Intro to Web Prolog for Erlangers

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Why Prolog? What can we do with Prolog that we cannot easily do with Erlang?

How about symbolic AI?

- Logic-based knowledge representation and reasoning
- Meta-interpreters for e.g. expert systems
- Parsing and generation with DCG — a unification-based grammar formalism
- Problem solving of various kinds — perhaps using CLP.
- ... and much more.

With Web Prolog, all this can be done in a concurrent and distributed manner – on the Web!

Pure Prolog is a subset of FOPL

```
p(X) :- q(X), r(X).

q(a).
q(b).  r(b).
q(c).  r(c).

?- p(X).
```

$$\forall x[q(x) \wedge r(x) \rightarrow p(x)]$$

$$q(a)$$
$$q(b) \quad r(b)$$
$$q(c) \quad r(c)$$

$$\vdash \exists x[p(x)]$$

Pure Prolog is a subset of FOPL

```
p(X) :- q(X), r(X).

q(a).
q(b).  r(b).
q(c).  r(c).

?- p(X).
X = b
```

$$\forall x[q(x) \wedge r(x) \rightarrow p(x)]$$

$$q(a)$$
$$q(b) \quad r(b)$$
$$q(c) \quad r(c)$$

$$\vdash \exists x[p(x)]$$

Pure Prolog is a subset of FOPL

```
p(X) :- q(X), r(X).

q(a).
q(b).  r(b).
q(c).  r(c).
```

$$\forall x[q(x) \wedge r(x) \rightarrow p(x)]$$

$$q(a)$$
$$q(b) \quad r(b)$$
$$q(c) \quad r(c)$$

```
?- p(X).
X = b ;
X = c.

?-
```

$$\vdash \exists x[p(x)]$$

Appending lists in pure Prolog

```
append([],L,L).
append([H|T],L2,[H|L3]) :-
    append(T,L2,L3).
```

```
?- append([a,b],[c,d],Xs).
Xs = [a,b,c,d].

?- append(Xs,Ys,[a,b,c]).
Xs = [], Ys = [a,b,c] ;
Xs = [a], Ys = [b,c] ;
Xs = [a,b], Ys = [c] ;
Xs = [a,b,c], Ys = [] ;
false.

?-
```

Problem solving: the n-queens puzzle

```
:- use_module(library(clpfd)).

queens(N, Queens) :-
    length(Queens, N),
    Queens ins 1..N,
    safe_queens(Queens),
    labeling([ff], Queens).

safe_queens([]).
safe_queens([Queen|Queens]) :-
    safe_queens(Queens, Queen, 1),
    safe_queens(Queens).

safe_queens([], _, _).
safe_queens([Queen|Queens], Queen0, D0) :-
    Queen0 #\= Queen,
    abs(Queen0 - Queen) #\= D0,
    D1 #= D0 + 1,
    safe_queens(Queens, Queen0, D1).
```

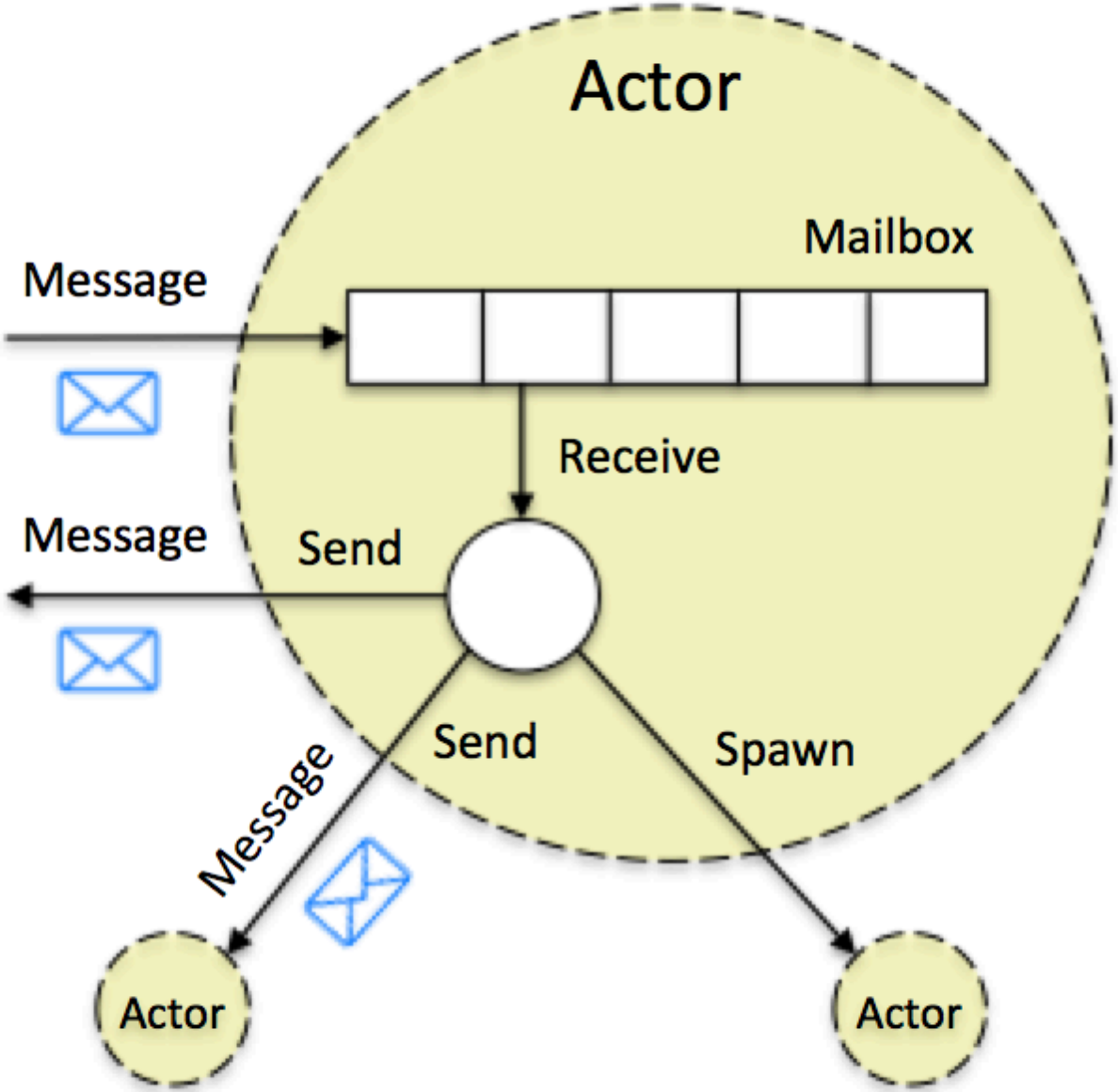
```
?- queens(8, Qs).
Qs = [1, 5, 8, 6, 3, 7, 2, 4] ;
Qs = [1, 6, 8, 3, 7, 4, 2, 5] ;
Qs = [1, 7, 4, 6, 8, 2, 5, 3] ;
Qs = [1, 7, 5, 8, 2, 4, 6, 3] ;
Qs = [2, 4, 6, 8, 3, 1, 7, 5] ;
Qs = [2, 5, 7, 1, 3, 8, 6, 4] ;
Qs = [2, 5, 7, 4, 1, 8, 6, 3] ;
Qs = [2, 6, 1, 7, 4, 8, 3, 5] ;
Qs = [2, 6, 8, 3, 1, 4, 7, 5] ;

. . .
```

```
?- queens(100, Qs).
Qs = [1, 3, 5, 57, 59, 4, 64, 7, 58, 71, 81, 60, 6, 91, 82,
90, 8, 83, 77, 65, 73, 26, 9, 45, 37, 63, 66, 62, 44, 10, 48,
54, 43, 69, 42, 47, 18, 11, 72, 68, 50, 56, 61, 36, 33, 17,
12, 51, 100, 93, 97, 88, 35, 84, 78, 19, 13, 99, 67, 76, 92,
75, 87, 96, 94, 85, 20, 14, 95, 32, 98, 55, 40, 80, 49, 52,
46, 53, 21, 15, 41, 2, 27, 34, 22, 70, 74, 29, 25, 30, 38,
86, 16, 79, 24, 39, 28, 23, 31, 89]
```

Parsing with DCG

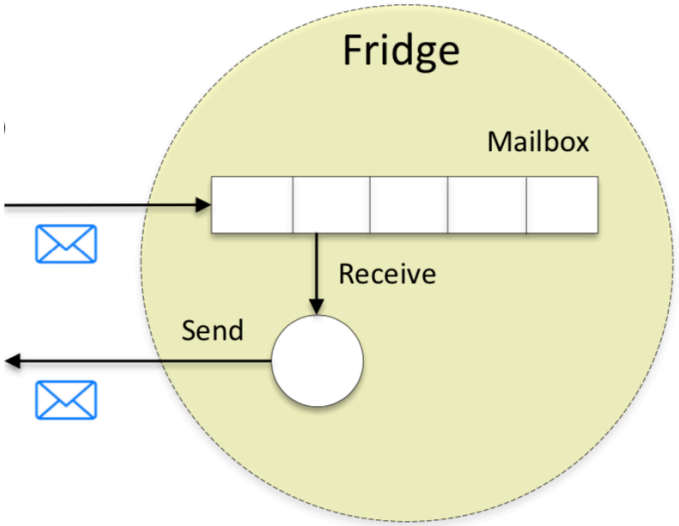
```
s(s(NP,VP)) --> np(NP, Num), vp(VP, Num).

np(NP, Num) --> pn(NP, Num).
np(np(Det,N), Num) --> det(Det, Num), n(N, Num).
np(np(Det,N,PP), Num) --> det(Det, Num), n(N, Num), pp(PP).

vp(vp(V,NP), Num) --> v(V, Num), np(NP, _).
vp(vp(V,NP,PP), Num) --> v(V, Num), np(NP, _), pp(PP).

pp(pp(P,NP)) --> p(P), np(NP, _).

det(det(a), sg) --> [a].

pn(pn(john), sg) --> [john].

n(n(man), sg) --> [man].
n(n(telescope), sg) --> [telescope].

v(v(saw), _) --> [saw].

p(p(with)) --> [with].


?- phrase(s(Tree), [john,saw,a,man,with,a,telescope]).
Tree = s(pn(john),vp(v(saw),np(det(a),n(man),pp(p(with),np(det(a),n(telescope)))))) ;
Tree = s(pn(john),vp(v(saw),np(det(a),n(man)),pp(p(with),np(det(a),n(telescope))))) ;
false.


?-
```

Algorithm = Logic + Control


Actor
Mailbox
Message
Receive
Message
Send
Send
Spawn
Message
Actor
Actor

Fred's fridge simulation example

```
fridge(FoodList0) :-
    receive({
        {From, {store, Food}} ->
            self(Self),
            From ! ok(Self),
            fridge([Food|FoodList0]);
        {From, {take, Food}} ->
            self(Self),
            (   select(Food, FoodList0, FoodList)
            ->  From ! ok(Self, Food),
                fridge(FoodList)
            ;   From ! not_found(Self),
                fridge(FoodList0)
            );
        terminate ->
            true
    }).
```



Inspired by Erlang example from "*Learn You Some Erlang for great good!" by Fred Hébert*

Fred's fridge simulation example

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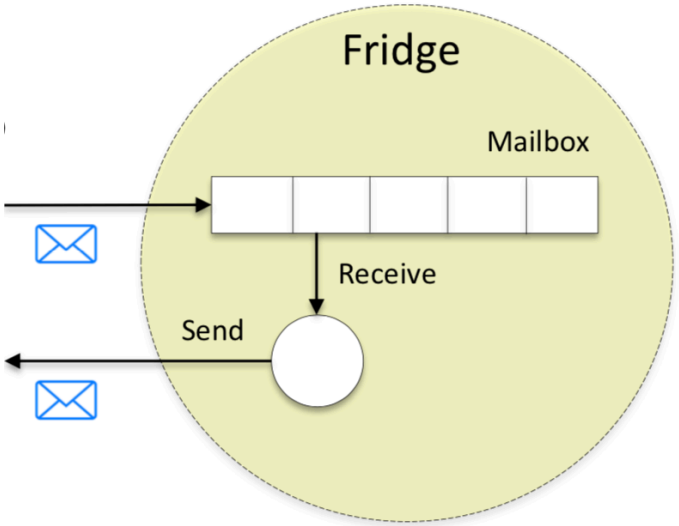
            ->  From ! ok(Self, Food),
                fridge(FoodList)
            ;   From ! not_found(Self),
                fridge(FoodList0)
            );
        terminate ->
            true
    }).
```



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        terminate ->
            true
    }).
```

