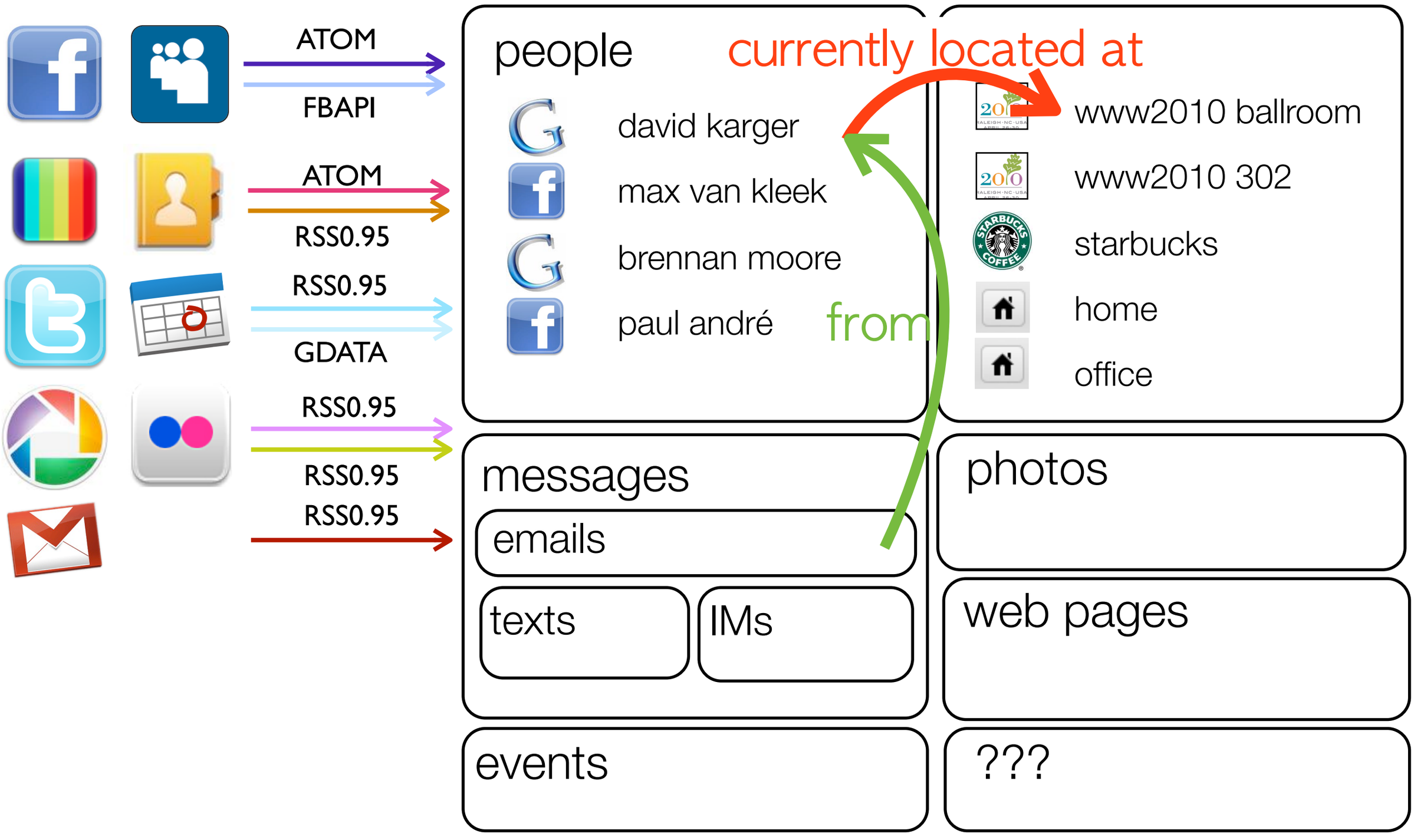

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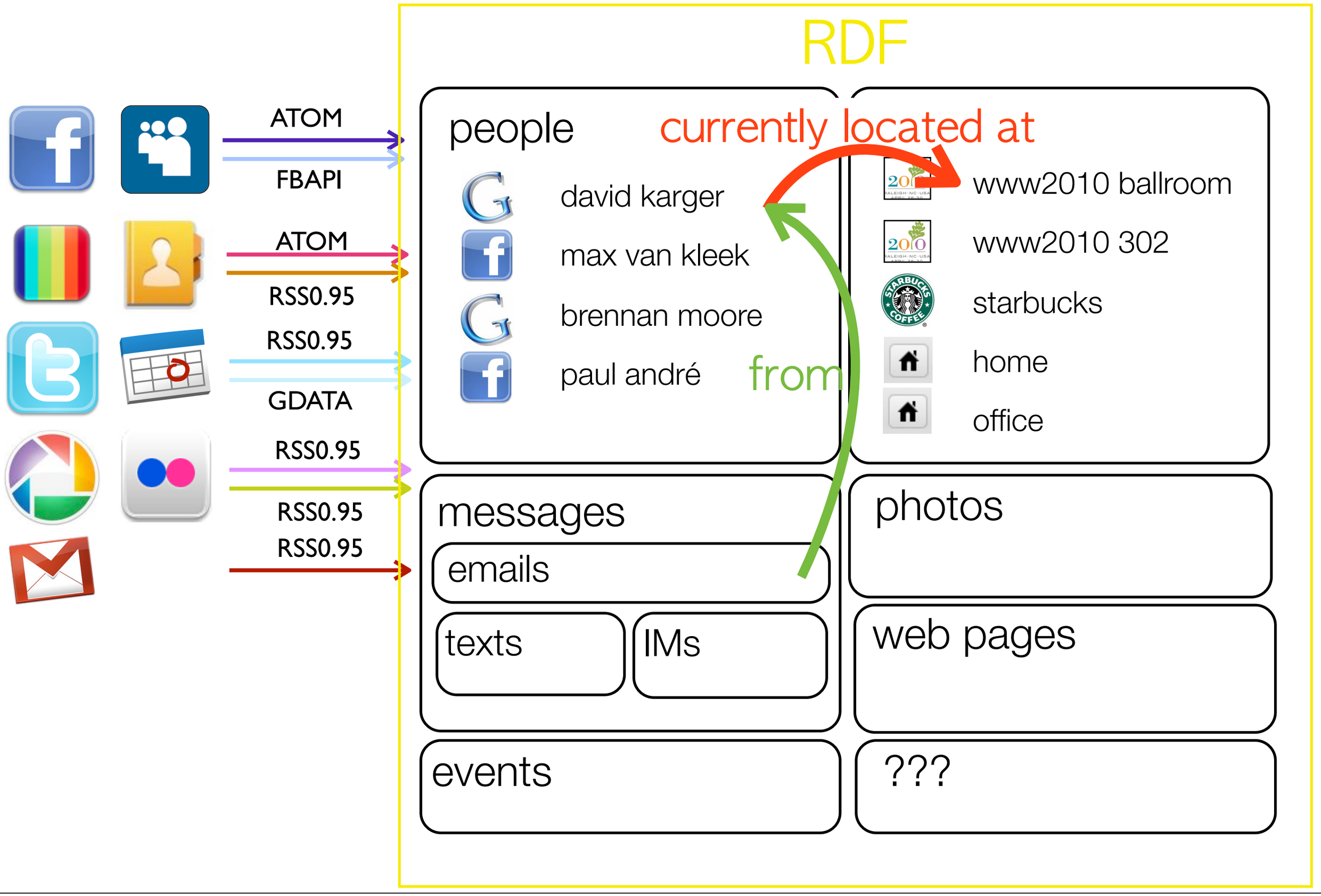

