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25th May 2011

Formal Reasoning Gets Social

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Met Office

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You are here: Home ▸ Weather ▸ UK ▸ Latest ▸ Snow in your area?

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Snow in your area?

Snow is forecast for certain areas during the next few days. Some places could well see significant falls of snow, but many of us will see very little as the distribution of snow can vary enormously from place to place.

Have you got snow in your area? Why not let the Met Office know by telling us where you are and how much snow is on the ground? You can help build the national picture by submitting your report using the form below. Your observation will be added to our snow depth observations map.

How to measure the depth of snow

- Measure the depth in centimetres using a ruler held vertically in a location free from drifting or scouring by wind.
- Ideally, take three measurements at different places and report the average of these.
- You must ensure that the ruler is either adapted to read zero at ground level or you take account of the length of the short gap between the end of the ruler and the zero mark when you make your measurement.
- Make sure your ruler does not pierce the grass or other ground surface beneath the snow, as this will give a false reading.

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Your snow observation

An asterisk (*) indicates a required field.

Your location

Town*

County

Postcode*

Your observation

Depth of level snow on a grass surface* centimetres ? How to measure the depth of snow

Date of observation* 22 May 2011

Time of observation* 14 : 10

Data Protection Act

We will not use your personal data for marketing purposes.

The Met Office is an Executive Agency of the UK Ministry of Defence. The Met Office is registered under the Data Protection Act 1998.

Send weather report

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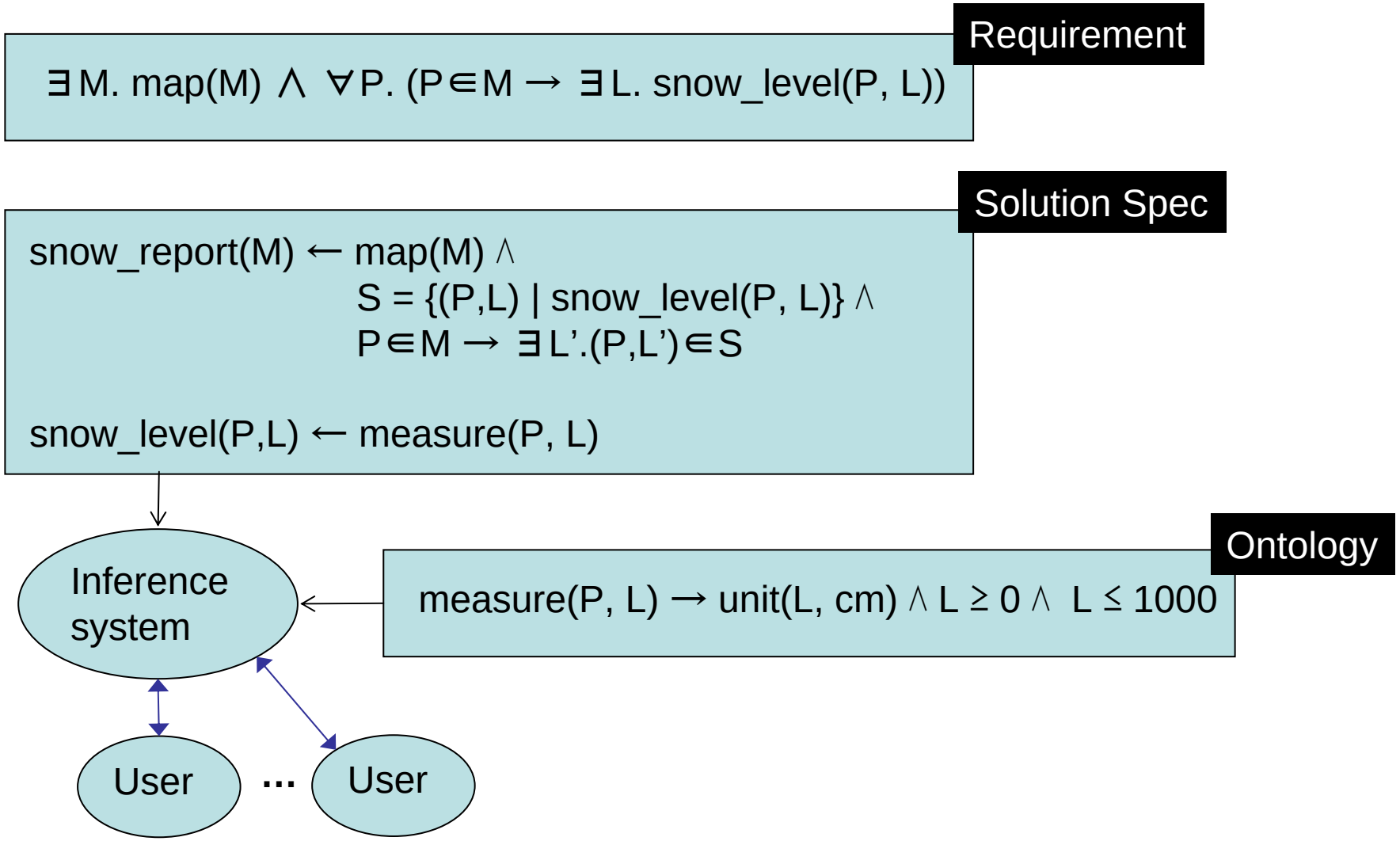
Snow Example: Traditional, centralised