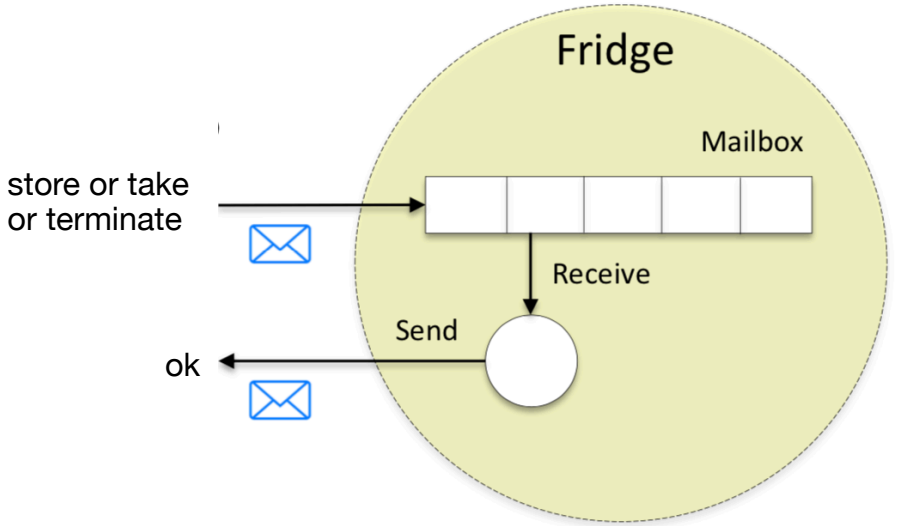

Inspired by Erlang example from "*Learn You Some Erlang for great good!*" by Fred Hébert

Reading the code was fun — I had to do a double take — was I reading Erlang or Prolog — they often look pretty much the same.

Joe Armstrong (p.c. June 18, 2018)

Fred's fridge simulation example

```
fridge(FoodList0) :-
    receive({
        store(From, Food) ->
            self(Self),
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        take(From, Food) ->
            self(Self),
            (   select(Food, FoodList0, FoodList)
            ->  From ! ok(Self, Food),
                fridge(FoodList)
            ;   From ! not_found(Self),
                fridge(FoodList0)
            );
        terminate ->
            true
    }).
```
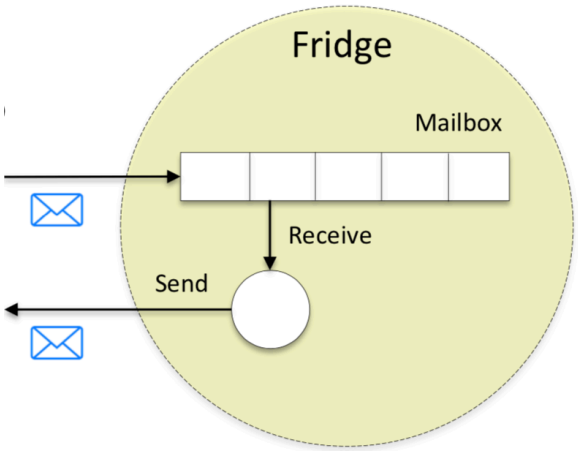

```
?- spawn(fridge([]), Pid, [
        node('http://fridge.org'),
        monitor(true)
   ]).
Pid = 6734313@'http://fridge.org'.

?-
```



Fred's fridge simulation example

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    receive({
        store(From, Food) ->
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            From ! ok(Self),
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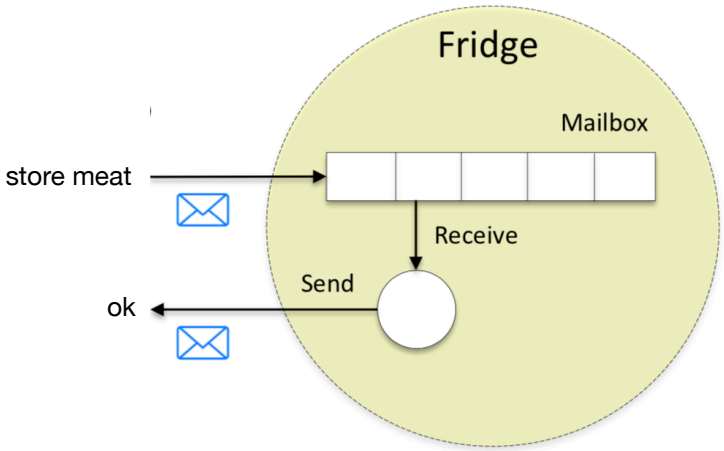
            ->  From ! ok(Self, Food),
                fridge(FoodList)
            ;   From ! not_found(Self),
                fridge(FoodList0)
            );
        terminate ->
            true
    }).
```

```
?- spawn(fridge([]), Pid, [
        node('http://fridge.org'),
        monitor(true)
   ]).
Pid = 6734313@'http://fridge.org'.

?- self(Me), $Pid ! store(Me, meat),
   $Pid ! store(Me, cheese).
Me = 9201673@'http://local.org'.

?-
```



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            ->  From ! ok(Self, Food),
                fridge(FoodList)
            ;   From ! not_found(Self),
                fridge(FoodList0)
            );
        terminate ->
            true
    }).
```
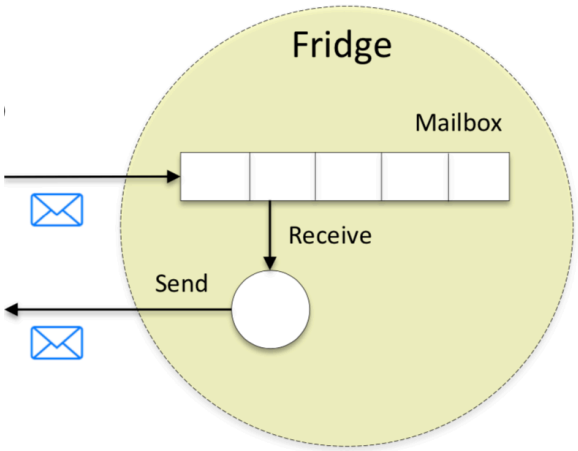

```
?- spawn(fridge([]), Pid, [
        node('http://fridge.org'),
        monitor(true)
   ]).
Pid = 6734313@'http://fridge.org'.

?- self(Me), $Pid ! store(Me, meat),
   $Pid ! store(Me, cheese).
Me = 9201673@'http://local.org'.

?- flush.
Shell got ok(6734313@'http://fridge.org')
Shell got ok(6734313@'http://fridge.org')
true.

?-
```



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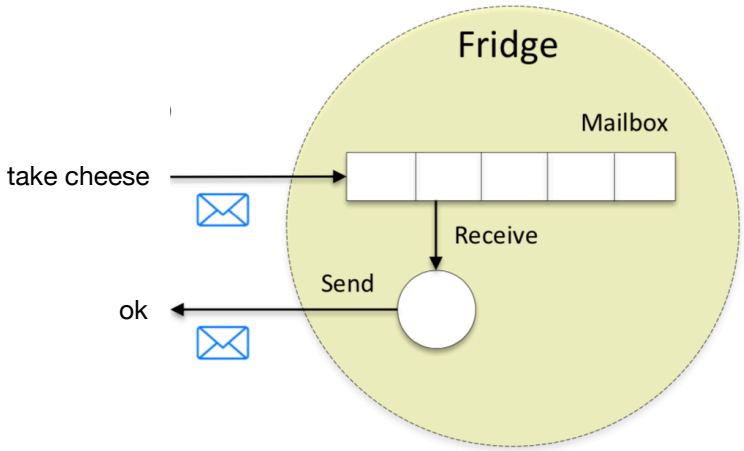
            ->  From ! ok(Self, Food),
                fridge(FoodList)
            ;   From ! not_found(Self),
                fridge(FoodList0)
            );
        terminate ->
            true
    }).
```

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        monitor(true)
   ]).
Pid = 6734313@'http://fridge.org'.

?- self(Me), $Pid ! store(Me, meat),
   $Pid ! store(Me, cheese).
Me = 9201673@'http://local.org'.

?- flush.
Shell got ok(6734313@'http://fridge.org')
Shell got ok(6734313@'http://fridge.org')
true.

?- $Pid ! take($Me, cheese).
true.

?- flush.
Shell got ok(6734313@'http://fridge.org',cheese)
true.

?-
```

Fred's fridge simulation example

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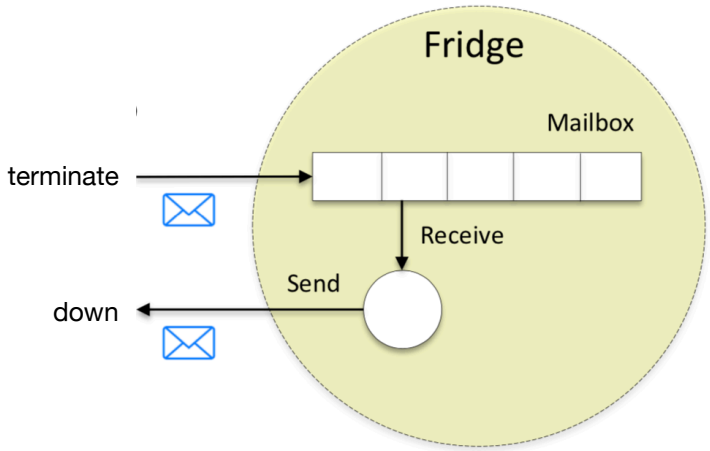
fridge(FoodList0) :-
    receive({
        store(From, Food) ->
            self(Self),
            From ! ok(Self),
            fridge([Food|FoodList0]);
        take(From, Food) ->
            self(Self),
            (   select(Food, FoodList0, FoodList)
            ->  From ! ok(Self, Food),
                fridge(FoodList)
            ;   From ! not_found(Self),
                fridge(FoodList0)
            );
        terminate ->
            true
    }).
```




```
?- spawn(fridge([]), Pid, [
        node('http://fridge.org'),
        monitor(true)
   ]).
Pid = 6734313@'http://fridge.org'.

?- self(Me), $Pid ! store(Me, meat),
   $Pid ! store(Me, cheese).
Me = 9201673@'http://local.org'.

?- flush.
Shell got ok(6734313@'http://fridge.org')
Shell got ok(6734313@'http://fridge.org')
true.

?- $Pid ! take($Me, cheese).
true.

?- flush.
Shell got ok(6734313@'http://fridge.org',cheese)
true.

?- $Pid ! terminate.
true.

?- flush.
Shell got down(6734313@'http://fridge.org',exit).
true.