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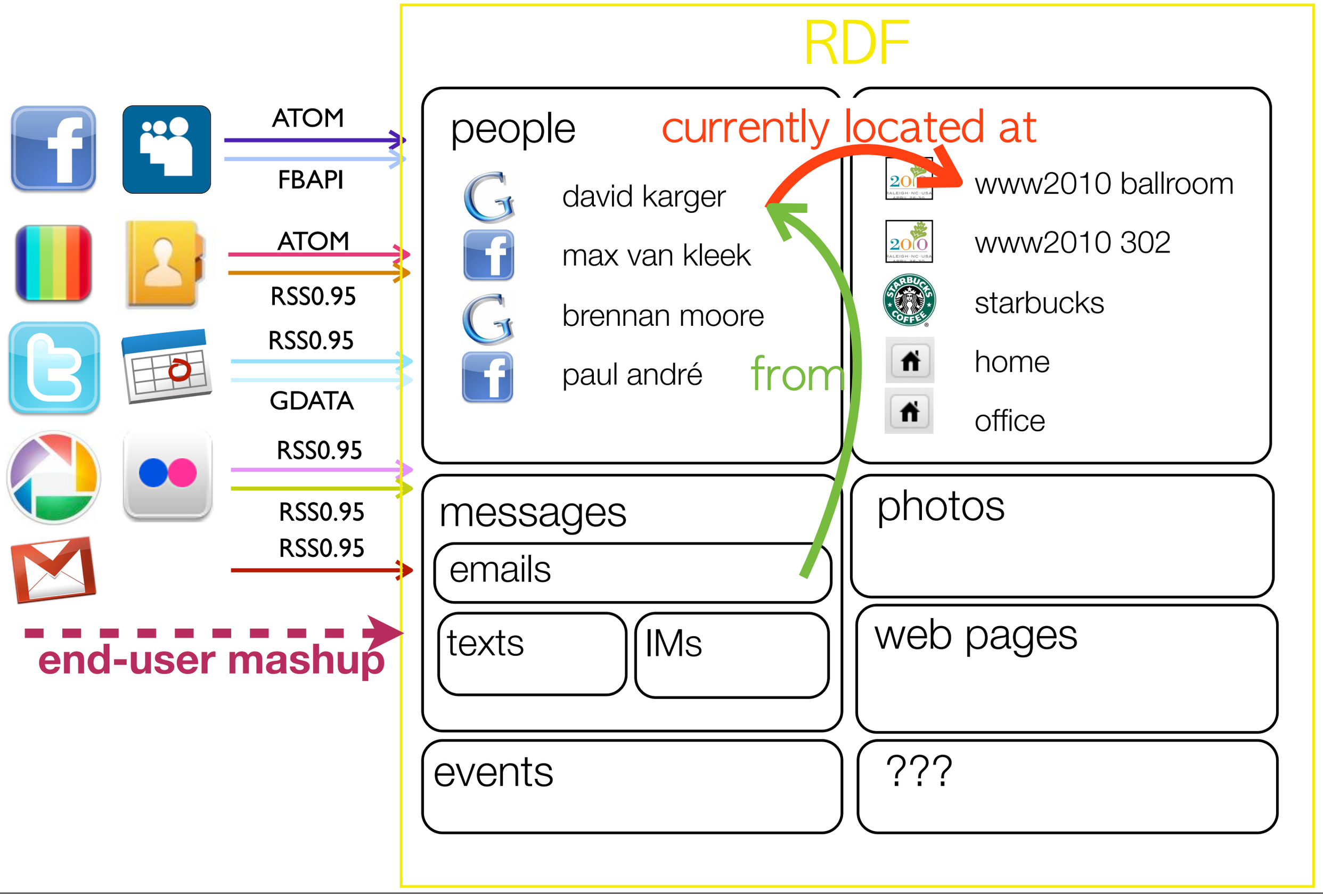

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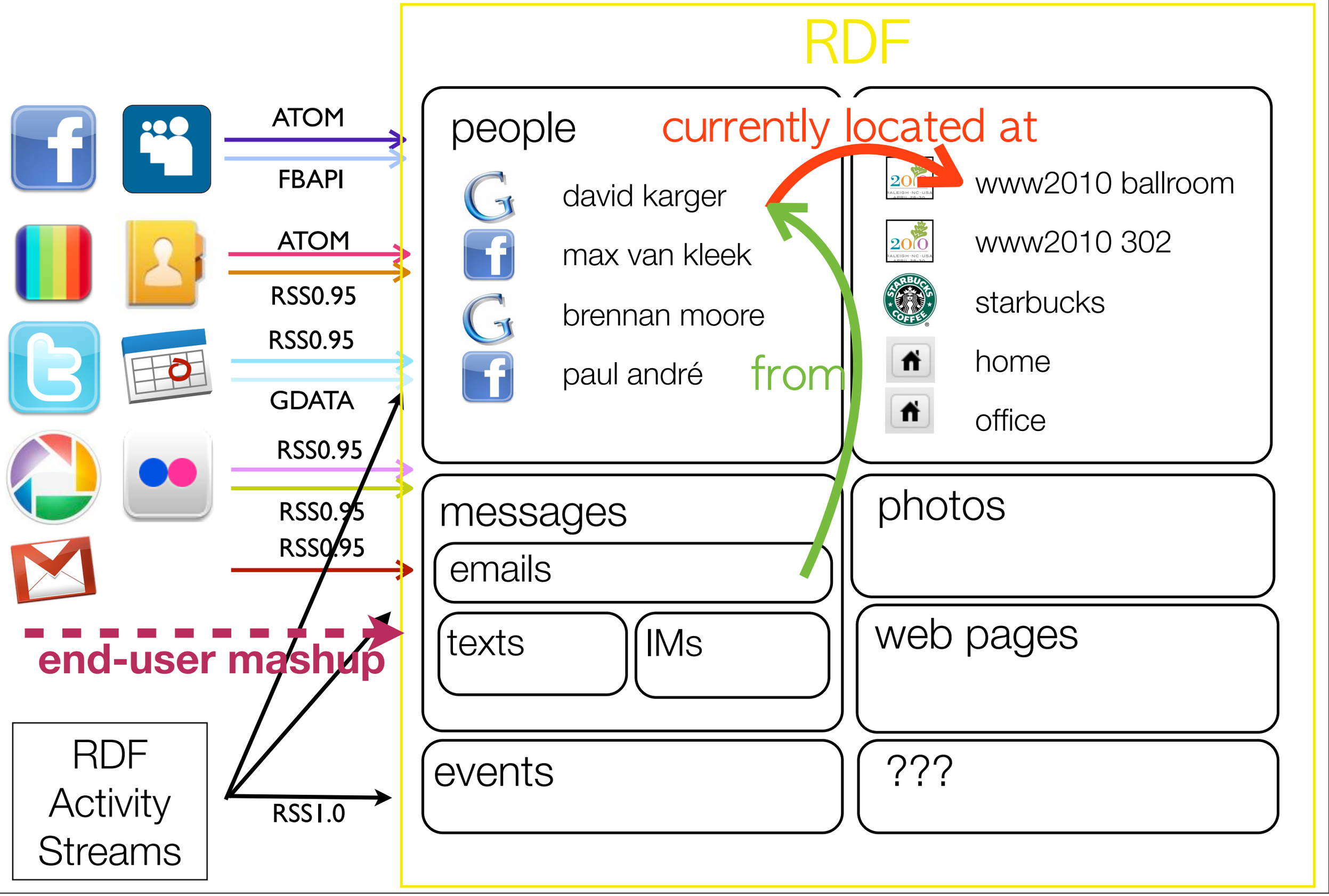
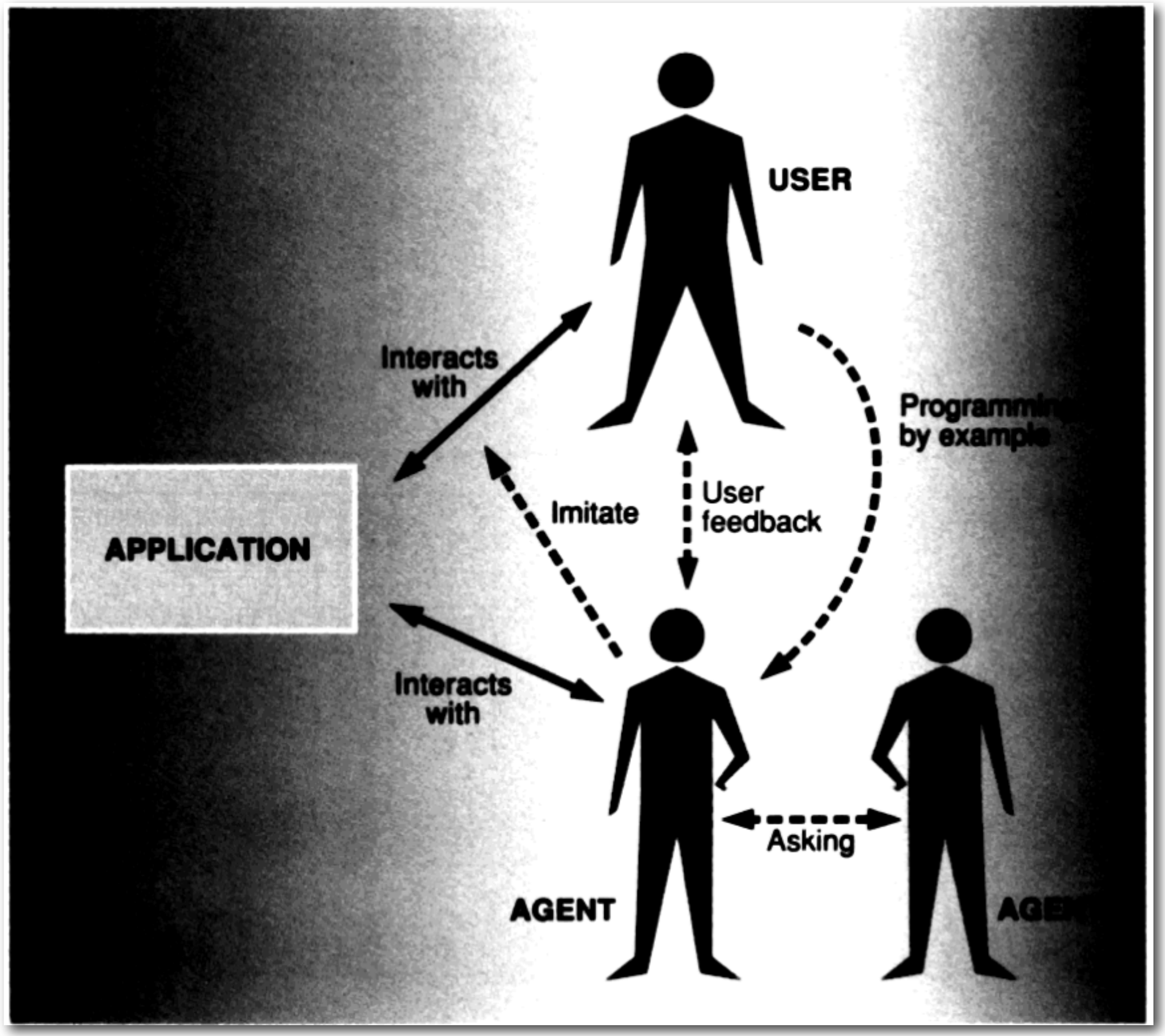