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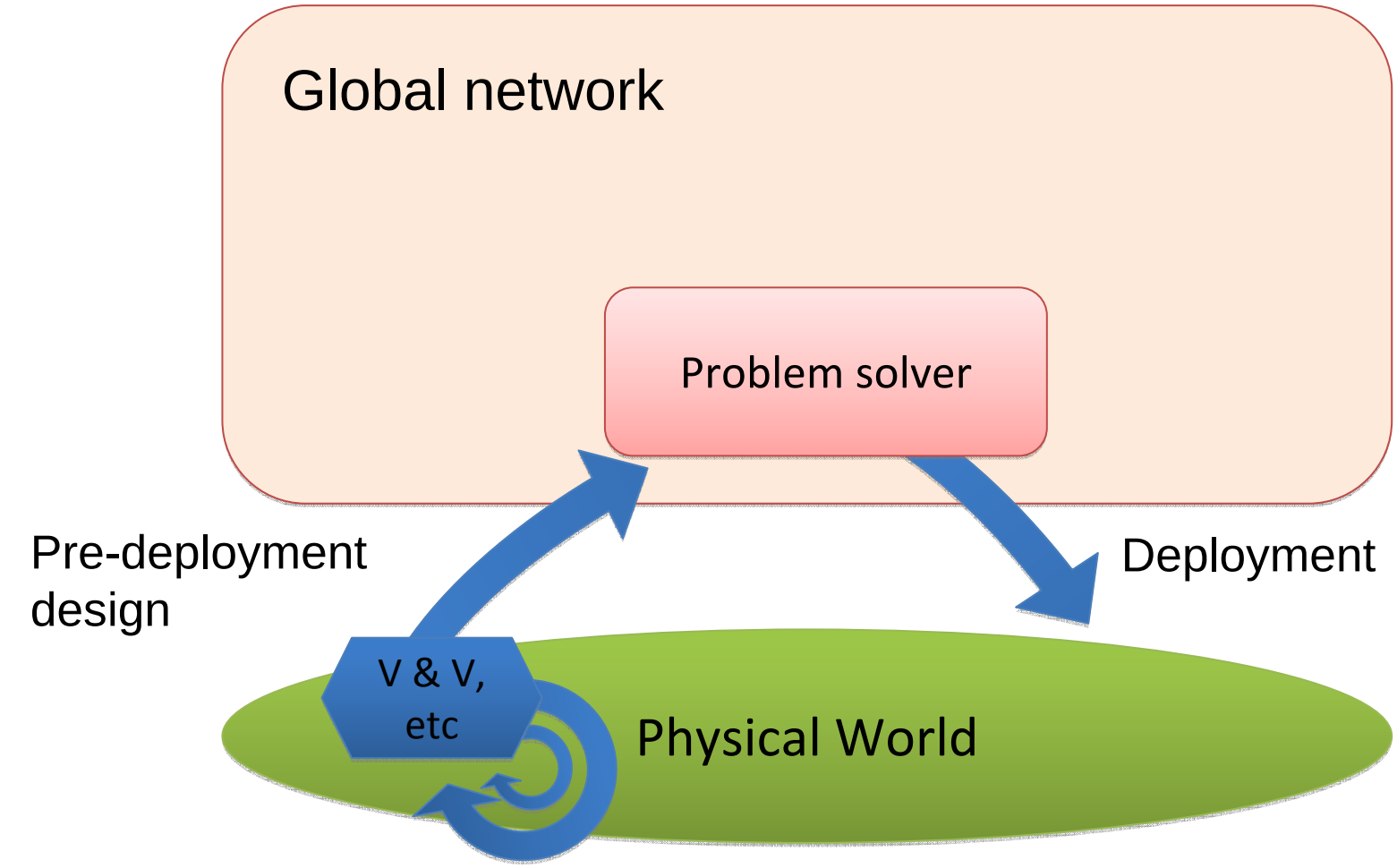