?-
```

Ping-pong example

Erlang

```
-module(tut15).
-export([start/0, ping/2, pong/0]).

ping(0, Pong_Pid) ->
    Pong_Pid ! finished,
    io:format('Ping finished');
ping(N, Pong_Pid) ->
    Pong_Pid ! {ping, self()},
    receive
        pong ->
            io:format('Ping received pong')
    end,
    ping(N - 1, Pong_Pid).

pong() ->
    receive
        finished ->
            io:format('Pong finished');
        {ping, Ping_Pid} ->
            io:format('Pong received ping'),
            Ping_Pid ! pong,
            pong()
    end.

start() ->
    Pong_Pid = spawn(tut15, pong, []),
    spawn(tut15, ping, [3, Pong_Pid]).
```

Web Prolog

```
ping(0, Pong_Pid) :-
    Pong_Pid ! finished,
    io:format('Ping finished').
ping(N, Pong_Pid) :-
    self(Self),
    Pong_Pid ! ping(Self),
    receive({
        pong ->
            io:format('Ping received pong')
    }),
    N1 is N - 1,
    ping(N1, Pong_Pid).

pong :-
    receive({
        finished ->
            io:format('Pong finished’);
        ping(Ping_Pid) ->
            io:format('Pong received ping'),
            Ping_Pid ! pong,
            pong
    }).

start :-
    spawn(pong, Pong_Pid, [
        % node(‘http://ex.org'),
        src_predicates([pong/0])
    ]),
    spawn(ping(3, Pong_Pid), _, [
        src_predicates([ping/2])
    ]).
```

Ping-pong example

Erlang

```
-module(tut15).
-export([start/0, ping/2, pong/0]).

ping(0, Pong_Pid) ->
    Pong_Pid ! finished,
    io:format("ping finished");
ping(N, Pong_Pid) ->
    Pong_Pid ! {ping, self()},
    receive
        pong ->
            io:format("Ping received pong")
    end,
    ping(N - 1, Pong_Pid).

pong() ->
    receive
        finished ->
            io:format("Pong finished");
        {ping, Ping_Pid} ->
            io:format("Pong received ping"),
            Ping_Pid ! pong,
            pong()
    end.

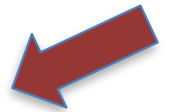
start() ->
    Pong_Pid = spawn(tut15, pong, []),
    spawn(tut15, ping, [3, Pong_Pid]).
```

Web Prolog

```
ping(0, Pong_Pid) :-
    Pong_Pid ! finished,
    io:format('Ping finished').
ping(N, Pong_Pid) :-
    self(Self),
    Pong_Pid ! ping(Self),
    receive({
        pong ->
            io:format('Ping received pong')
    }),
    N1 is N - 1,
    ping(N1, Pong_Pid).

pong :-
    receive({
        finished ->
            io:format('Pong finished’);
        ping(Ping_Pid) ->
            io:format('Pong received ping'),
            Ping_Pid ! pong,
            pong
    }).

start :-
    spawn(pong, Pong_Pid, [
        node(‘http://remote.org’),
        src_predicates([pong/0])
    ]),
    spawn(ping(3, Pong_Pid), _, [
        src_predicates([ping/2])
    ]).
```



Handling non-determinism

```
?- self(Self),
   spawn(( p(X),
           Self ! X,
           receive({
               next -> fail;
               stop -> Self ! stopped
           })
         ), Pid).
Pid = 1035231,
Self = 3122459@'http://local.org'.

?-
```

```
% Program loaded


p(a).
p(b).
p(c).
```

Handling non-determinism

```
?- self(Self),
   spawn(( p(X),
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               next -> fail;
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           })
         ), Pid).
Pid = 1035231,
Self = 3122459@'http://local.org'.

?- flush.
Shell got a
true.

?-
```

```
% Program loaded


p(a).
p(b).
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Handling non-determinism

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Pid = 1035231,
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?- flush.
Shell got a
true.

?- $Pid ! next.
true.

?-
```

```
% Program loaded


p(a).
p(b).
p(c).
```

Handling non-determinism

```
?- self(Self),
   spawn(( p(X),
           Self ! X,
           receive({
               next -> fail;
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           })
         ), Pid).
Pid = 1035231,
Self = 3122459@'http://local.org'.

?- flush.
Shell got a
true.

?- $Pid ! next.
true.

?- flush.
Shell got b
true.

?-
```

```
% Program loaded


p(a).
p(b).
p(c).
```

Handling non-determinism

```
?- self(Self),
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Pid = 1035231,
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?- flush.
Shell got a
true.

?- $Pid ! next.
true.

?- flush.
Shell got b
true.

?- $Pid ! stop,
   receive({Message -> true}).
Message = stopped.

?-
```

```
% Program loaded


p(a).
p(b).
p(c).
```

Handling non-determinism

```
?- self(Self),
   spawn(( p(X),
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               next -> fail;
               stop -> Self ! stopped
           })
         ), Pid).
Pid = 1035231,
Self = 3122459@'http://local.org'.

?- flush.
Shell got a
true.

?- $Pid ! next.
true.

?- flush.
Shell got b
true.

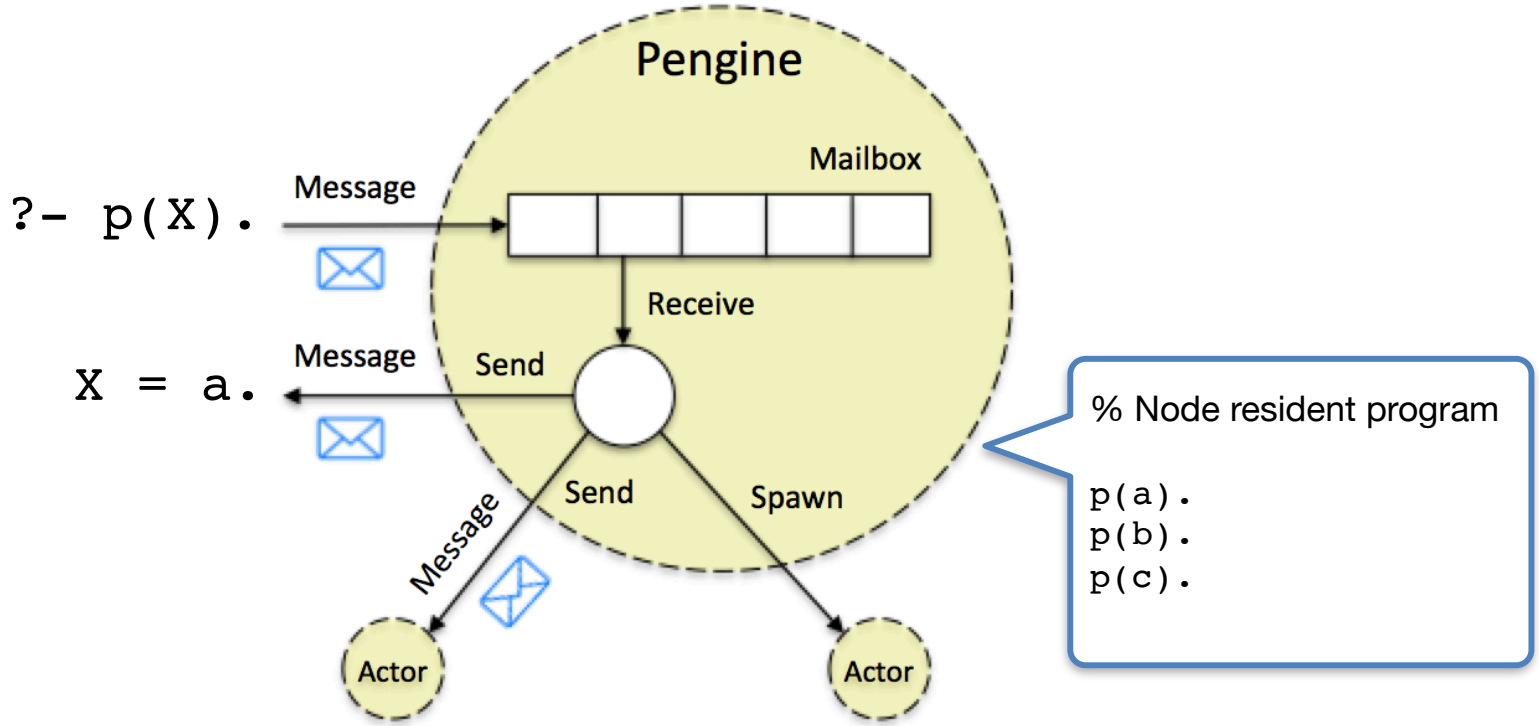
?- $Pid ! stop,
   receive({Message -> true}).
Message = stopped.