USER
Interacts with
Programming by example
APPLICATION
Imitate
User feedback
Interacts with
Asking
AGENT

logged activity data

browser

USER

interacts with

end-user programming of rules

reminders defered messages

browsing activity

digg

Tube

Y!

the web

invoke actions

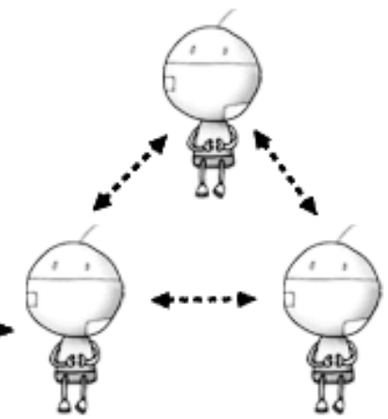
updates about user, people, events, news and messages

CLNI

production system

RDF world model

sharing



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browser

USER

interacts with

end-user programming of rules

reminders defered messages

browsing activity

the web

invoke actions

updates about user, people, events, news and messages

ATOMATE

sharing

other people's atomates

2 atomate

a few examples

architecture + world model

extending the system

sharing updates to other atomates

Example 1: Simple context-sensitive reminding

Remind me to take the trash out
when I get home on Tuesday evenings

what would **you** like me to do?

my actions | my stuff | share me

when [who] [does] [what] + [do something]

ie: my current location | ie: is near | ie: Home

when - - - -

save

Example 2: Travel management

When I’m traveling, warn people who are e-mailing me that I might not get back to them for a while.

How do we tell when we're traveling?

How do we tell when we're traveling?

How do we tell when we're traveling?

How do we tell when we're traveling?

How do we tell when we're traveling?

going on now? → currently traveling?

How do we tell when we're traveling?

Google
Latitude

How do we tell when we're traveling?

DOPPLR —going on now?→ currently traveling?

Google Latitude →

How do we tell when we're traveling?

DOPPLR —going on now?→ currently traveling?

Google Latitude → current location

How do we tell when we're traveling?

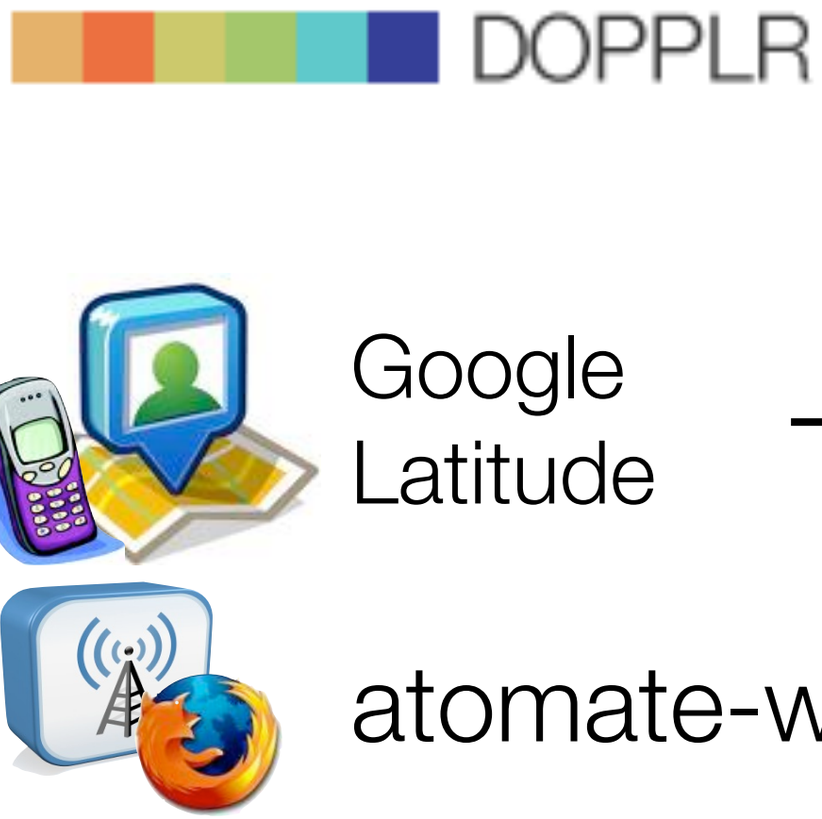
DOPPLR —going on now?→ currently traveling?

Google Latitude

atomate-wifi

→ current location

How do we tell when we're traveling?



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when - - - -

save

2 atomate

a few examples

architecture, rule representation

extending the system

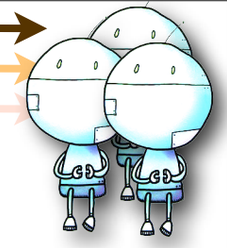
sharing updates to other atomates

web sources

atom-smasher

server for connecting atomates

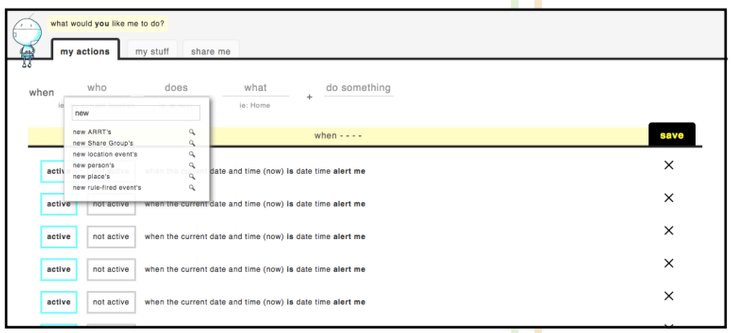
customized RSS
and RDF-JSON
feeds for atomates of
friends, family, colleagues

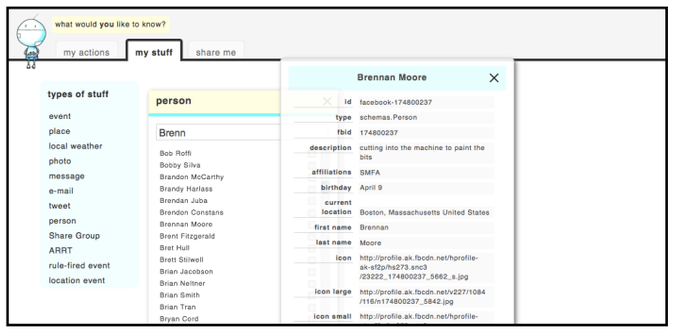


actions
REST APIs()

atomate world model updates
RDF-JSON

RSS feeds/REST APIs





rule creator + inspector UI

(core atomate XPCOM)

feeder ···➤ rule engine

RDF KB
(mozStorage)

location logger
(nsIWiFi)

web activity
tracker

(xulrunner mozilla seamonkey, firefox, fennec)

inside a rule:

when (one-shot) / *whenever* (repeating)

ANTECEDENT (conditions for execution)

AND predicate(subj-pathquery, obj-pathquery-or-val)

AND predicate2(...) AND ...