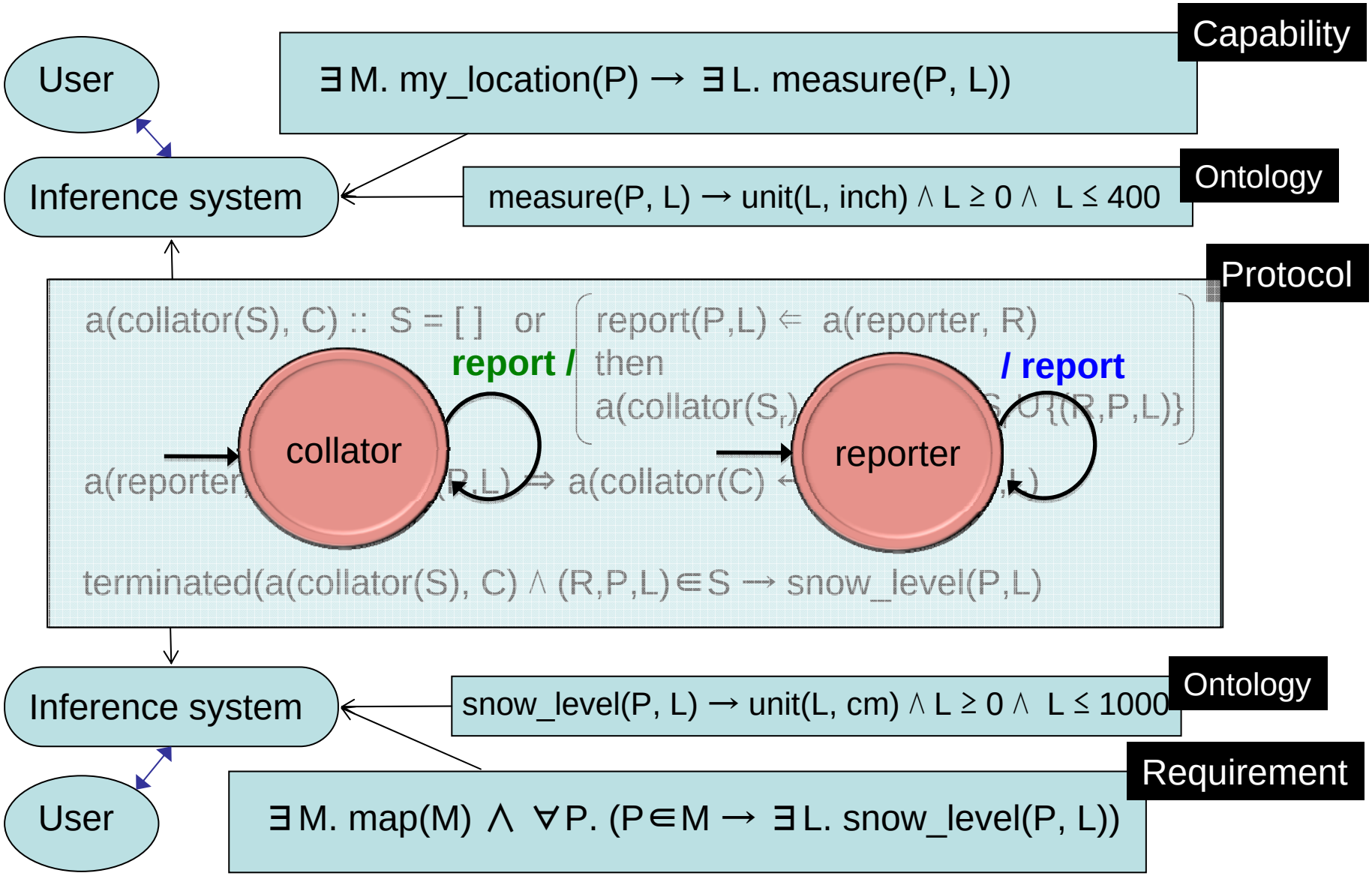
Building Traditional Systems