?-
```

`receive/1-2` is **semi-deterministic** (i.e. either fails or succeeds exactly once), so calling `fail/0` here causes it to fail and triggers backtracking

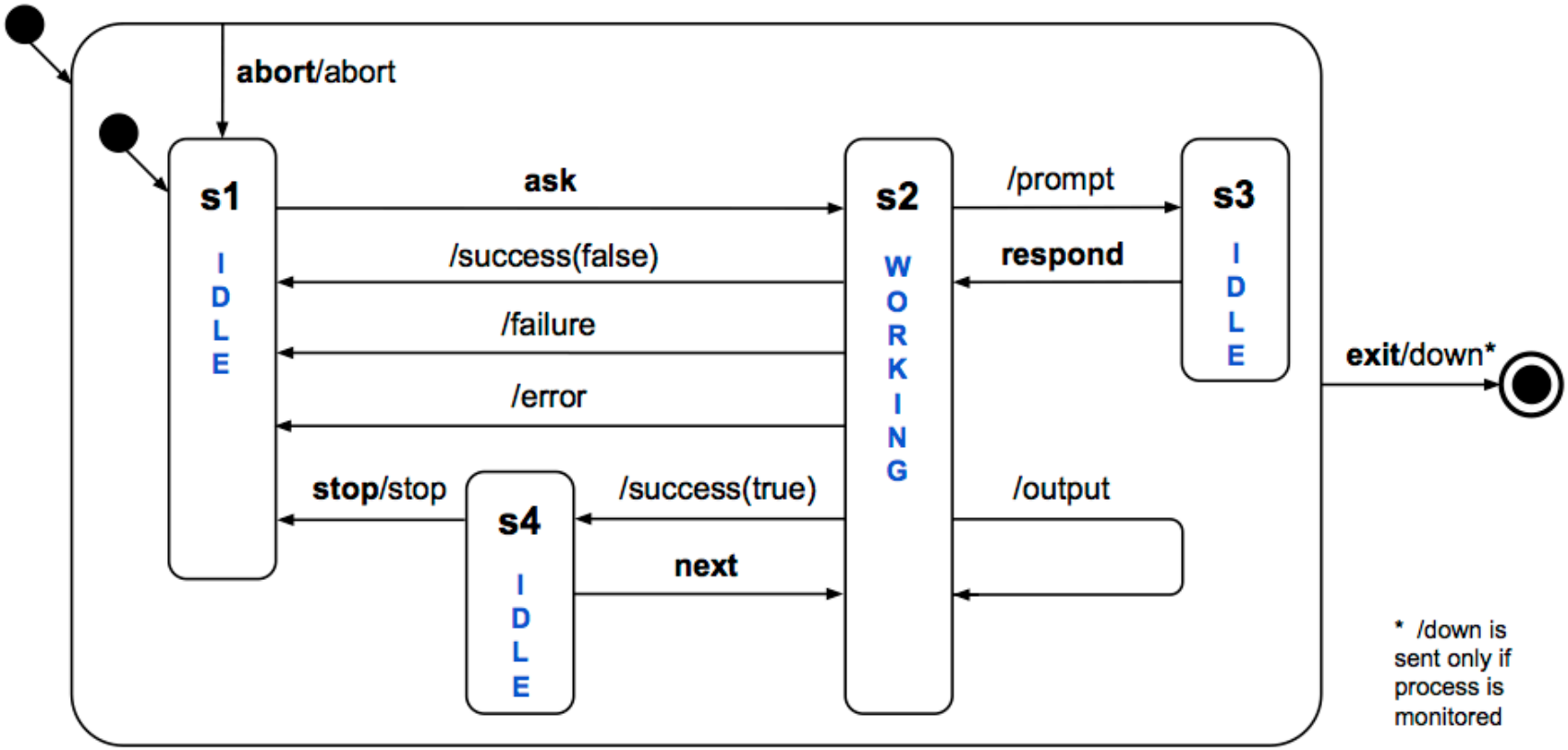
The pengine (Prolog engine)

- A pengine sends back answers, or other forms of messages, to a parent asking queries or issuing commands.



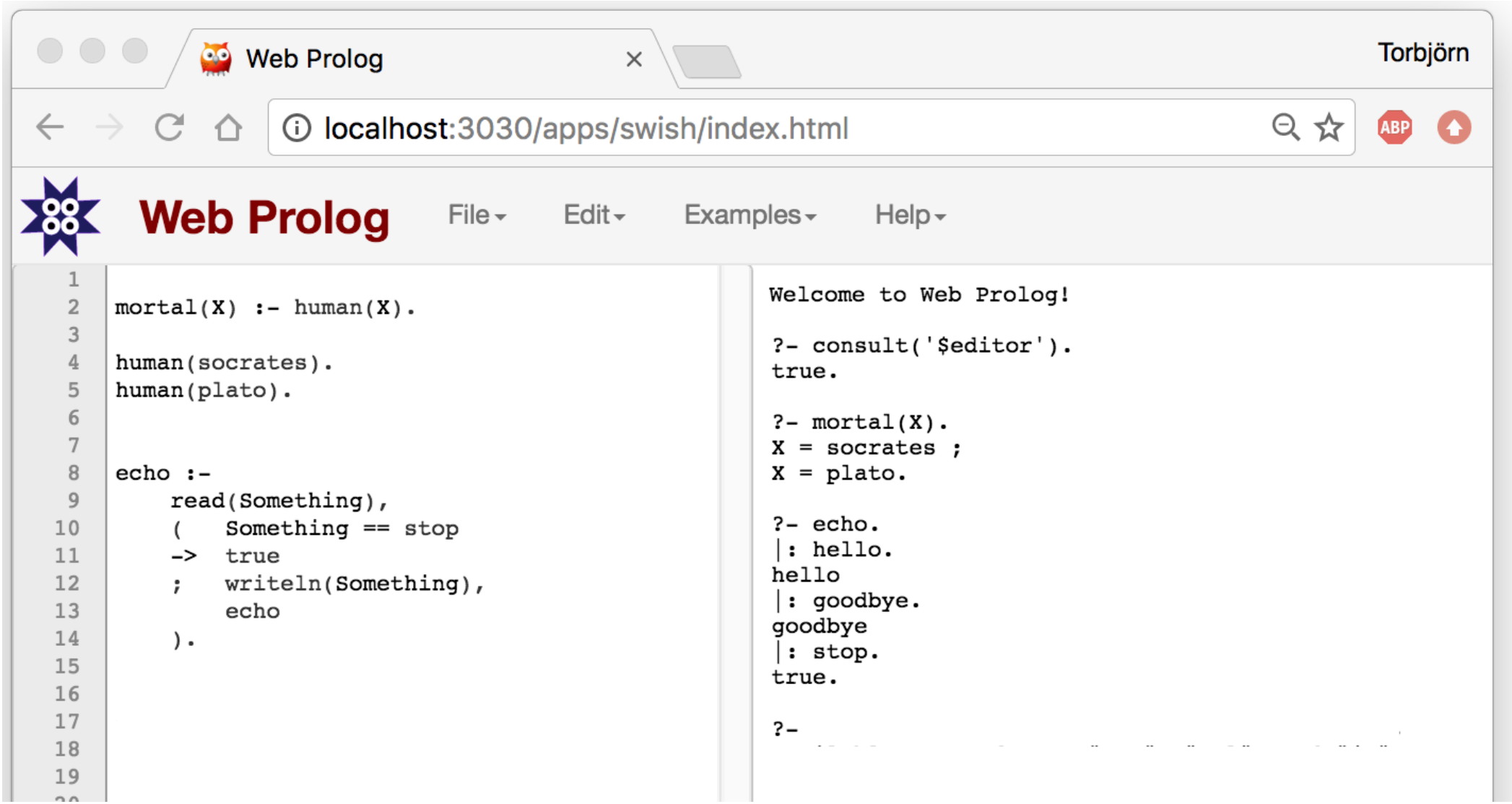
The Pengine Communication Protocol

- A pengine is special *kind* of actor, characterised by its protocol – the Pengine Communication Protocol (PCP)



The proof-of-concept IDE

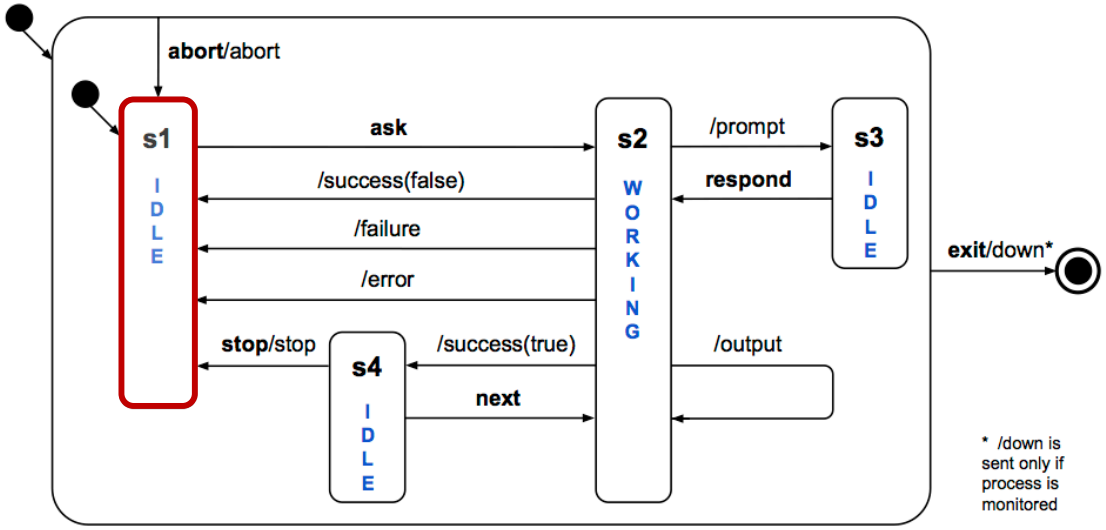
See `https://github.com/Web-Prolog`



Working with pengines

```
?- pengine_spawn(Pid, [
        node('http://remote.org'),
        monitor(true)
    ]).
Pid = 752872@'http://remote.org'.

?-
```

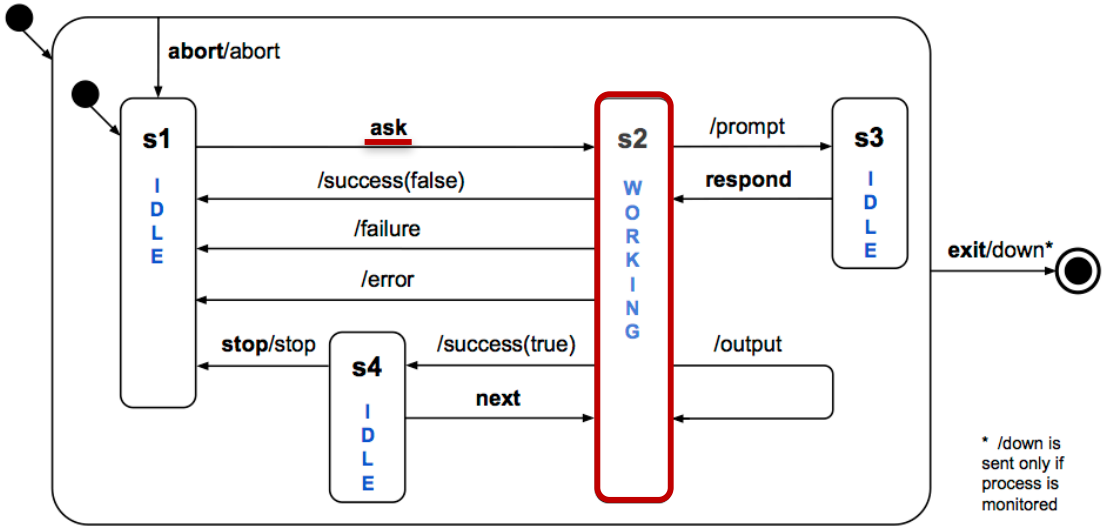


Working with pengines

```
?- pengine_spawn(Pid, [
       node('http://remote.org'),
       monitor(true)
   ]).
Pid = 752872@'http://remote.org'.

?- pengine_ask($Pid, p(X), [
       template(X)
   ]).
true.

?-
```



Working with pengines

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        node('http://remote.org'),
        monitor(true)
    ]).
Pid = 752872@'http://remote.org'.

?- pengine_ask($Pid, p(X), [
        template(X)
    ]).
true.

?- flush.
Shell got success(752872@'http://remote.org',[a], true)
true.

?-
```

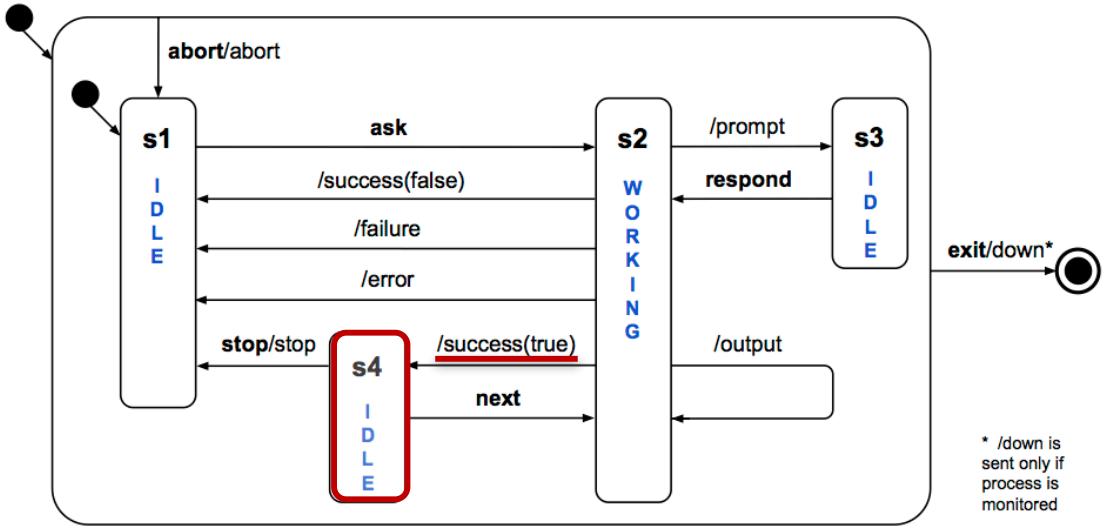

Working with pengines

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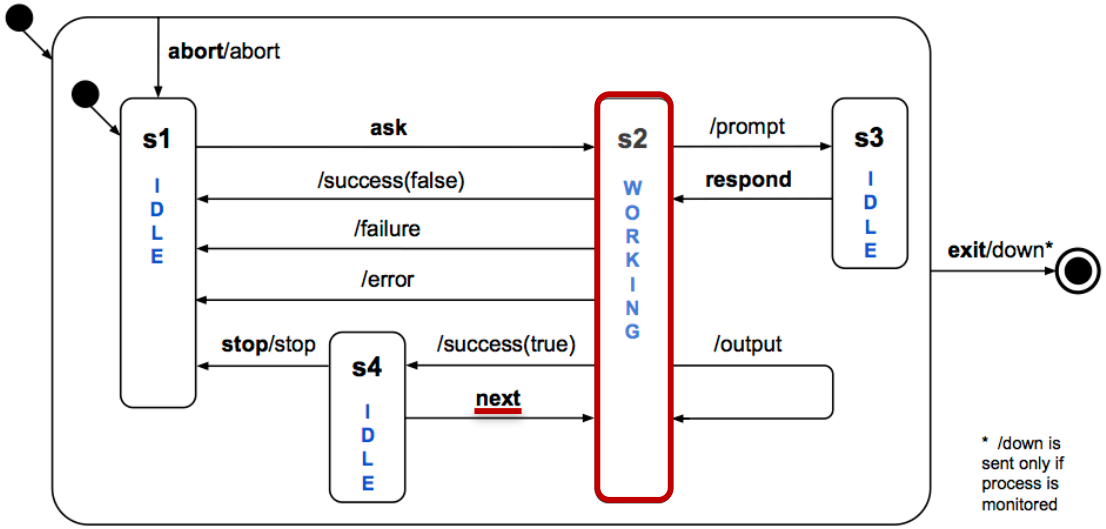
        node('http://remote.org'),
        monitor(true)
    ]).
Pid = 752872@'http://remote.org'.