CONSEQUENT (what to do)

action(arg-path-or-val, arg-path-or-val..)

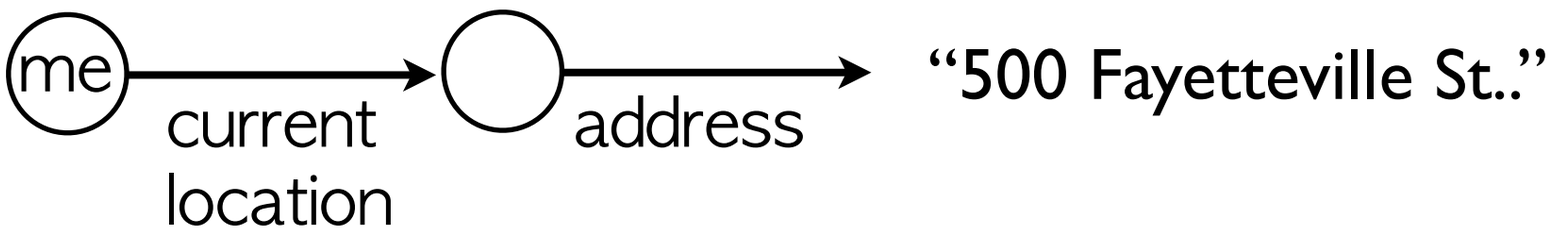
rules in constrained natural language

entities represented by their label

(e.g., “David Karger”, “home”, and special pronoun “me”)

possessives for path queries

(e.g., my current location’s address)



infix english verbs for predicates

eq(number,number) ⇒ “is”

near(Location,Location) ⇒ “near”

rules in constrained natural language

variables represented with “any/new <type>”

?x rdf:type :Person =〉 “any Person”
newly created Person entity: “new Person”

bound variables with “that <type>”

“any Person’s birthday is today
email that person ‘happy birthday’”

actions in constrained natural language

actions represented as fill-in-the-blank sentences with typed blanks

```
[“reply to”,
  {name:”email” type:”schemas.Email”},
  “with”,
 { name: “message”, type:”schemas.String”} ]
```

reply to *email* with *message*

2 atomate

a few examples

architecture + world model

extending the system

sharing updates to other atomates

extending the system

modifying/extending atomate's schema

adding new data sources (sensors or entities)

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Allrecipes Daily Recipes for Healthy

Allrecipes Daily Recipes Daily Feed

Low-Cholesterol Recipes: Red Raspberry Vinaigrette | Submitted By: LindaJ6724
April 28, 2010 11:22 AM

A very easy, flavor-filled dressing that goes with any kind of salad. Only three ingredients! I like to use it with romaine, feta, toasted pecans, bacon, and red onion.

Dairy-Free Recipes: Maui Chicken | Submitted By: CandiceJ
April 28, 2010 11:22 AM

Maui chicken is a festive dish featuring succulent chicken breast, sweet red and orange peppers and mushrooms. This colorful dish is then simmered in a spicy ginger, garlic, and pineapple sauce and poured over white or brown rice. The combination is as delightful as the Maui sunset.

Diabetic Recipes: Spicy Chicken Breasts | Submitted By: Barbara Radford
April 28, 2010 11:22 AM

This is a terrific rub for chicken just before it 's plopped onto the grill. It adds amazing flavors, seals in juices, and gives the finished chicken a lot of color. Stores nicely.

Egg-Free Recipes: Vegan Lasagna I | Submitted By: jessica
April 28, 2010 11:22 AM

A nice, thick tomato-based sauce is cooked up with hints of garlic, onion, parsley and basil. Tofu is mashed with garlic, parsley and basil. The noodles are cooked. Now you 're ready to make lasagna. Lots of layers and a hot oven do the trick. Makes eight

Gluten-Free Recipes: Chinese Shrimp Salad | Submitted By: Joanne
April 28, 2010 11:22 AM

Shrimp tossed with lychee, apples, lemon juice and mayonnaise chilled before serving.

Low-Carb Recipes: Crab Stuffed Mushrooms II | Submitted By: Kimber
April 28, 2010 11:22 AM

The Dijon mustard adds a different twist to this delicious appetizer! Water chestnuts are optional, but add a nice texture to the smooth cream cheese and crab filling.

High-Fiber Recipes: Potato and Shiitake Mushroom Gratin | Submitted By: Christine L.
April 28, 2010 11:22 AM

Fall mushrooms give this dish a hearty flavor. Substitute vegetable broth for the chicken broth, and this makes a perfect meal for that vegetarian girlfriend your son is bringing to the holiday dinner. The rest of the family will love it too. Originally submitted to ThanksgivingRecipe.com.

Sugar-Free Recipes: Tonkatsu - Asian-style Pork Chop | Submitted By: SHIN98
April 28, 2010 11:22 AM

This is using Panko, which is Japanese bread crumbs (really light and airy, more so than crackers), and thinly sliced boneless pork chops.

Low-Fat Recipes: Pasta Salad I | Submitted By: Sylvia Kehler
April 28, 2010 11:22 AM

This colorful pasta salad features a medley of crunchy veggies! Combine pasta with broccoli, cauliflower, carrots, celery, bell peppers, mushrooms and fiery sweet red onions. A sweetened mayonnaise and vinegar binds

extending the system predicates and actions

```
new JV3.schemas.AtomatePredicate(
        {
         id:"occurs_date_dows",
         name:"occurs on a",
         arg0type:"schemas.SpecificDate",
         arg1type:"schemas.SpecificDOW",
         impl:"function(JV3,x,y) {
         return x.getDate().getDay() == y.getDate().getDay();}"
        }
);
```

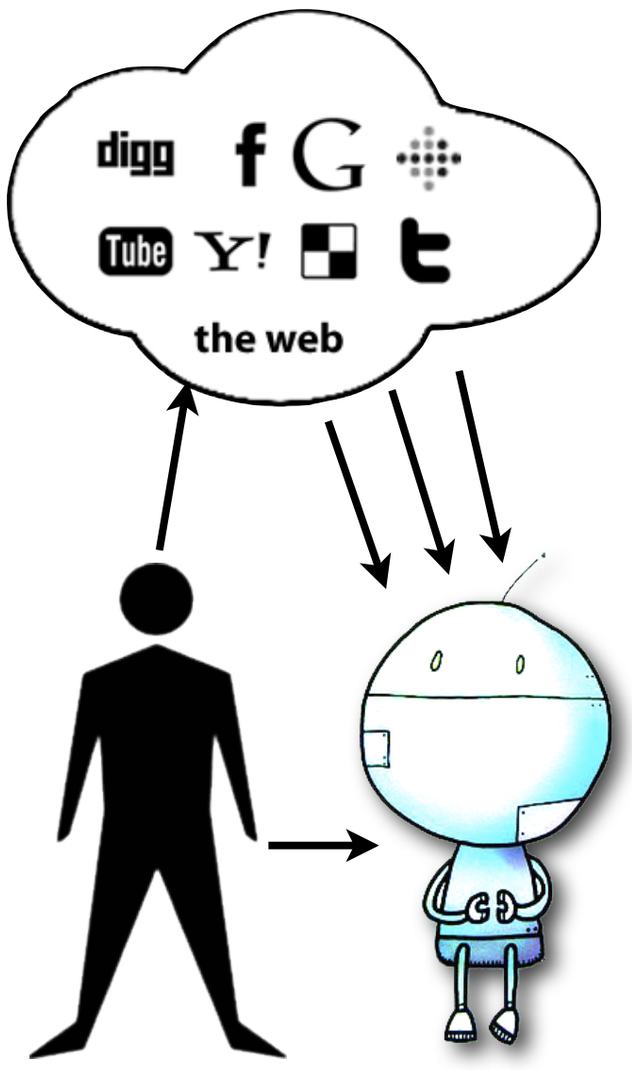
“occurs on a”

