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Neg-o-Net (v.1.0)

Capturing stakeholder negotiation within FIRMA

Q.) Why do this?

A.) I'll give one good reason from many.

- If we can capture plausible negotiation processes we can explore many (thousands) of environmental scenarios and "test" different negotiation strategies for robustness – something that would be impossible with stakeholder "gaming" (for example).

Q.) Can we be Generic and Qualitative?

A.) yes, if we modularize and constrain.

- We want to apply a basic model framework to several FIRMA scenarios. To this end we have modularize by:
- Agent “Viewpoints”
  - Already much data collected
- Negotiation “Strategies”
  - On-going (Thames – gaming, other data Zurich)
- Environmental Simulation
  - Already have several produced by members

Constraining the term "Negotiation"

- Negotiation is viewed as:
- Grounded in the attempt, by agents, to induce desirable *actions* in others
- *Not* dependent on shared or even compatible goals or beliefs (agents may have different "viewpoints")

Unpacking Negotiation - Three types of negotiation “moves”

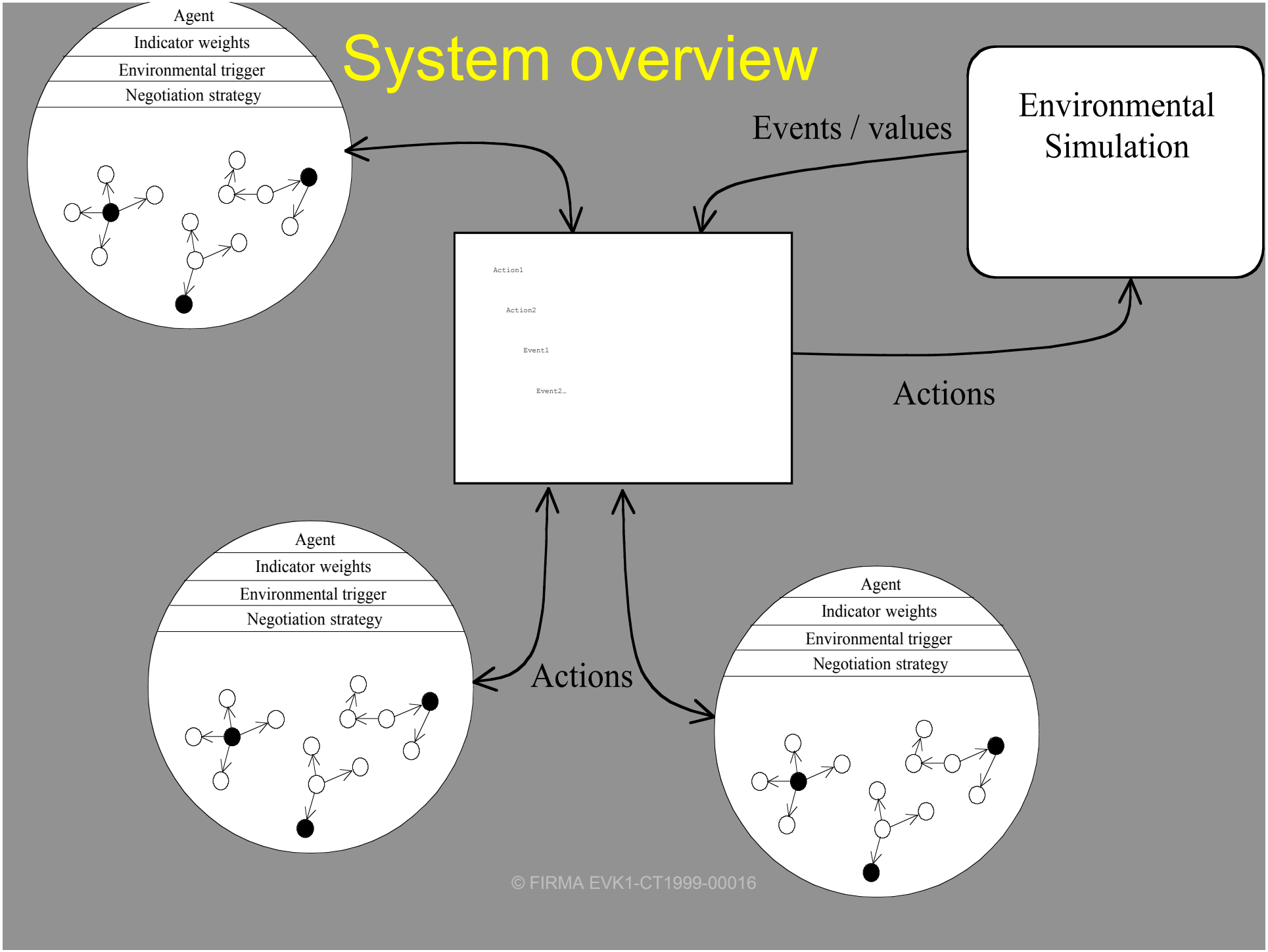
- In Neg-o-net we have categorized possible negotiation moves into three types:
- 1. Action haggling – e.g. “I’ll do A if you do B”
- 2. Belief communication – e.g. “if citizens protest, government become less popular”
- 3. Goal communication – “It is important to protect the environment”
- (2 and 3 above come in regular and “meta” flavors).