Time consuming and expensive ➔

- Specialist deployment niches unexplored
- Very large social challenges unassailable

Snow Example: Social, decentralised



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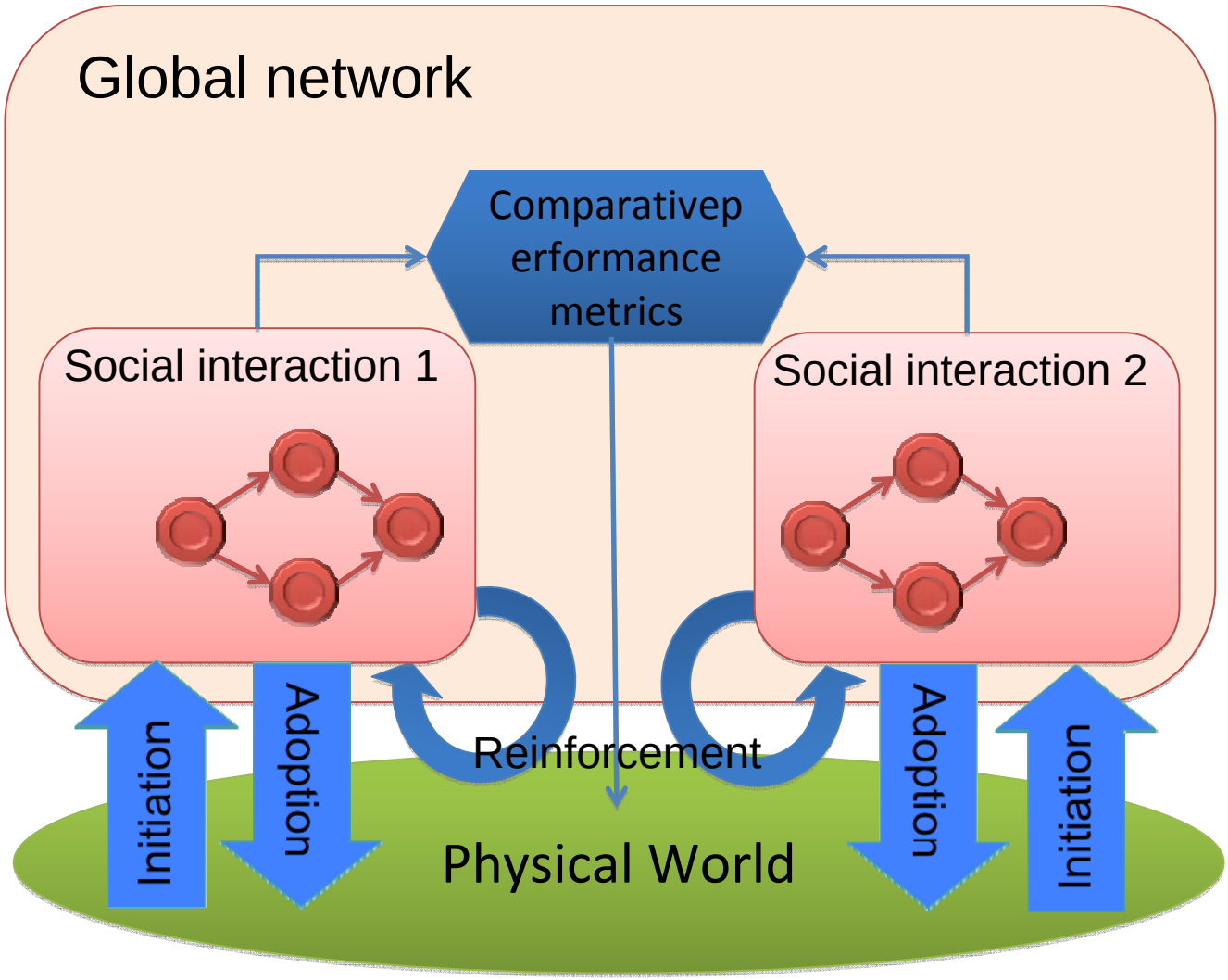
Building Social Computer Systems