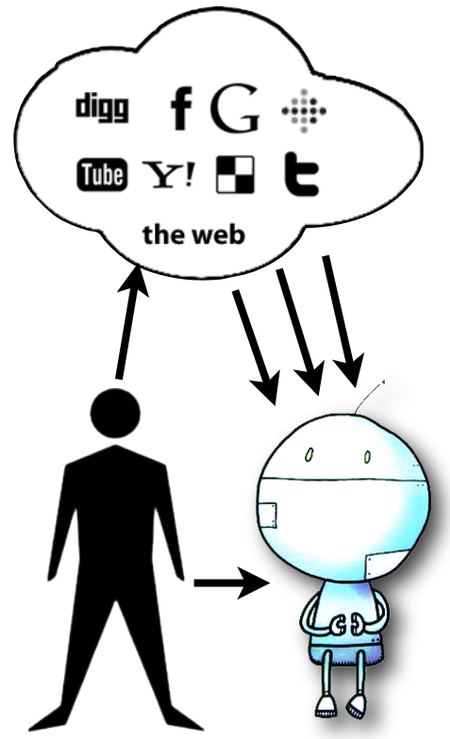
```
new JV3.schemas.AtomateAction(
        {
          id:"tweet-action",
          args:[“tweet”, {type:["schemas.String"], name:'message'}],
          impl:"function(x) { this.TwitterHelper.tweet(x); }"
        }
);
```

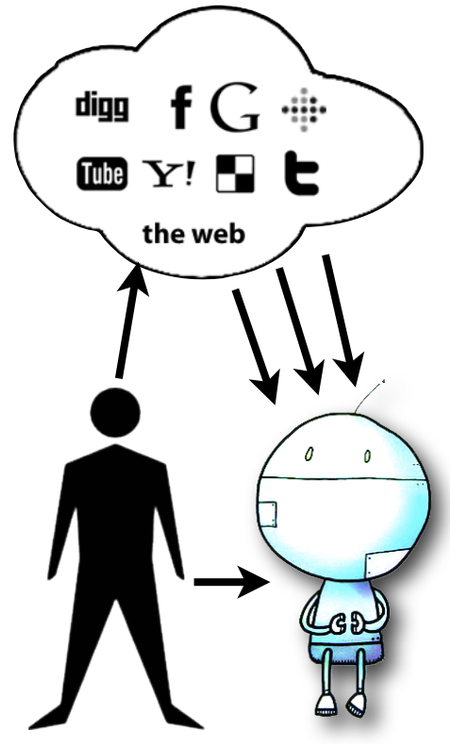
“tweet”

connecting atomates

when my currently viewed page is the same as
any person's currently viewed page







connecting atomates

when my currently viewed page is the same as
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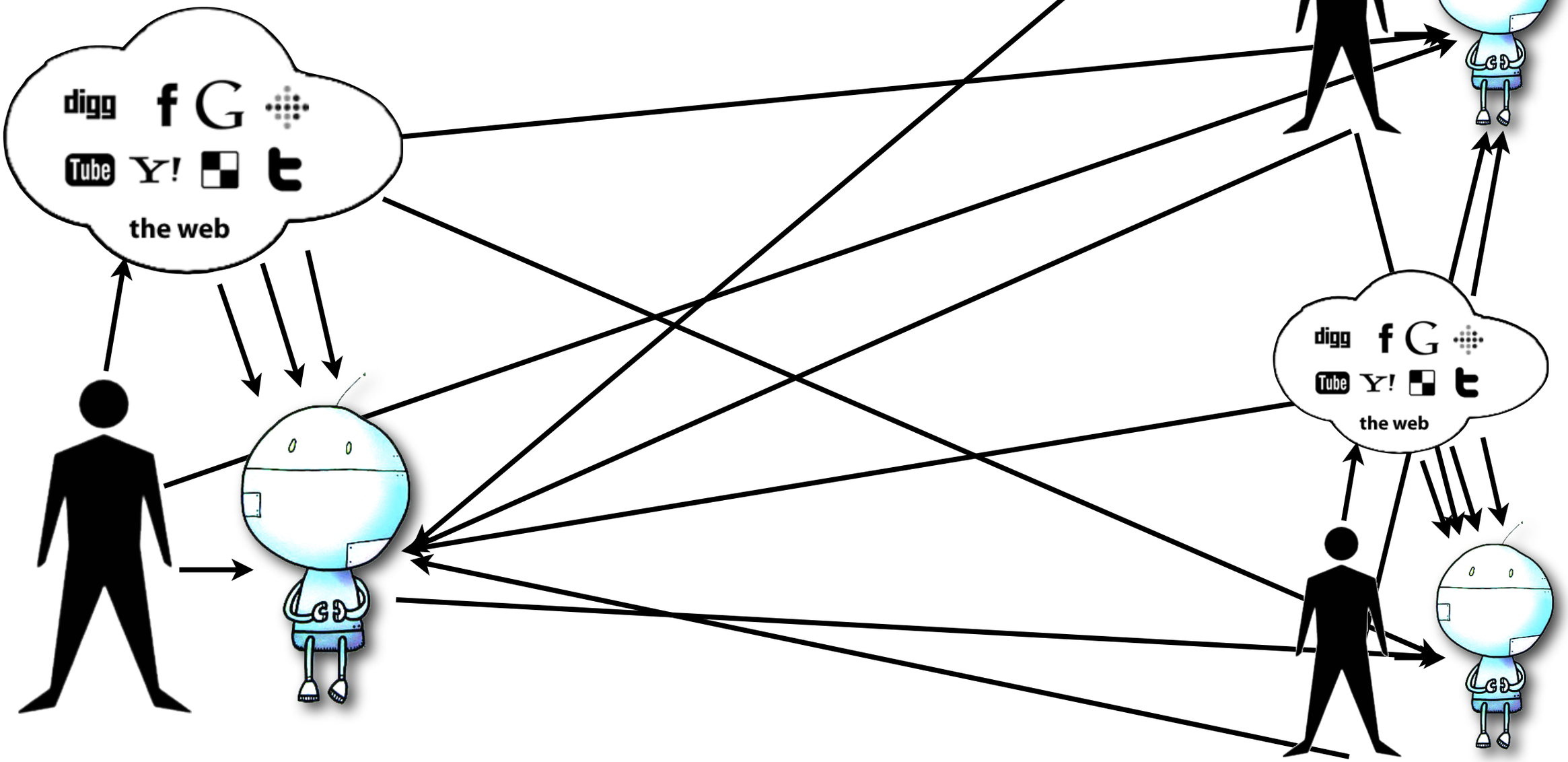
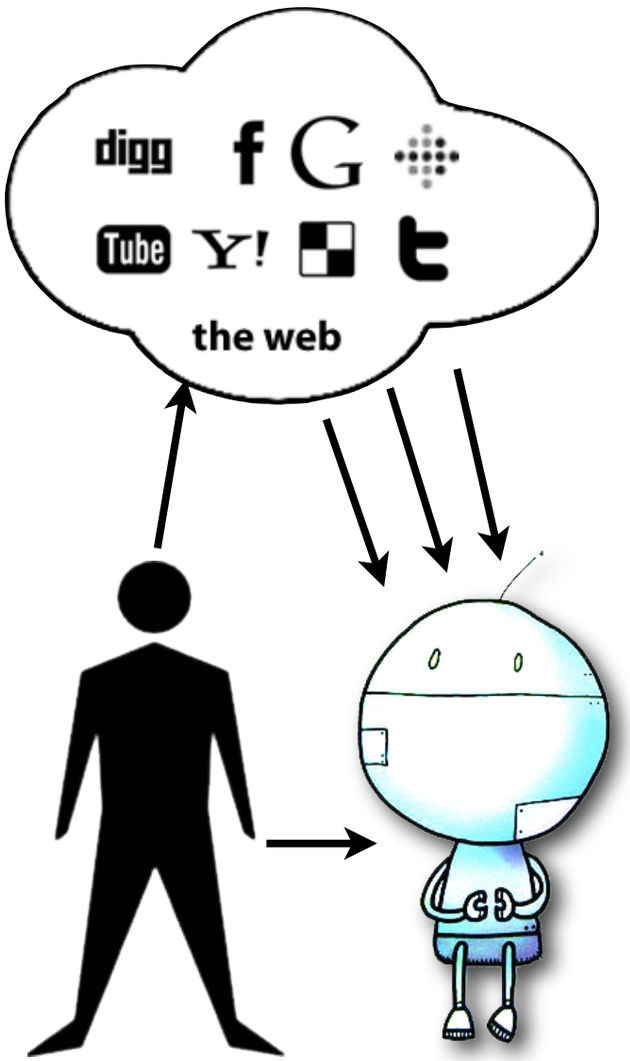