?- pengine_ask($Pid, p(X), [
        template(X)
    ]).
true.

?- flush.
Shell got success(752872@'http://remote.org',[a], true)
true.

?- pengine_next($Pid, [
        limit(10)
    ]).
true.

?-
```



Working with pengines

```
?- pengine_spawn(Pid, [
       node('http://remote.org'),
       monitor(true)
   ]).
Pid = 752872@'http://remote.org'.

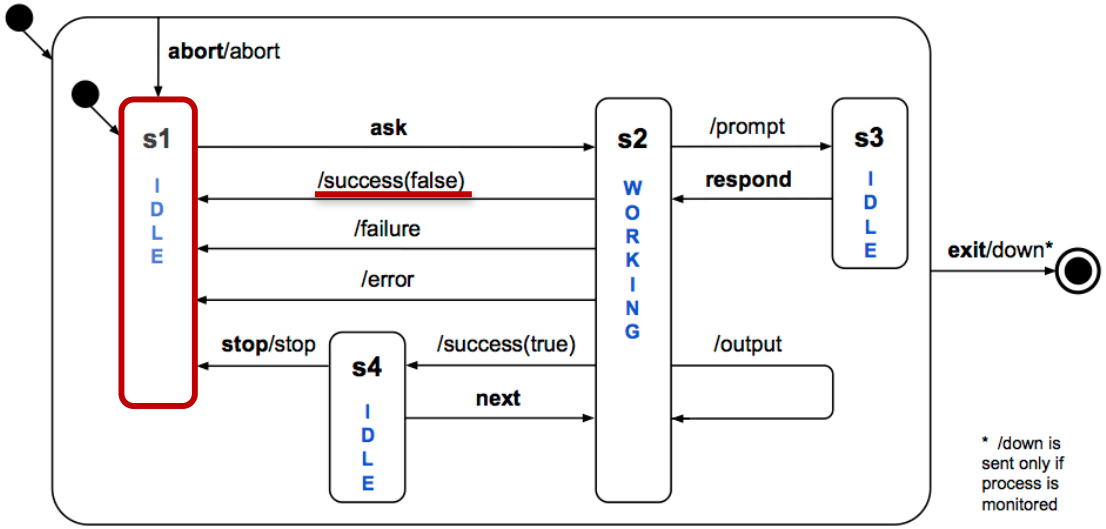
?- pengine_ask($Pid, p(X), [
       template(X)
   ]).
true.

?- flush.
Shell got success(752872@'http://remote.org',[a], true)
true.

?- pengine_next($Pid, [
       limit(10)
   ]).
true.

?- flush.
Shell got success(752872@'http://remote.org',[b,c], false)
true.

?-
```



Working with pengines

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?- pengine_spawn(Pid, [
       node('http://remote.org'),
       monitor(true)
   ]).
Pid = 752872@'http://remote.org'.

?- pengine_ask($Pid, p(X), [
       template(X)
   ]).
true.

?- flush.
Shell got success(752872@'http://remote.org',[a], true)
true.

?- pengine_next($Pid, [
       limit(10)
   ]).
true.

?- flush.
Shell got success(752872@'http://remote.org',[b,c], false)
true.

?- exit($Pid, goodbye).
true.

?- flush.
Shell got down(752872@'http://remote.org', goodbye)
true.
```
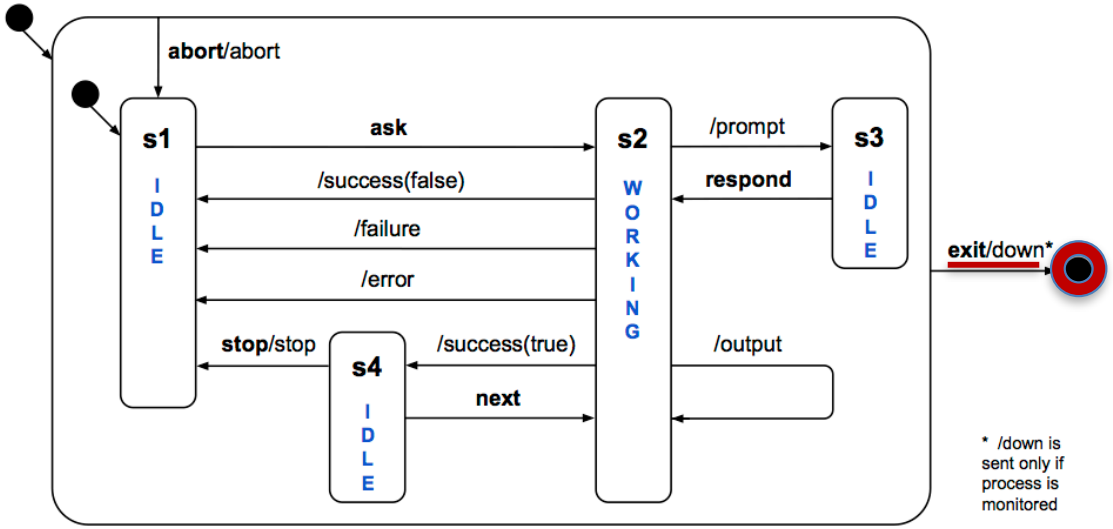



Non-deterministic RPC (NDRPC)

- The `rpc/2-3` predicate allows a process running in a node A to call and try to solve a query in the Prolog context of another node B, taking advantage of the data and programs being offered by B, just as if they were local to A.

- Very simple - no concurrency involved.

Exemplifying NDRPC

```
?- rpc('http://remote.org', p(X)).
X = a ;
X = b ;
X = c.
```

Has to make three network round trips

```
?- rpc('http://remote.org', p(X), [
        limit(10)
   ]).
X = a ;
X = b ;
X = c.
```

Needs only one network round trip

```
?- rpc('http://remote.org', (p(X),q(X)), [
        src_text("q(a). q(b).")
   ]).
X = a ;
X = b.
```

Inject code

```
?- rpc(localnode, p(X), [
        src_uri('http://remote.org/src')
   ]).
X = a ;
X = b ;
X = c.
```

Runs locally, with code fetched from a URI. (Needs only one network round trip)

How is NDRPC implemented?

```
rpc(URI, Query, Options) :-
    pengine_spawn(Pid, [
         node(URI),
         exit(true),
         monitor(false)
       | Options
    ]),
    pengine_ask(Pid, Query, Options),
    wait_answer(Query, Pid).

wait_answer(Query, Pid) :-
    receive({
        failure(Pid) -> fail;
        error(Pid, Exception) ->
            throw(Exception);
        success(Pid, Solutions, true) ->
            (   member(Query, Solutions)
            ;   pengine_next(Pid),
                wait_answer(Query, Pid)
            );
        success(Pid, Solutions, false) ->
            member(Query, Solutions)
    }).
```

Programming abstractions

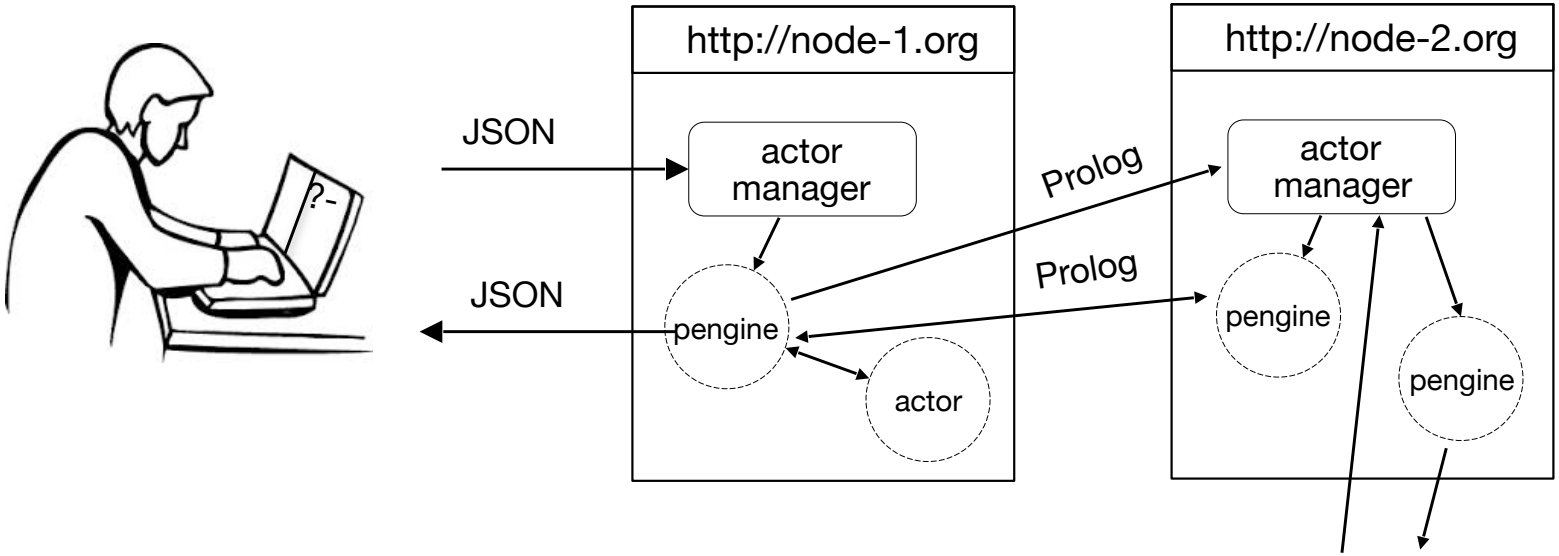
- Actors — the loci of computation in Web Prolog
- Pengines — actors adhering to the PCP protocol
- Non-deterministic remote procedure calls (NDRPC)

They are all related!

Communicating Prolog engines is a great idea — this is more or less what Erlang started as — but I didn't like the idea of backtracking over nodes.

Joe Armstrong (p.c. June 16, 2018)

In conversation with the Prolog Web

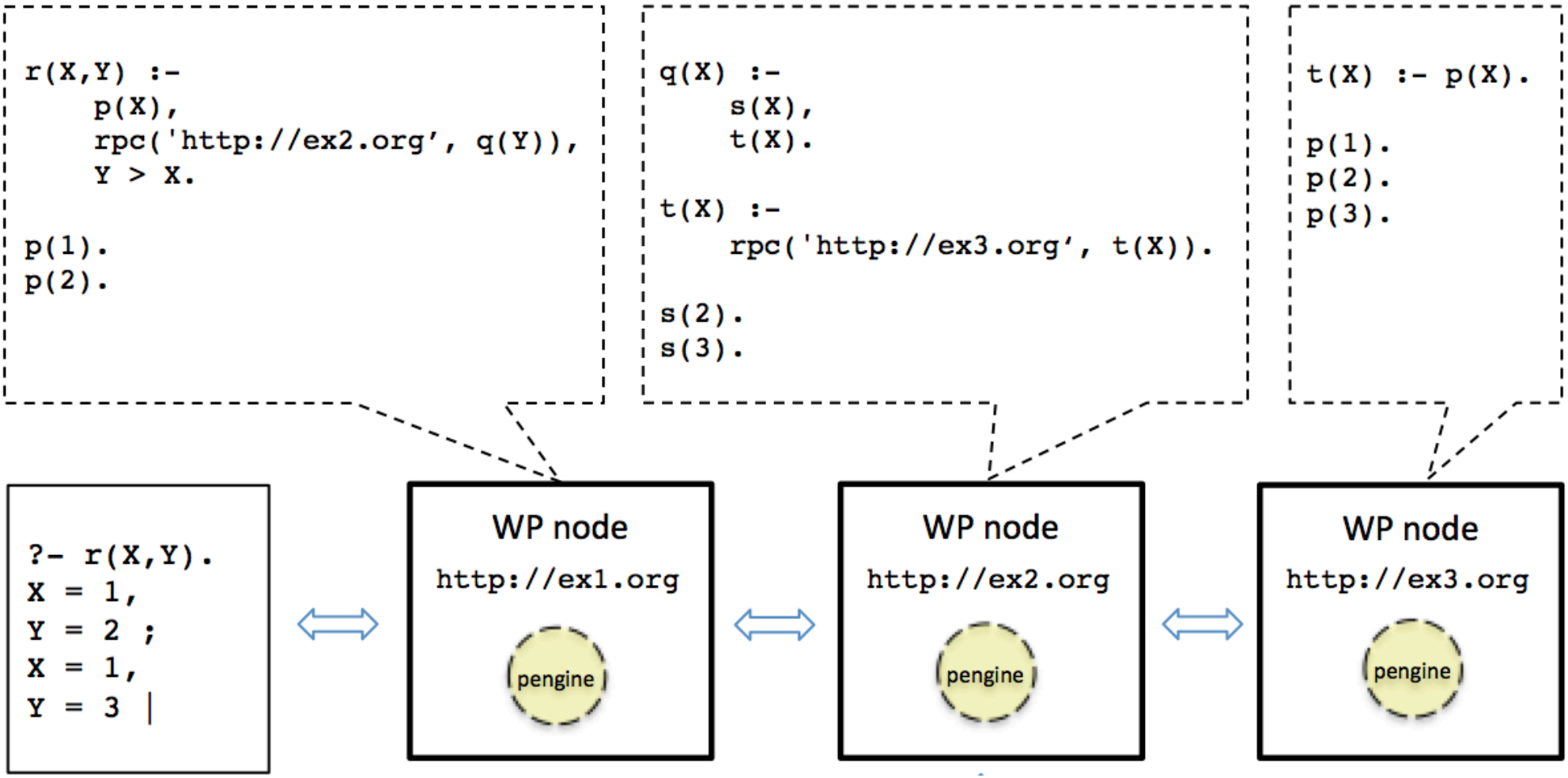



```
$ curl http://node-2.org/api?query=q(X)&offset=1&limit=10&format=json
{ "type":"success",
  "data”:[{"X":3},{"X”:8}],
  "more":false
}
```