Many independent designs initiated

Adoption and reinforcement via metrics

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Social Incentives Make the "Program" Run

Informal problem specification

A number of events, identifiable by most individuals in the population, are likely to occur within a given timeframe in some geographical area but we don't know where they will occur. It is infeasible to find out by applying technology directly. Nevertheless, we want to find out as quickly as possible when and where the events have occurred.

Informal solution specification

Build a system that allows people to register as reporters of the target events and subsequently report the location if they witness an event. If reporters are recruited in sufficient numbers to cover the geographical area then these act as ad hoc sensors of the events. To help gain this coverage, allow people to recommend their friends as reporters.

Example:
DARPA Network Challenge

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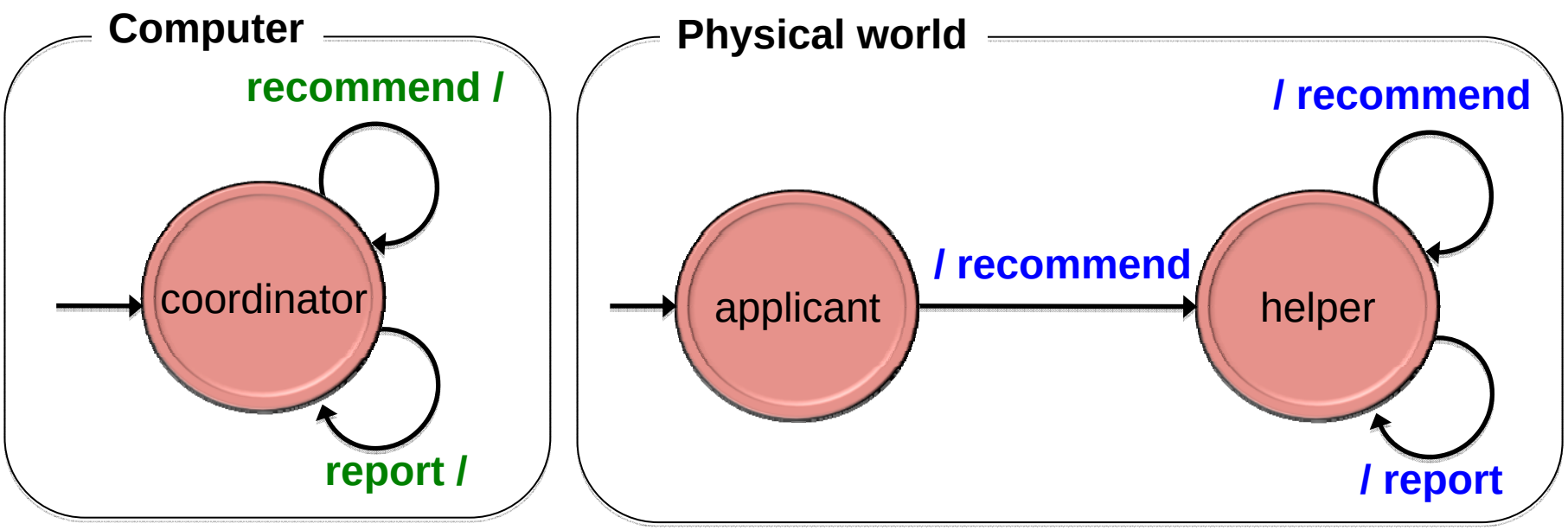
Computer versus Society Specification



coordinator(P, L) ::
L = [] or
*(P = [(A,R)|P_1] ← **recommend**(A) ⇐ R then coordinator(P_1, L)) or*
*(P = [(X,R)|L_1] ← **report**(X) ⇐ R then coordinator(P, L_1))*

*applicant(C) :: **recommend**(self) ⇒ C then helper(C)*

This specifies social behaviour.