Representing agent viewpoints with *digraphs*

- Each agent has a set of diagraphs representing their subjective “viewpoint”
- Nodes represent subjective world states
- Arcs give causal links between nodes
- Nodes may have associated “trigger” conditions which cause them to become active

Digraph representation of viewpoints in Neg-o-Net

- Each node contains set of “indicator values” characterizing desirability (e.g. pollution, employment etc.).
- Each node lists the actions available to the agent (action repertoire) with an optional cost values.
- Each arc has associated conditions which need to be satisfied to traverse the arc


System overview
Agent
Indicator weights
Environmental trigger
Negotiation strategy
Events / values
Environmental Simulation
Action1
Action2
Event1
Event2…
Actions
Agent
Indicator weights
Environmental trigger
Negotiation strategy
Actions
Agent
Indicator weights
Environmental trigger
Negotiation strategy
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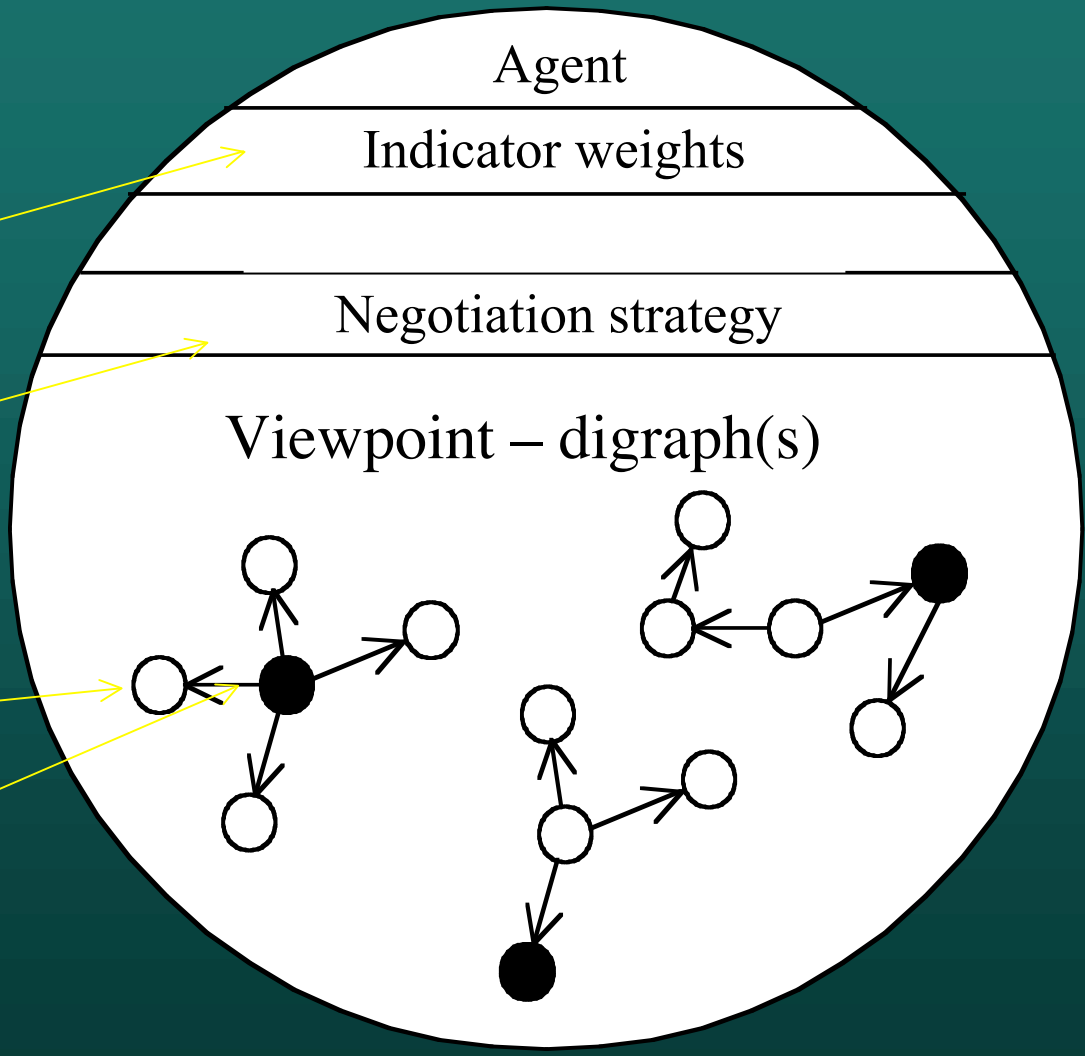
An agent