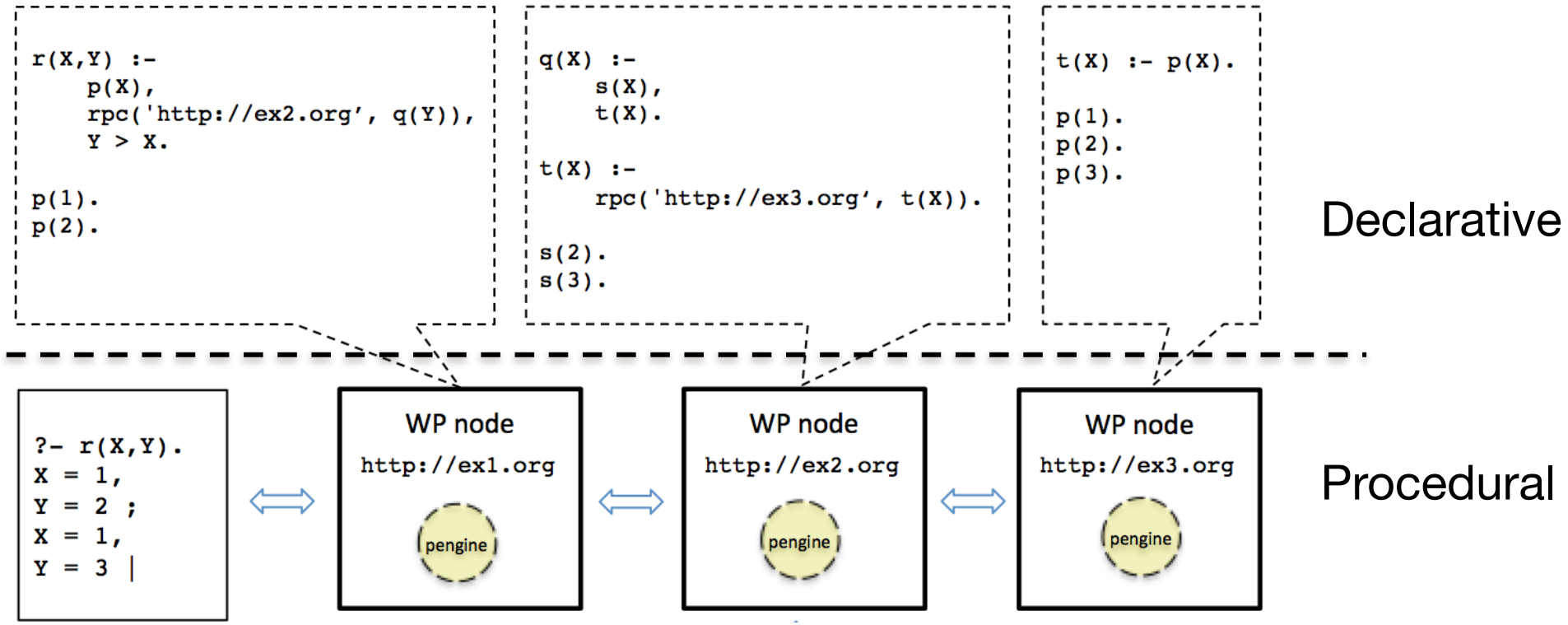
Using the stateless HTTP API

```
GET http://remote.org/ask?query=append(Xs,Ys,[a,b,c])&limit=2
{ "type":"success",
  "pid":"anonymous",
  "data":[{"Xs":[], "Ys":["a","b","c"]},{"Xs":["a"], "Ys":["b","c"]}],
  "more":true
}

GET http://remote.org/ask?query=append(Xs,Ys,[a,b,c])&offset=2&limit=2
{ "type":"success",
  "pid":"anonymous",
  "data":[{"Xs":["a","b"], "Ys":["c"]},{"Xs":["a","b","c"], "Ys":[]}],
  "more":false
}
```