*helper(C) :: (**recommend**(A) ⇒ C ← **friend(A)** or*
*__report__(X) ⇒ C ← **witnessed(X)**) then helper(C)*

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A Property of a Social Computation

If the role of coordinator is completed and all the target events are found then
•those who located the target events will be paid the advertised reward and
•anyone who recommended someone who is paid a reward will be paid half the amount given to the person they recommended.

$$\forall P,L.\ (\ completed(coordinator(P, L)) \wedge all\_found(L)\ ) \rightarrow$$
$$(\ \forall R,N.\ \exists X.(X,R) \in L \wedge \textbf{reward}(N) \rightarrow \textbf{pay}(R, N)\ ) \wedge$$
$$(\ \forall R_1,N_1,R_2.(\textbf{pay}(R_1, N_1) \wedge (R_1,R_2) \in P \wedge \neg(R_1 = R_2) \rightarrow \textbf{pay}(R_2, N_1/2)\ )$$

Participants in the computation need to understand this property and believe that it holds of the computation, otherwise the computation will not succeed. The existence of such participants is a property of society, not the computer system.

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Broadly Speaking….

Social computation: A computation for which an executable specification exists but the successful implementation of this specification depends upon large scale, computer mediated social interaction between the human actors in its implementation.

Social property: A requirement associated with the specification of social computation that must be maintained, and perhaps communicated, during the execution of the specification in order for the computation to establish the social group needed to run it.

Social computer: A computer system that allows people to initiate social computations (via executable specifications) and adopt appropriate roles in social computations initiated by others, ensuring while doing so that social properties of viable computations are preserved. A general purpose social computer provides a domain-independent infrastructure for this purpose.