Objectives (overall goal)

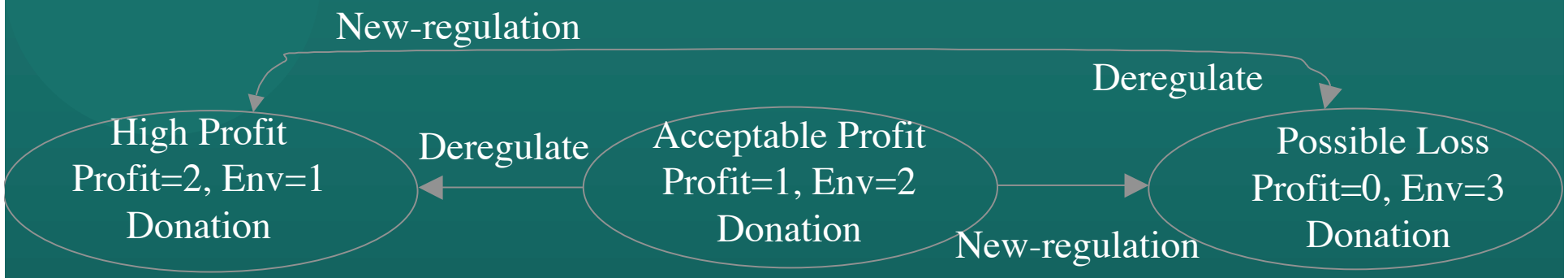
Haggling, Belief and Goal

Viewpoint node

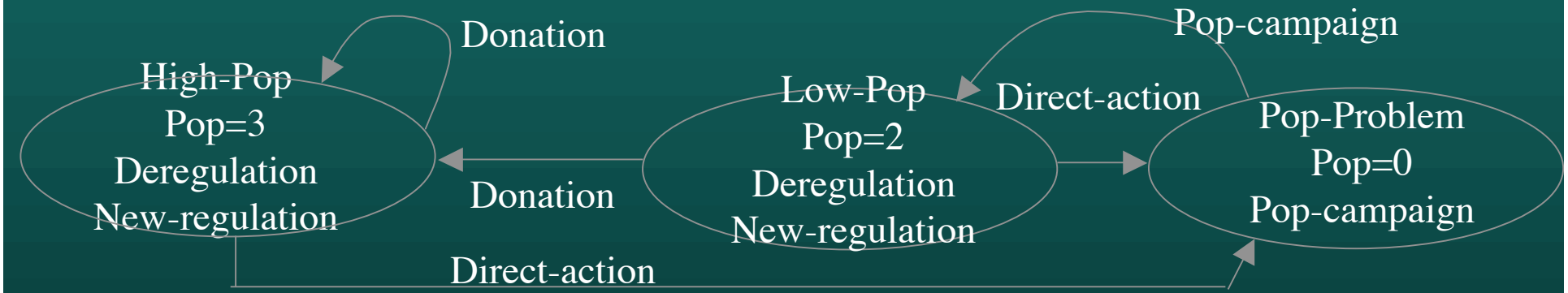
Current active node

Illustrative Viewpoints (Simplified Fragments)

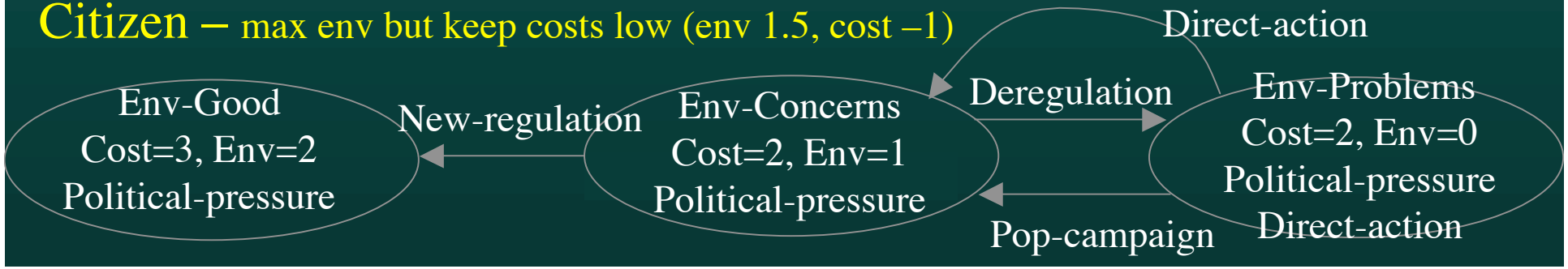
Company – max profit first, some env concern – (profit 1, env 0.5)