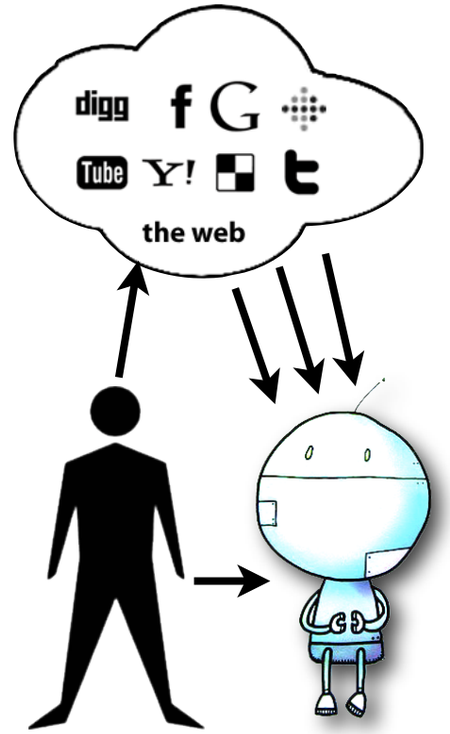
connecting atomates

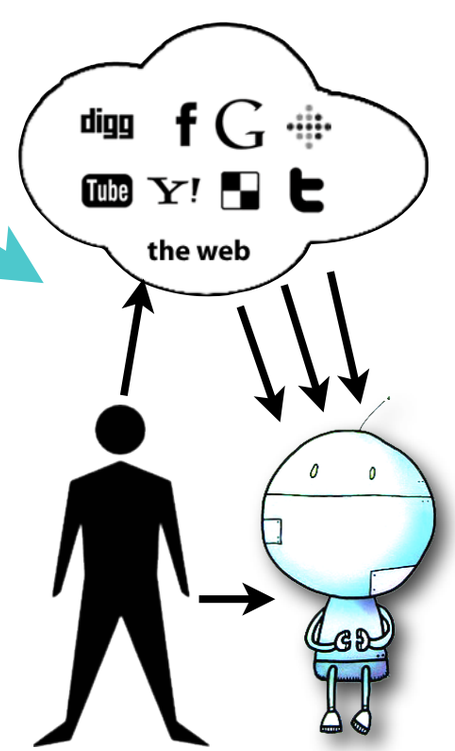
when my currently viewed page is the same as
any person's currently viewed page



rss pub-
sub
server

update feeds
to different groups
of friends





3 study

Can users create rules?

Perceived difficulty of use

Pitfalls

Ideas for fixing these problems

Rule creation study (method)

Recruited over the web

Basic demographics, sign up, 2 minute tutorial video

9 Rule creation exercises

(2 time, 3 easy, 3 medium, 1 difficult)

Short exit survey:

On average, how difficult was it to create the rules?

Was there anything that was confusing/difficult?

How useful would such a system be to you?

What would you use this system for?

What else do you wish this system could do?

Rule 1	You have a meeting with a colleague tomorrow at 3pm. Set a reminder.
Rule 2	You have to provide a work status report every Thursday at 2pm. Set a reminder.
Rule 3	Set up an alert that notifies you whenever anyone you know is near your house.
Rule 4	Set an alert that notifies you when your boss, John von Neumann, arrives at his office.
Rule 5	You often forget to bring your shopping list with you to the store. Have atomate text you your new shopping list (1. eggs. 2. bread. 3. milk) to you when you arrive at your local grocery store (Cropz).

Rule 6	You have been buying too many books from Amazon.com. Remind yourself every time you visit amazon.com to check your local public library for the book.
Rule 7	You are working on an urgent project with Vannevar Bush and want to make sure to not miss new e-mails about it. Have Atomate alert you when you receive a new email from him containing the word "MEMEX" in the subject line.
Rule 8	Have Atomate automatically update your facebook status when you are at a concert.
Rule 9	Have Atomate send you a text message when you have an activity scheduled in 5 minutes that is not close to where you are.

Rule creation study

november 2009

33 participants recruited (26 completed)

(ages 25-45)