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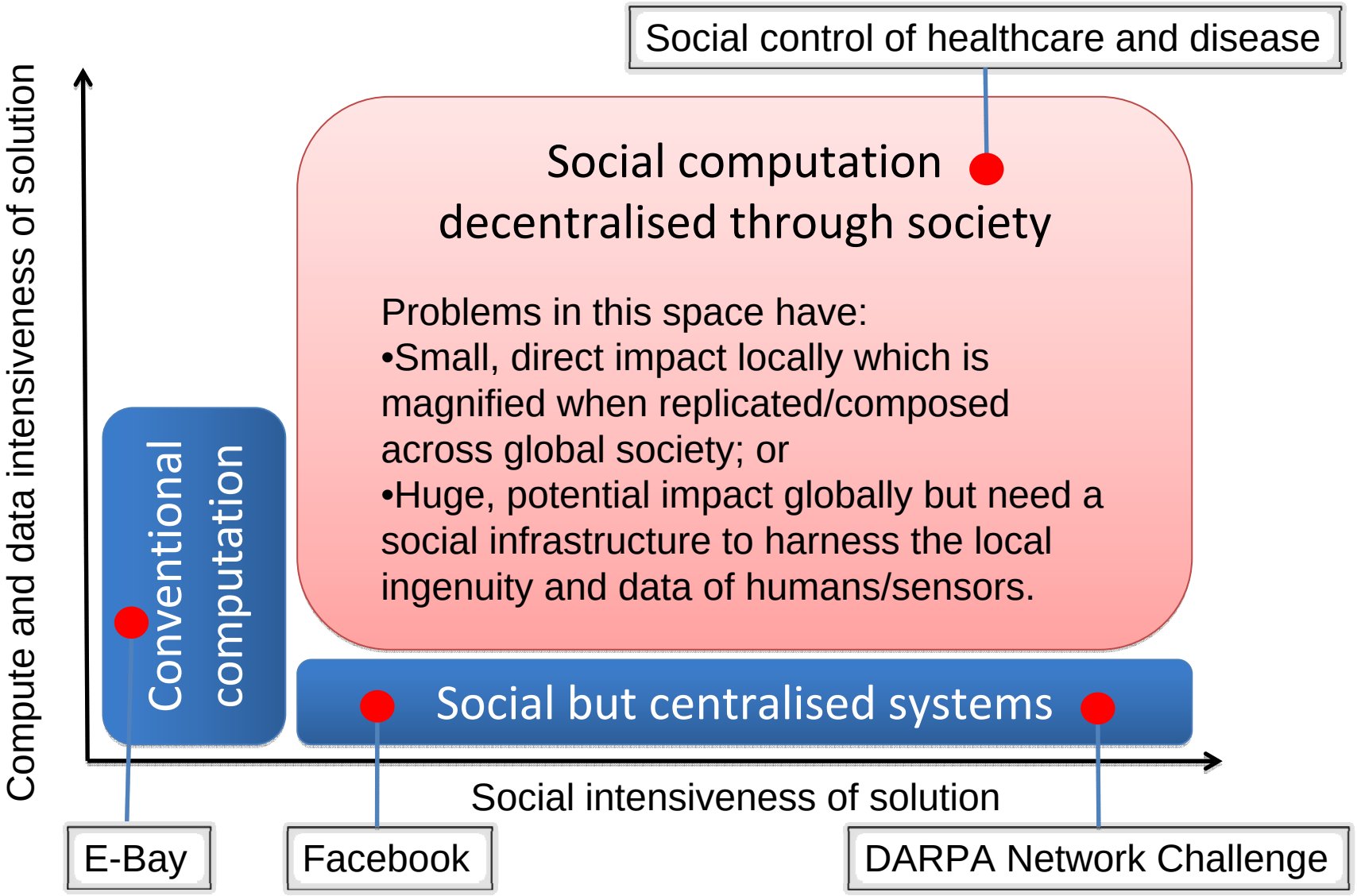
Issues of Scale and Decentralisation



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Problem 1: Where does the protocol come from?

- Traditional view (agency) : There isn't one.
- Traditional view (Web services) : Engineers write them.
- Modelling view: Normal people write them.
- Choreography view: They are shared/synthesised.

How can shareable social protocols be synthesised and composed from requirements on local devices?

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Problem 2: What do the symbols mean?

- Traditional view : Whatever the shared ontology describes, over all peers.
- Multi-agent view: Whatever can be negotiated.
- Statistical view: Whatever they most frequently mean.

Is there a practical knowledge representation language that combines symbolic and statistical social reasoning on an internet scale?

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Problem 3: What's the context for inference?

- Traditional view : Local beliefs provide context.
- Protocol-centric view: Interaction provides additional context.
- Web-centric view: Tags and links provide additional context.

How do we make use of the huge number of social interactions between agents in order to make local inference more sophisticated and reliable?

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Problem 4: What's the state of the computation?

- Traditional view : The state on the server.
- Pure P2P view: Distributed across peer network.
- Web view: The state of the document(s).
- Social view: Any of the above plus the state of the social network.

What's the best view of the state of social computation, and how is it dependent on architecture?

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Problem 5: How is trust established?

- Traditional view : Through identity.
- Language view: Through languages in which commitment may be expressed.
- Statistical view: Through analysis of behaviour (via protocols).

Is there a practical system for representing commitment and reasoning about trust that combines symbolic and statistical social reasoning on an internet scale?

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Problem 6: How is security maintained?

- Traditional view : Trusted third party.
- Agent view: Through local defence.
- Social view: Through trusted social groups.

What mechanisms can exist (social or otherwise) to ensure security in open social computations?

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Problem 7: How do we align to human society?

- Traditional view : Build the software and sell it.
- Economics view: Incentives.
- Sociology view: Inclusion, coherence, ethics.

How do economists/sociologists fit into the technical process of system design, and what sorts of system design methods allow them a role?