Politician – max pop and hence get votes – (pop 1)



Citizen – max env but keep costs low (env 1.5, cost –1)



Current implementation (v.1.0)

- Three example haggling strategies:
  - No haggling
  - Some (open dyadic coalition) haggling
  - Best possible coordinated action
- Single active node in viewpoint diagraph
- No belief or goal communication yet
- No environmental model hooked-up
- Conditions on arcs just a conjunction of atomic actions actions
- All agents follow same negotiation strategy and only “look-a-head” by one link

Example script (input)

```
#
# Neg-o-Net script - very simple viewpoint fragments
#

#==========

Agent:   Company  : The water company       # agent name and description

IndicatorWeights:profit 1 env 0.5           # weights applied to indicators

# now we have a set of nodes and links which belong to the agent

Node: Acceptable-Profit             : the company is in profit
Indicators: profit 1 env 2
Action: Donation                    : the company donates to the politician
Link: New-Regulation => Possible-Loss : the company moves to a possible loss
Link: Deregulation => High-Profit  : the company moves to high profit

Node: Possible-Loss                 : the company is in a possible loss
situation
Indicators: profit 0 env 3
Action: Donation                    : the company donates to the politician
Link: Deregulation => High-Profit  : the company moves to high profit

Node: High-Profit                   : the company is in high profit
Indicators: profit 2 env 1
Action: Donation                    : the company donates to the politician
Link: New-Regulation => Possible-Loss : the company moves to a possible loss
```

Example run 1 (output)

>>> Iteration 1

Perception phase:

The water company (Company):
 the company is in profit (Acceptable-Profit)
The politician (Politician):
 the politician has a low popularity (Low-Pop)
The citizens (Citizen):
 the citizens have concerns about the environment (Env-Concerns)

Negotiation phase: The agents are attempting some coordination of actions via haggling
---
    agent Company says to all: I require action Deregulation. Can anyone help?
    agent Politician says to all: I require action Donation. Can anyone help?
    agent Company says to all: I can offer action Donation.
    agent Politician says to agent Company: will you agree to do actions { Donation } ?
    agent Company replies: only if you can offer actions { Deregulation } in return.
    agent Politician says to agent Company: Okay, I can do that
    agent Politician says to all: I have agreed to perform action(s) { Deregulation }
    agent Company says to all: I have agreed to perform action(s) { Donation }

Action phase:

The water company (Company):
 the company donates to the politician (Donation)
The politician (Politician):
 the politician secures deregulation (Deregulation)

Example run 2 (output)

>>> Iteration 2

Perception phase:

The water company (Company):
 the company moves to high profit
 the company is in high profit (High-Profit)
The politician (Politician):
 donations will help popularity
 the politician has a high popularity (High-Pop)
The citizens (Citizen):
 the citizens think deregulation will lead to problems
 the citizens are deeply concerned about environmental problems (Env-Problems)

Negotiation phase: The agents are attempting some coordination of actions via haggling
---
    agent Politician says to all: I require action Donation. Can anyone help?
    agent Politician says to all: I'm getting nowhere, I retract my previous offers and requirements!

Action phase:

The citizens (Citizen):
 the citizens take direct action (Direct-Action)

Example run 3 (output)

>>> Iteration 3

Perception phase:

The water company (Company):
 the company is in high profit (High-Profit)
The politician (Politician):
 direct action by citizens will lead to low popularity
 the politician has a very low popularity (Pop-Problem)
The citizens (Citizen):
 direct action is sometimes necessary
 the citizens have concerns about the environment (Env-Concerns)

Negotiation phase: The agents are attempting some coordination of actions via haggling
---

Action phase:

The politician (Politician):
 the politician tries a popularity campaign (Pop-Campaign)

Example run 4 (output)

>>> Iteration 4

Perception phase:

The water company (Company):
 the company is in high profit (High-Profit)
The politician (Politician):
 the popularity campaign has done some good
 the politician has a low popularity (Low-Pop)
The citizens (Citizen):
 the citizens have concerns about the environment (Env-Concerns)

Negotiation phase: The agents are attempting some coordination of actions via haggling
---
    agent Politician says to all: I require action Donation. Can anyone help?
    agent Politician says to all: I'm getting nowhere, I retract my previous offers and requirements!

Action phase:

The next step with FIRMA partners – the next 6 Months

- We are hoping to closely collaborate with at least two regional partners to:
- Develop viewpoints in detail
- Develop plausible negotiation strategies
- Integrate existing environmental models
- We envisage adding and amending features to accommodate real data!
- This task is not trivial!
- We want to start simple – get some detailed viewpoints and ask “what do we need to change / add to make the model more plausible”