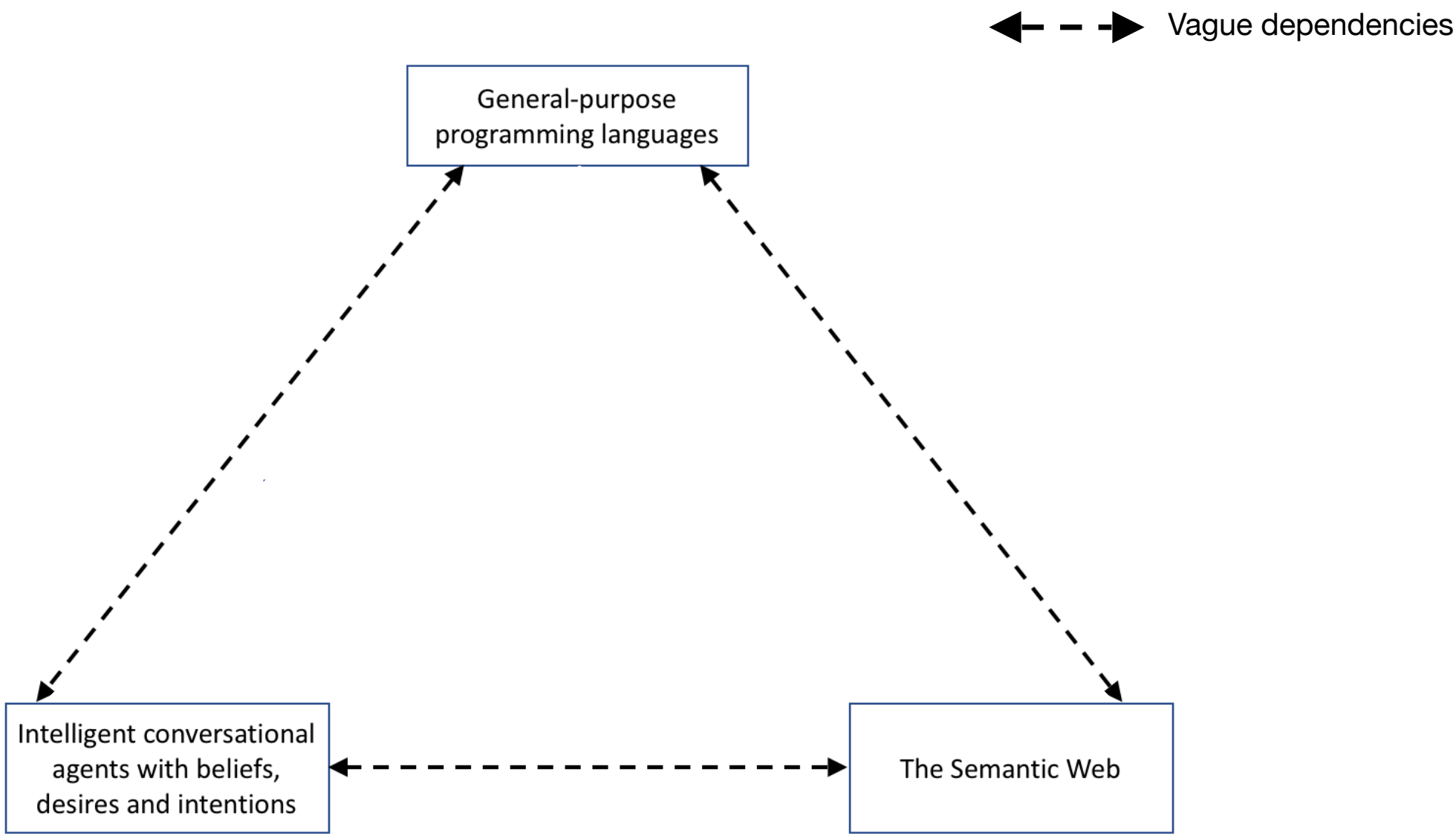
Querying the *pure* Prolog Web



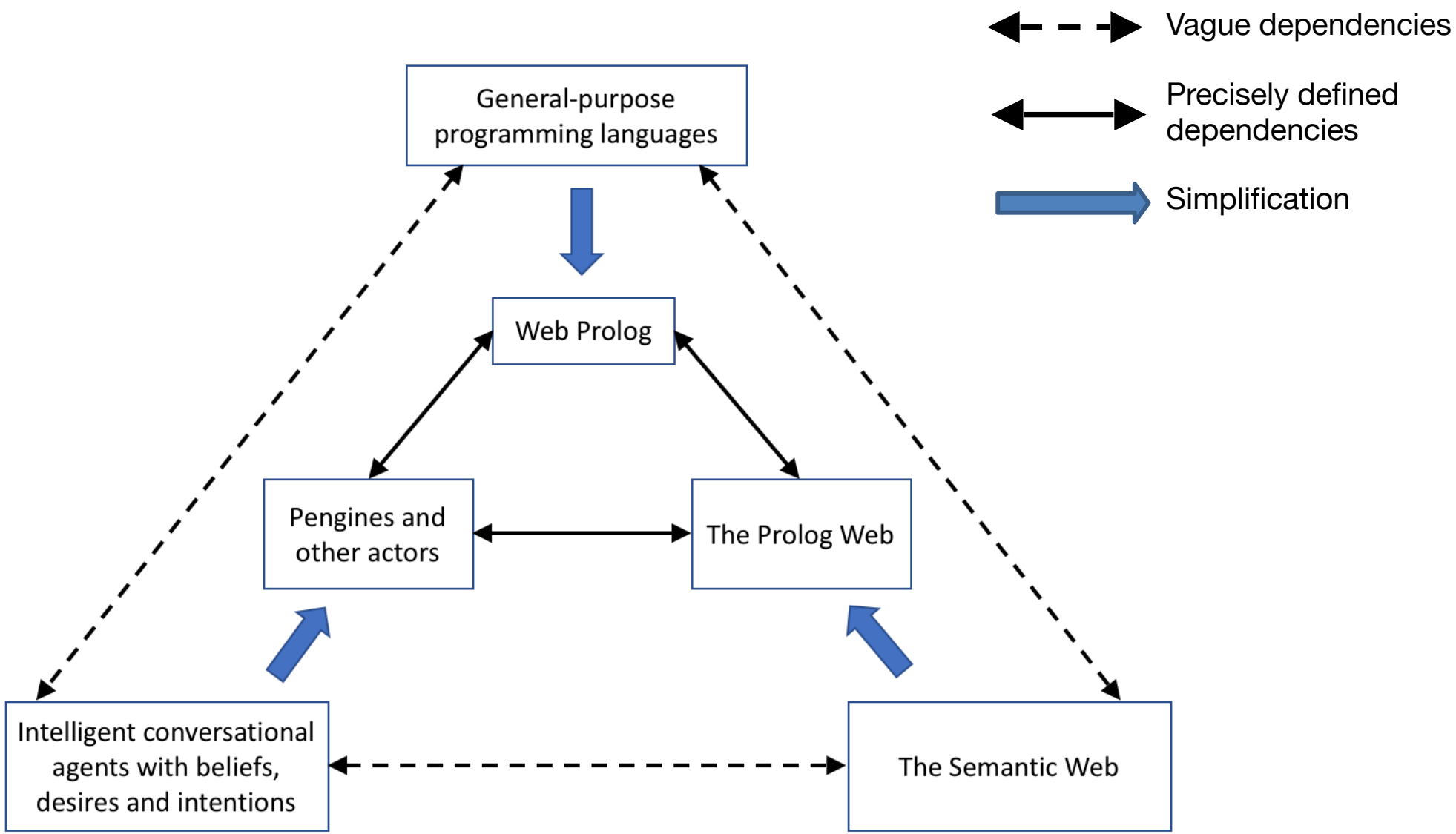
Two levels of abstraction



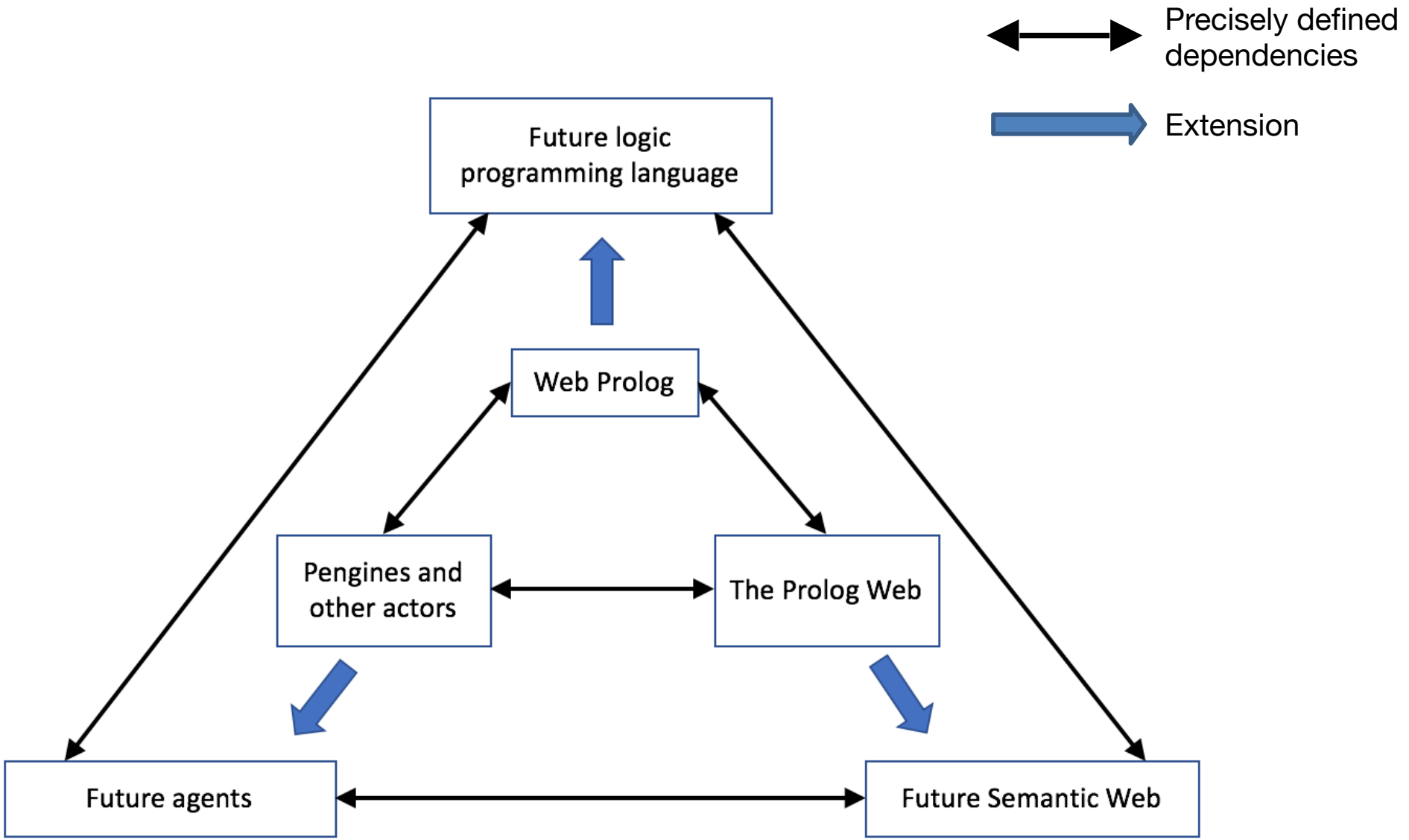
The big picture



The big picture



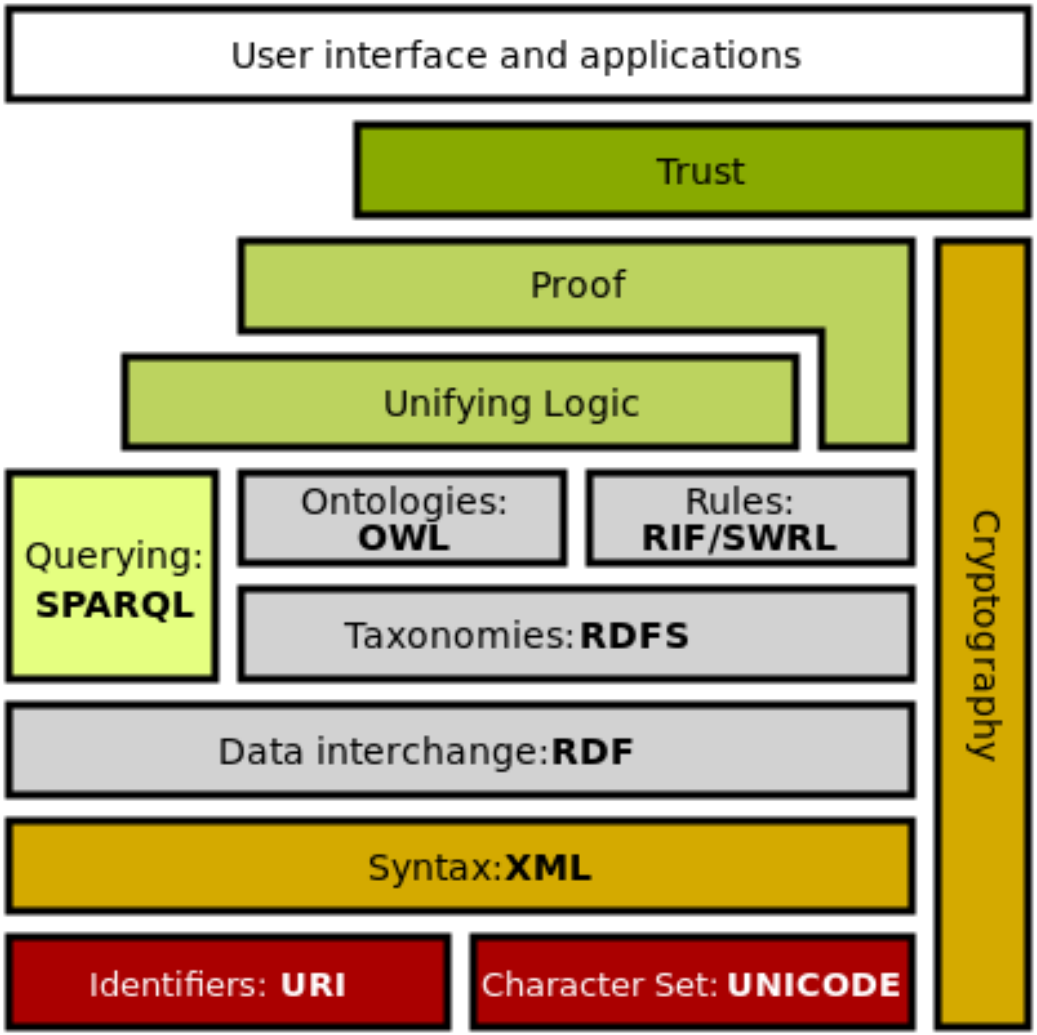
The big picture in a potential future



Web Prolog “killer application” areas

- Semantic web programming
- Agents - intelligent conversational agents in particular

Compare with the Semantic Web



Comparing with the Semantic Web

The Prolog Web

- Same language for knowledge representation and querying
- Web Prolog is a programming language
- The Prolog Web comes with an architecture

The Semantic Web

- Different languages for knowledge representation and querying
- Semantic Web languages are not programming languages
- The Semantic Web doesn't come with an architecture

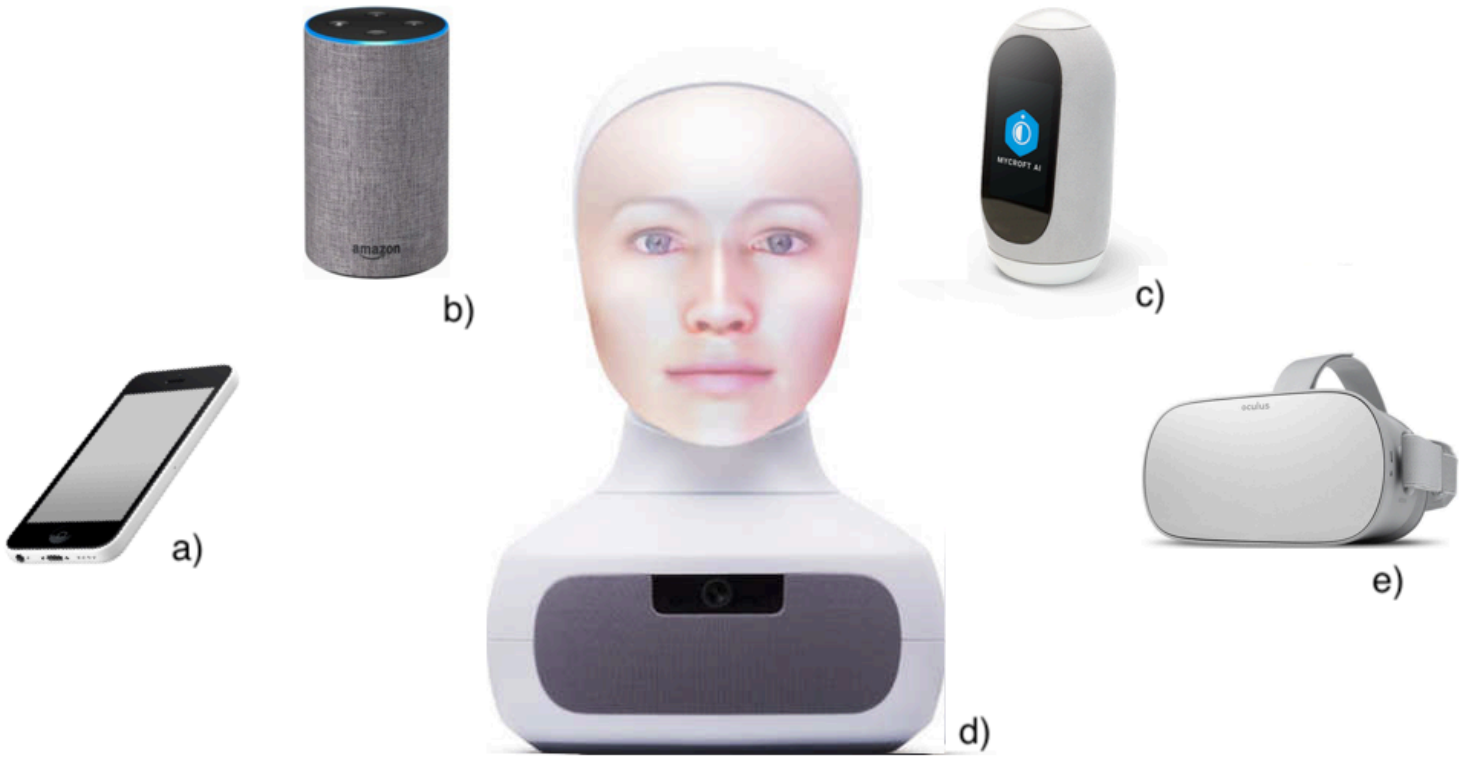
Towards a Semantic Web logic programming language