14 had some programming experience

All experienced with the Web

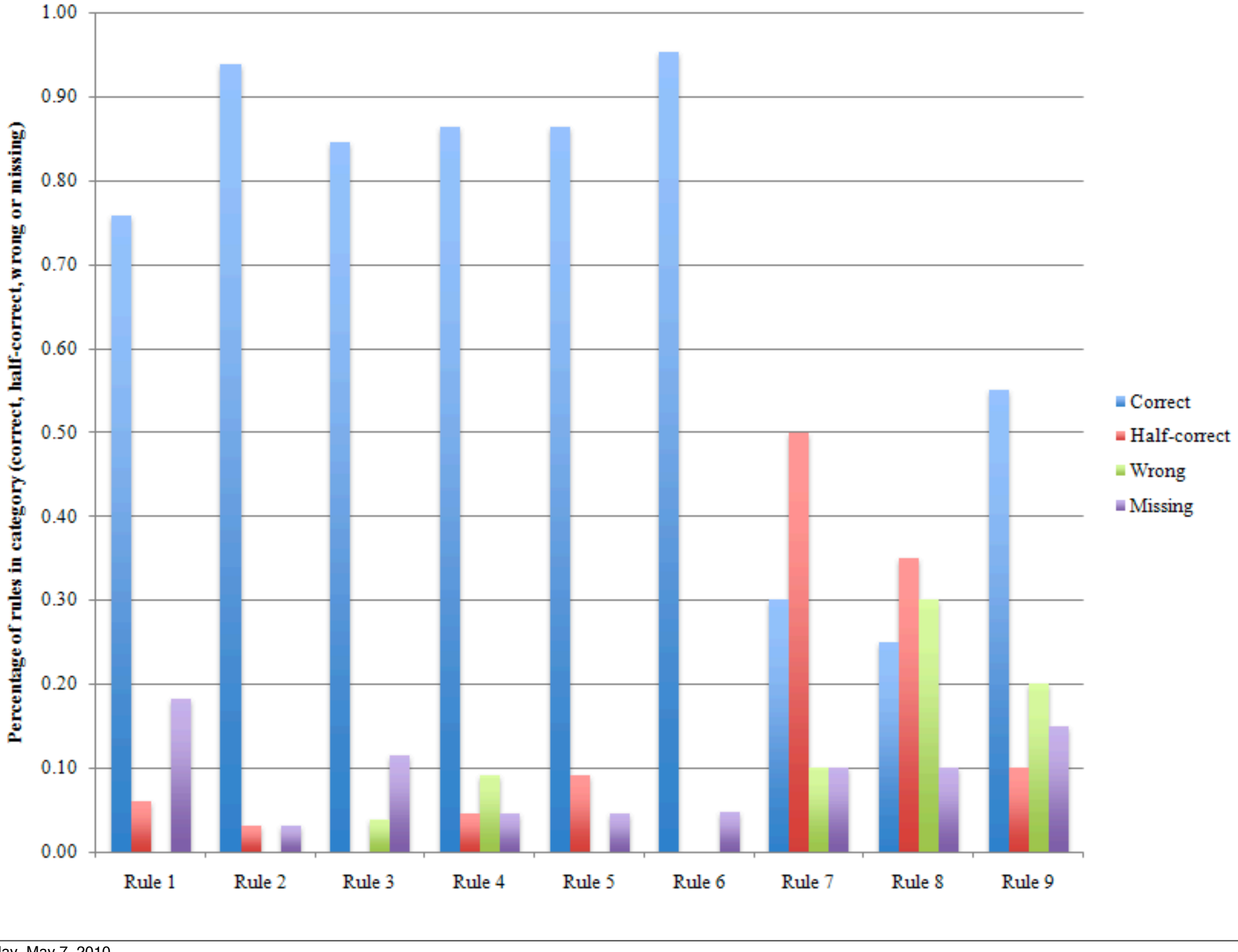
Rule creation study

correct - rule expressed perfectly

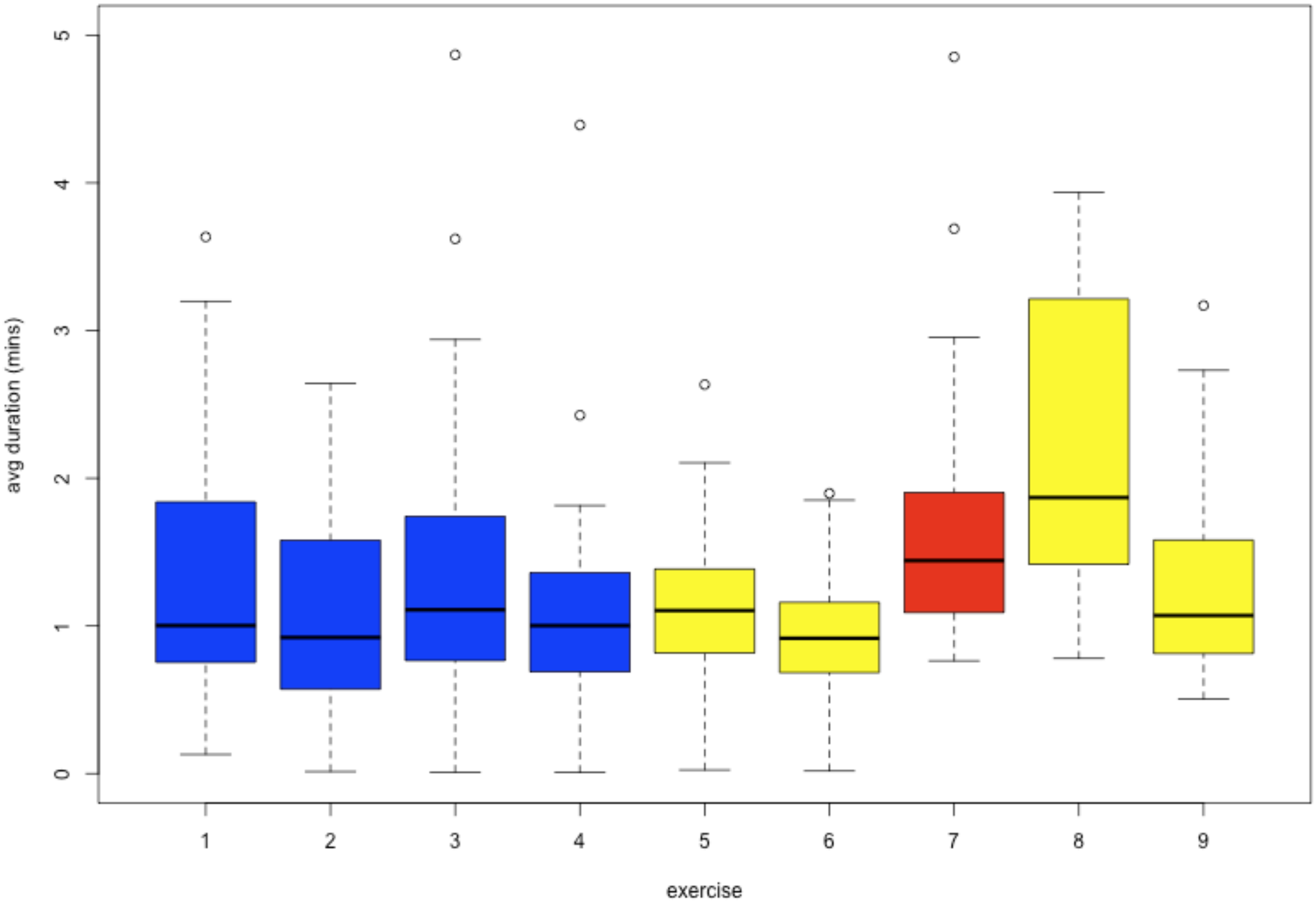
half-correct - rule insufficiently specific; will trigger more often than intended

wrong - 1 or more incorrectly expressed clause will not fire at all, or at all as intended

missing - rule not completed


1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Percentage of rules in category (correct, half-correct, wrong or missing)
Rule 1
Rule 2
Rule 3
Rule 4
Rule 5
Rule 6
Rule 7
Rule 8
Rule 9
Correct
Half-correct
Wrong
Missing