- Wielemaker et al. 2016 - Cliopatria: A prolog infrastructure for the semantic web:

  > “We do not consider SPARQL adequate for creating rich semantic web applications. SPARQL often needs additional application logic that is located near the data to provide a task-specific API that drives the user interface. Locating this logic near the data is required to avoid protocol and latency overhead. *RDF-based application logic is a perfect match for Prolog and the RDF data is much easier queried through the Prolog RDF libraries than through SPARQL.*”

- Avoids impedance mismatch

Intelligent conversational agents



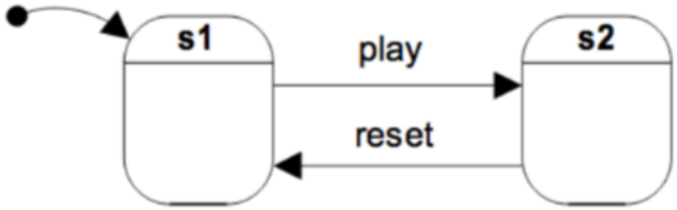
They seem to need **knowledge representation** and **reasoning, natural language processing** as well as **means for fine-grained real-time interaction** …

Algorithm = Logic + Control

Intelligent conversation =

Logic + Even more control

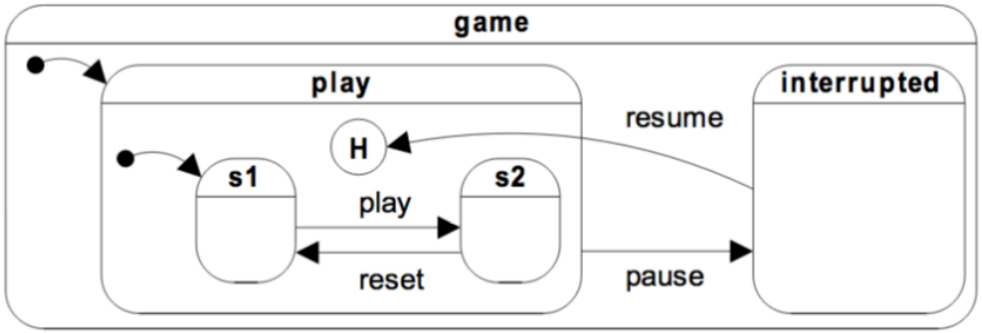
Running a statechart actor



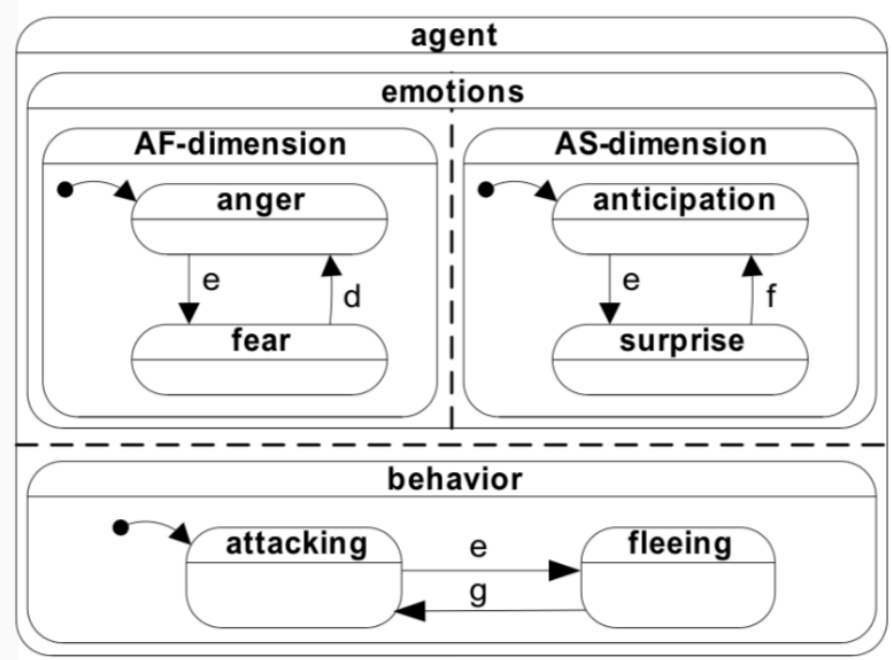

```
<scxml datamodel="web-prolog" initial="s1">
    <state id="s1">
        <onentry>return('IDLE')</onentry>
        <transition event="play" target="s2"/>
    </state>
    <state id="s2">
       <onentry>return('PLAYING')</onentry>
       <transition event="reset" target="s1"/>
    </state>
</scxml>
```

```
?- spawn(run([]), Pid, [
       type(scxml),
       src_uri('http://src.org/game.scxml'),
       monitor(true)
   ]).
Pid = 341293.

?- flush.
Shell got 'IDLE'
true.

?- $Pid ! play.
true.

?- receive({What -> true}).
What = 'PLAYING.

?- $Pid ! reset.
true.

?- receive({What -> true}).
What = ‘IDLE’.
?-
```

Hierarchy and parallelism




```
<scxml datamodel="web-prolog" initial="play">
    <state id="play" initial="s1">
        <history id="h">
            <transition target="s1"/>
        </history>
        <state id="s1">
            <transition event="play" target="s2"/>
        </state>
        <state id="s2">
            <transition event="reset" target="s1"/>
        </state>
        <transition event="pause" target="interrupted"/>
    </state>
    <state id="interrupted">
        <transition event="resume" target="h"/>
    </state>
</scxml>
```




```
<scxml datamodel="web-prolog" initial="agent">
    <parallel id="agent">
        <parallel id="emotions">
            <state id="AF-dimension">
                <state id="anger">
                    <transition event="e" target="fea
                </state>
                <state id="fear">
                    <transition event="d" target="ang
                </state>
            </state>
            <state id="AS-dimension">
```

Collaboration?

Things we have in common

- Actor-based programming
- A lot of syntax and programming patterns
- Some of the technology behind the BEAM

WAM, JAM, BAM and BEAM

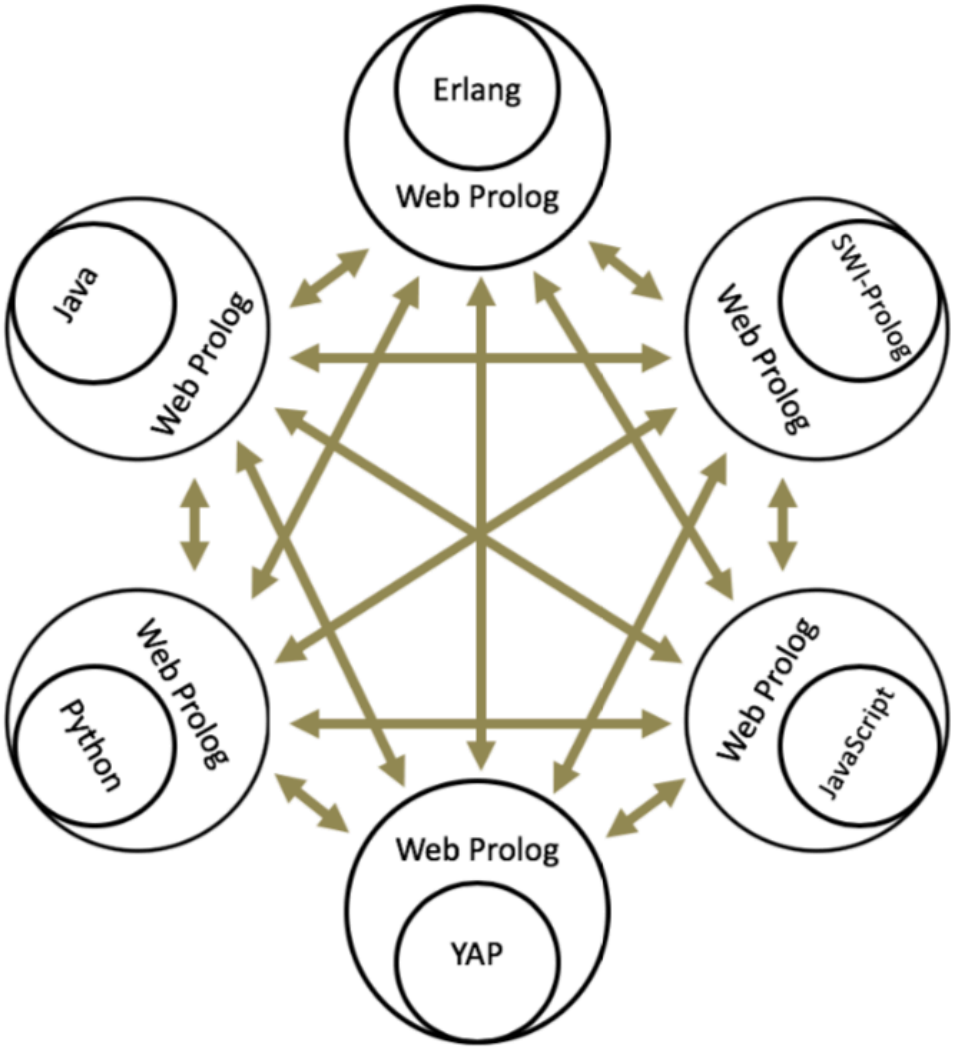
- **The paper:** The holy grail for a Web Prolog runtime system is a compiler targeting a *virtual machine with BEAM-like properties*, capable of producing code which when run will create processes as small and efficient as Erlang processes, yet with the useful capabilities that Prolog offers. *We do not dare to guess whether building such a virtual machine is feasible.*

- **Richard O'Keefe:** I do! It is!

  Let's face it, processes in Logix were *tiny* compared with Erlang ones. And the BEAM was a reaction to JAM, which was inspired by the WAM, and Aquarius Prolog used the BAM which had some similarities to BEAM.

Standardisation of Web Prolog

Web Prolog as a *lingua franca*



A proposal for the Prolog and Erlang communities

2022

Celebrate Prolog's 50th anniversary in 2022 —
Marry Prolog with Erlang and spawn Web Prolog!

A proposal for the Prolog and Erlang communities

2022

Celebrate Prolog's 50th anniversary in 2022 —
Marry Prolog with Erlang and spawn Web Prolog!

Joe Armstrong 1950 - 2019

And honour
the inventors!

Alain Colmerauer 1941 - 2017

Rebranding Prolog

- as a **web logic programming language**
- as a dialect of Prolog based on **a subset of the ISO Prolog core extended with primitives inspired by Erlang**
- as a dialect of Erlang (*sic*!) with Prolog-like capabilities
- as a language serving as a ***lingua franca*** allowing different Prolog platforms running on the Web to **communicate**, **interoperate** and **cooperate** in the service of human users of the **Prolog Web**
- as a language which gives the Prolog community **a Prolog dialect in common**
- as a language that might **appeal to the logic programming community at large**
- as a **new standard** under the auspices of the **W3C**
- as a language targeting a **new application area – spoken (and possibly multi-modal) conversational systems.**

Small signs of success…

- Likes from Joe Armstrong, Markus Triska, and Richard O'Keefe.
- An invitation to join the ISO Prolog standardisation committee.
- O'Keefe wrote:

  "I should tell you that I am liking what I see very much
  and would enjoy using this."

- Interest from the Web world, in the form of Damon Sicore, a former Vice President of Engineering at Mozilla, and Wikimedia Foundation.

Thank you!