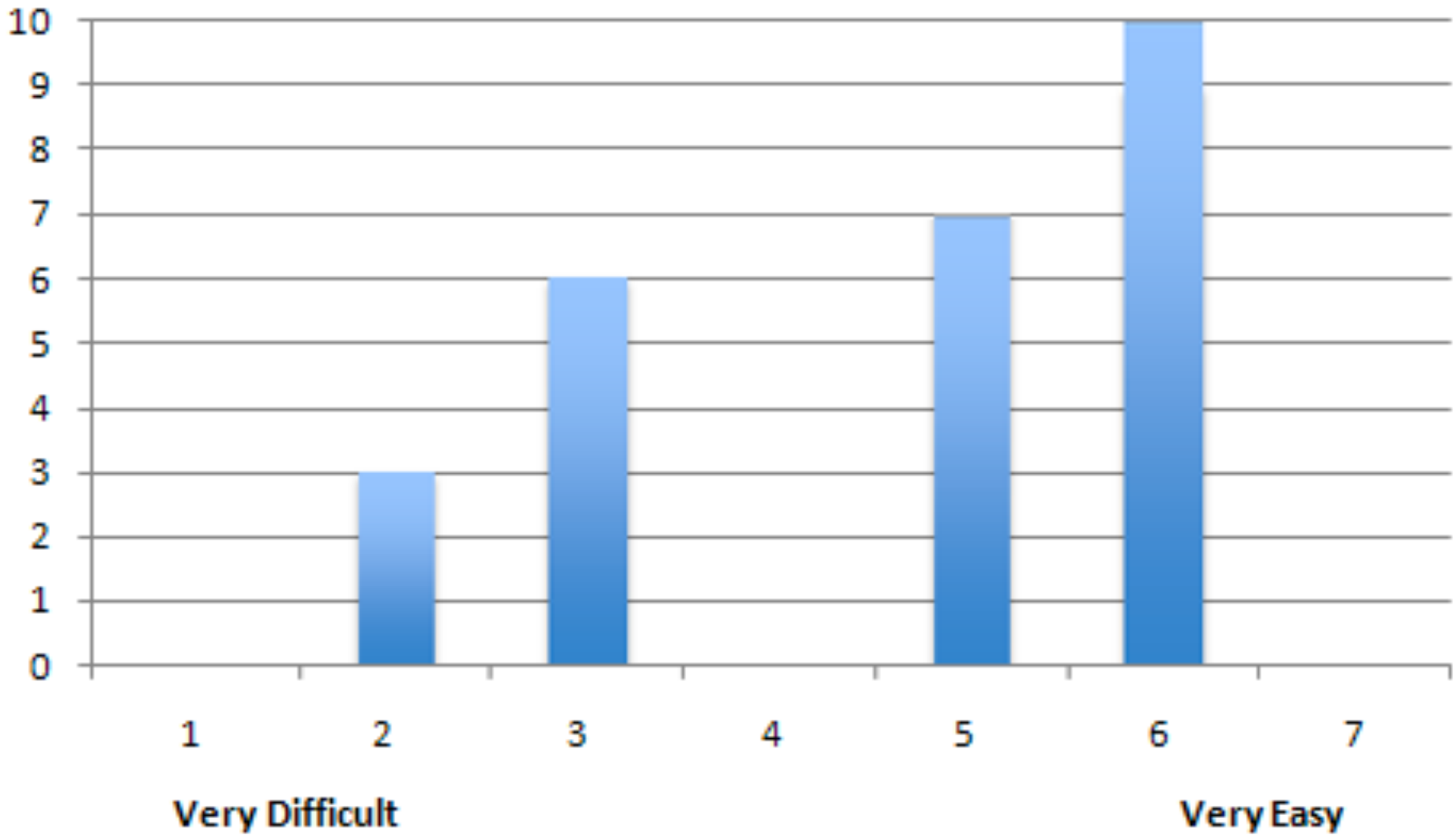
average time to complete each rule



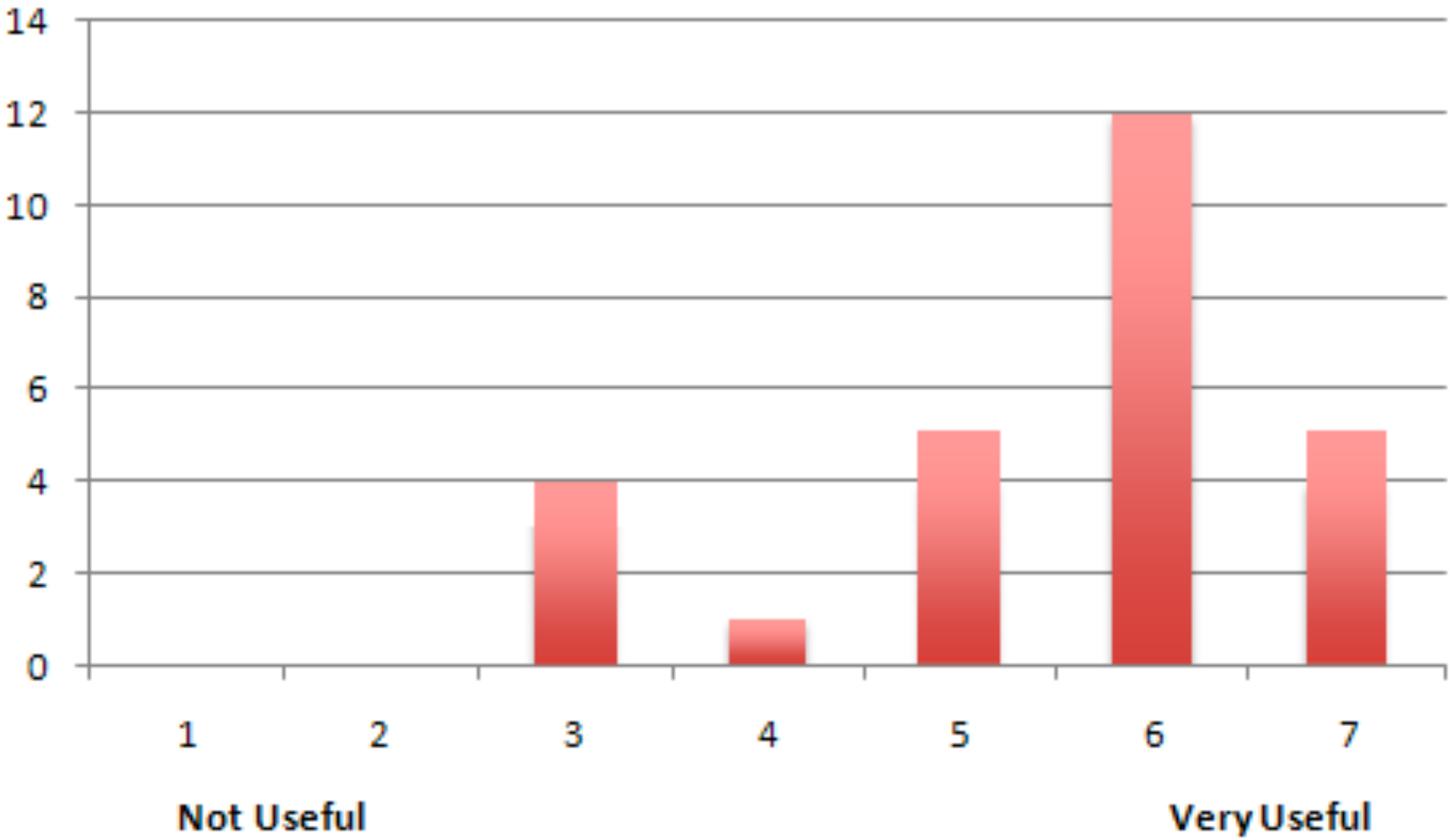
What caused problems?

Rule 7	You are working on an urgent project with Vannevar Bush and want to make sure to not miss new e-mails about it. Have Atomate alert you when you receive a new email from him containing the word “MEMEX” in the subject line.
Rule 8	Have Atomate automatically update your facebook status when you are at a concert.

perceived difficulty of creating rules



perceived usefulness



survey

what would you use atomate for?

(P4) Identifying when two locations converge (i.e. mine and a friends are close). This is like social networking, but moving it towards actual life. People could grant access to their friends to view their locations, and thus know if people are close at a given time.

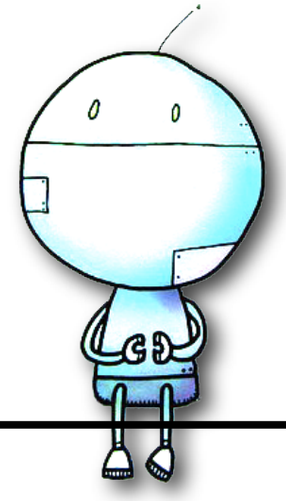
(P7) Reminding my friends and I that we have a shared event when we're both near each other. For example, I'm often meeting with someone and both of us want to go to the same event in an hour, but we get into a coding session and we forget about the event.

follow-ups and coordination

(P15) When I send email to someone and I want a response, I can tell atomate to send them a reminder email in 3 days if they haven't gotten back to me or something like that.

(P24) Emailing or responding to people when I am in transit or unavailable (no network connectivity or in an event where my phone's silenced)

4 related work



mashups and mashup-makers

Yahoo Pipes!, IBM Mashup Center,
Intel Mashmaker [R. Ennals]

end-user web customization tools

Chickenfoot [M. Bolin], Coscripter [G. Leshed]

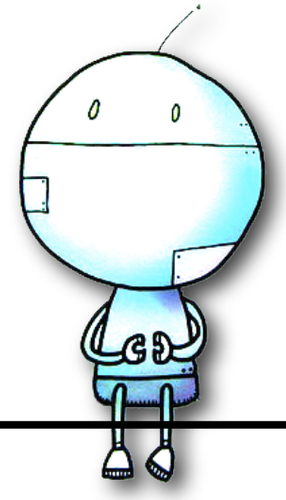
end-user reactive behavioral systems

iCAP [T. Sohn], CAMP [K. Truong], ReBA [A. Kulkharni]

constrained NL interfaces (CLNIs)

GINO/Ginseng [A. Bernstein], Sloppy [G. Little]

5 ongoing work

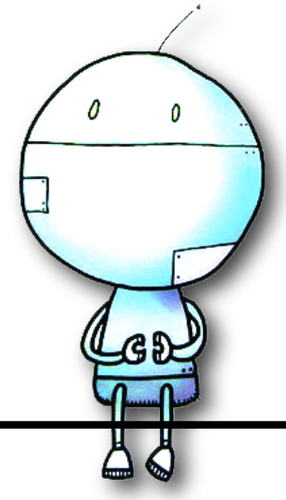


reducing errors in rule specification
rule authoring by “picking” from your lifelog

predictability/understandability
why’d it do that? what’ll it do next time?

taking into account variable feed quality (latency)
making actions end-user authorable

6 conclusions

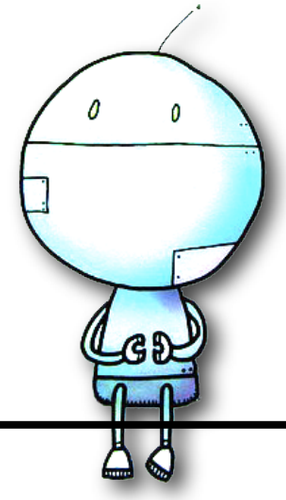


By treating web feeds as sensor streams for creating a simple, unified world model, we can start derive simple but useful reactive automation that helps regular users manage the deluge of information.

Plenty of challenges remain!
Reducing/eliminating errors in rule specification, predictability, improving efficiency of execution, etc.

Think beyond newsreaders and visual mashups when designing your Web APIs and data feeds

thanks!



try it!

For adventurers who use Firefox (3.6+):
http://atomate.me/pre-alpha

help us improve it ~

http://code.google.com/p/list-it [List-it/Atomate Framework]

acknowledgements ~

Web Science Trust, ECS, University of Southampton

contact me ~

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